Prepared for
Rio Tinto Limited
ABN: 96 004 458 404

Paraburdoo AR-24-18597 Flora, Vegetation and Fauna Assessment

Native Vegetation Clearing Permit – Supporting Report

10-Oct-2024
Doc No. 60726828_2
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Paraburdoo AR-24-18597 Flora, Vegetation and Fauna Assessment

Native Vegetation Clearing Permit – Supporting Report

Client: Rio Tinto Limited

ABN: 96 004 458 404

Prepared by

AECOM Australia Pty Ltd
Whadjuk Nyoongar Country, Level 15, Alluvion Building, 58 Mounts Bay Road, Perth WA 6000, GPO Box B59, Perth WA 6849, Australia
T +61 1800 868 654 www.aecom.com
ABN 20 093 846 925

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Quality Information

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Date	10-Oct-2024
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Checker/s	Cassandra House
Verifier/s	Jamie Shaw

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Rev	Revision Date	Details	Approved	
			Name/Position	Signature
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2	10-Oct-2024	Final Submission	Alix Chinnery Associate Director - Project Management	

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Executive Summary

Rio Tinto Iron Ore (Rio Tinto) engaged AECOM Australia Pty Ltd (AECOM) to undertake a flora, fauna habitat and vegetation assessment for a defined survey area in the Pilbara region. The survey area is located approximately 390 m north of the town of Paraburdoo, Western Australia and represents a 354.48 ha polygon.

The objective of the survey is to define and map significant environmental values in line with regulatory requirements to support a Native Vegetation Clearing Permit (NVCP) application. The survey targeted Threatened and Priority flora, communities and fauna habitats that may support conservation significant species.

A field survey was undertaken between 14 and 18 June 2024 by Celia Mitchell supported by Nina Sergeev. A summary of the results is presented below:

- No significant flora species listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), the *Biodiversity Conservation Act 2016* (BC Act) or by Department of Biodiversity Conservation and Attractions (DBCA) were recorded. Seven species listed as Priority had a 'high' likelihood of occurring. This was reduced to 'low' or 'negligible' in the absence of suitable habitat and the considerable degradation of vegetation in the survey area.
- No communities listed as Threatened or Priority under federal or state legislation were recorded and none were anticipated to occur.
- Three fauna habitats were defined and mapped: Alluvial Plain, Stony Plain, and Minor Drainage.
- Three significant fauna species have the potential to occur in the survey area:
    - Pilbara Olive Python (*Liasis olivaceus barroni*) listed as Vulnerable under the EPBC Act and BC Act may utilise the Minor Drainage as transient habitat to move between more preferable habitats
    - Northern Quoll (*Dasyurus hallucatus*) listed as Endangered under the EPBC Act and BC Act may use habitats for dispersal and foraging resources but no core habitat
    - Grey Falcon (*Falco hypoleucos*) listed as Vulnerable under the EPBC Act and BC Act may utilise the Alluvial Plain, Stony Plain and Minor Drainage as foraging and hunting habitat.

The survey was successfully undertaken, with no significant limitations identified that could influence the outcome of the survey. The survey was conducted during the ideal detection period for flora. The majority (95%) of the species were able to be identified to species level, with many species flowering at time of survey.

1.0 Introduction

1.1 Background

Rio Tinto Iron Ore (Rio Tinto) engaged AECOM Australia Pty Ltd (AECOM) to undertake a flora, fauna habitat and vegetation assessment for a defined survey area in the Pilbara region. The survey area is located approximately 390 m north of the town of Paraburdoo, Western Australia and represents a 354.48 ha polygon.

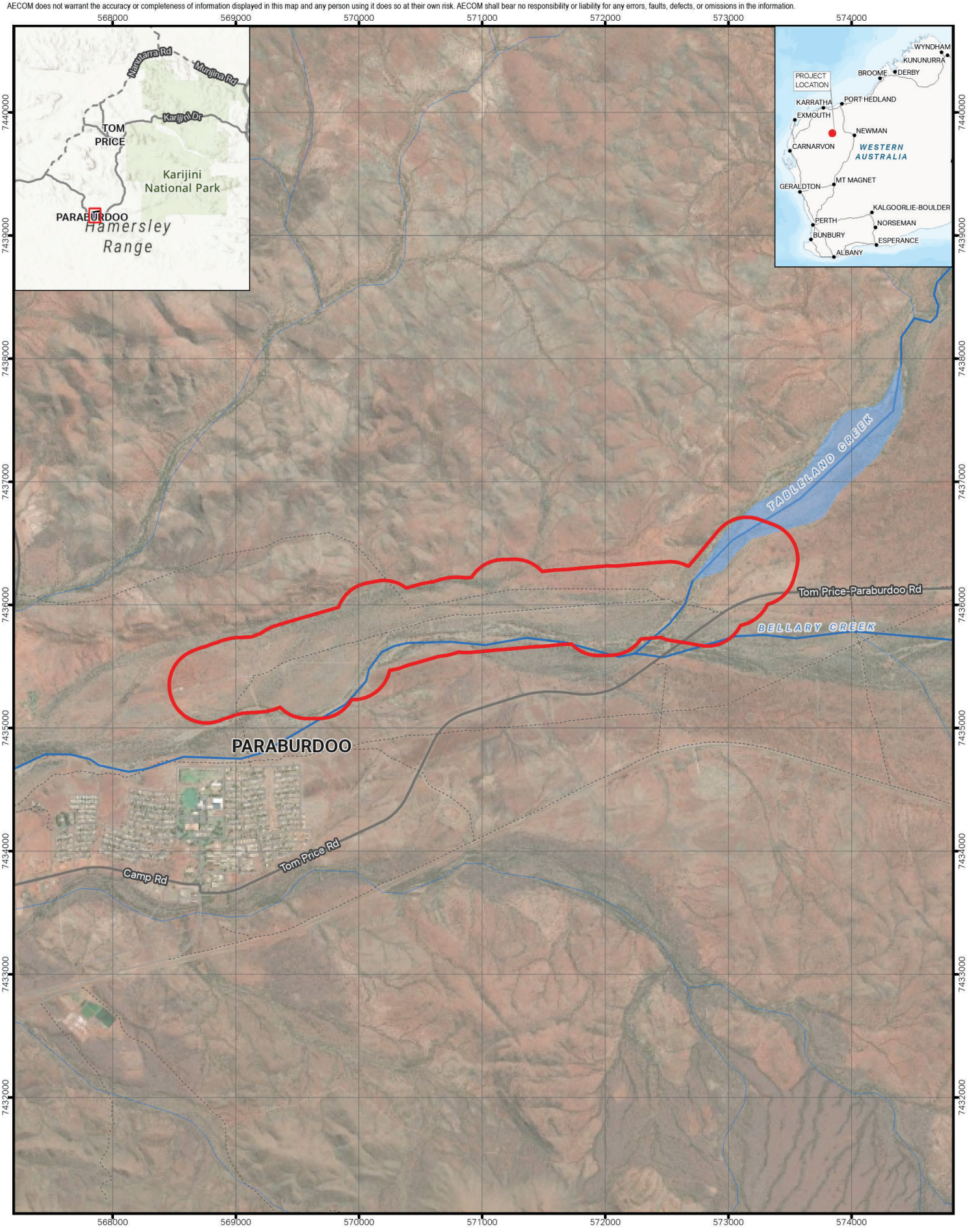
1.2 Location

The survey area is located within the Shire of Ashburton, in the Pilbara region of Western Australia. It is approximately 390 m north of the town of Paraburdoo, Western Australia and represents a 354.48 ha polygon.

1.3 Objective and Scope

The purpose of the survey is to identify and map environmental values pertaining to flora, vegetation, and fauna to support a Native Vegetation Clearing Permit (NVCP) application. The scope included:

- A detailed flora and vegetation assessment
- Targeted significant flora, community searches and assessment
- A basic fauna habitat assessment.



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DATE MODIFIED	12 AUG 2024	**APPROVED BY**	F DE WIT

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GDA2020 MGA ZONE 50

LEGEND

Survey Area

Survey Area

RIO TINTO

PARABURDOO AR-24-18597 FLORA, VEGETATION AND FAUNA ASSESSMENT

Figure 1

A4 size

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2.0 Conservation Codes

2.1 Flora and Fauna

Species at risk of extinction are recognised at a Commonwealth level under the *Environment Protection, Biodiversity and Conservation Act 1999* (EPBC Act) and are categorised as outlined in Table 1.

Table 1 Categories of species listed under Schedule 179 of the EPBC Act

Code	Category
Ex	**Extinct Taxa** A species which at a particular time if, at that time, there is no reasonable doubt that the last member of the species has died.
ExW	**Extinct in the Wild Taxa** A species which is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
CE	**Critically Endangered Taxa** A species which at a particular time if, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
E	**Endangered Taxa** A species which is not critically endangered, and it is facing a very high risk of extinction in the wild in the immediate or near future, as determined in accordance with the prescribed criteria.
V	**Vulnerable Taxa** A species which is not critically endangered or endangered and is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria
CD	**Conservation Dependent Taxa** A species which at a particular time if, at that time: the species is the focus of a specific conservation program the cessation of which would result in the species becoming vulnerable, endangered or critically endangered the following subparagraphs are satisfied: the species is a species of fish, the species is the focus of a plan of management that provides for management actions necessary to stop the decline of, and support the recovery of, the species so that its chances of long term survival in nature are maximised the plan of management is in force under a law of the Commonwealth or of a State or Territory cessation of the plan of management would adversely affect the conservation status of the species.
Mi	**Migratory Taxa** The EPBC Act also requires the compilation of a list of migratory species that are recognised under international treaties including: • Japan Australia Migratory Bird Agreement 1981 (JAMBA) • China Australia Migratory Bird Agreement 1998 (CAMBA) • Republic of Korea-Australia Migratory Bird Agreement 2007 (ROKAMBA) • Bonn Convention 1979 (The Convention on the Conservation of Migratory Species of Wild Animals). All migratory bird species listed in the annexes to these bilateral agreements are protected in Australia as a MNES under the EPBC Act.
Ma	**Marine Taxa** A species established under s248 of the EPBC Act.

Flora and fauna species that are considered Threatened and need to be specially protected because they are under identifiable threat of extinction are listed under the *Biodiversity Conservation Act 2016* (BC Act). These categories are defined in Table 2.

Table 2 Conservation codes for WA flora and fauna listed under the BC Act

Code	Category
CR	**Critically Endangered Taxa** Threatened species considered to be facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines. Listed as critically endangered under section 19(1)(a) of the BC Act in accordance with the criteria set out in section 20 and the ministerial guidelines.
EN	**Endangered Taxa** Threatened species considered to be facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines. Listed as endangered under section 19(1)(b) of the BC Act in accordance with the criteria set out in section 20 and the ministerial guidelines.
VU	**Vulnerable Taxa** Threatened species considered to be facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with criteria set out in the ministerial guidelines. Listed as vulnerable under section 19(1)(c) of the BC Act in accordance with the criteria set out in section 20 and the ministerial guidelines.
EX	**Extinct Taxa** Species which have been adequately searched for and there is no reasonable doubt that the last individual has died, and listing is otherwise in accordance with the ministerial guidelines (section 24 of the BC Act).
MI	**Migratory Taxa** Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or the species is subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth; and listing is otherwise in accordance with the ministerial guidelines (section 15 of the BC Act). Includes birds that are subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), and fauna subject to the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention), an environmental treaty under the United Nations Environment Program. Migratory species listed under the BC Act are a subset of the migratory animals, that are known to visit Western Australia, protected under the international agreements or treaties, excluding species that are listed as Threatened species.
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, and listing is otherwise in accordance with the ministerial guidelines (section 14 of the BC Act).
OS	**Other specially protected species** Fauna otherwise in need of special protection to ensure their conservation, and listing is otherwise in accordance with the ministerial guidelines (section 18 of the BC Act).

Species that have not yet been adequately surveyed to warrant being listed under the BC Act, or are otherwise data deficient, are added to a Priority List as Priority 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 listed as Priority 4. Categories and definitions of Priority Fauna species are provided in Table 3.

Table 3 Conservation codes for WA flora and fauna species as listed by DBCA and endorsed by the Minister for Environment

Code	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. Such species are in urgent need of further survey.
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. Such species are in urgent need of further survey.
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. Such species are in need of further survey.
P4	**Priority Four – Rare, Near Threatened and other species in need of monitoring** 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. 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.

2.2 Vegetation Communities

Threatened Ecological 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.

Communities can be classified as TECs under the EPBC Act. Categories of EPBC Act listed TECs are described in Table 4.

Table 4 Categories of TECs that are listed under the EPBC Act

Code	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.

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. TECs are listed under the BC Act in one of four categories defined in Table 5.

The 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 6.

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

Table 5 Conservation codes for state listed Ecological Communities

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

Table 6 Categories for Priority Ecological Communities

Code	Category
P1	Poorly-known ecological communities
P2	Poorly-known ecological communities
P3	Poorly-known ecological communities
P4	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.

2.3 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 *Biosecurity and Agricultural Management Act* (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.

3.0 Existing Environment

3.1 Climate

The survey area is located approximately 1.4 km from the township of Paraburdoo, which experiences a semi-arid climate. Semi-arid climates are characterised by areas that receive precipitation below the potential evapotranspiration rates. The climate is an intermediate between desert and humid climates and is characterised by hot and dry (sometimes exceptionally hot) summers, with cold winters. Cold semi-arid climates can have major temperature swings between day and night of up to 20°C.

Comprehensive rainfall and temperature data was obtained from Paraburdoo Aero (station 007185). Rainfall for the 12 months preceding the survey was 134.2 mm, more than 50% below the long-term average of 319.1 mm. Temperatures have also been warmer than average, with both minimum and maximum temperatures higher than the long-term average between August 2023 and May 2024 (BOM, 2024) .

The lower-than-average rainfall may have influenced the abundance of annual plant species that are observed during the survey.

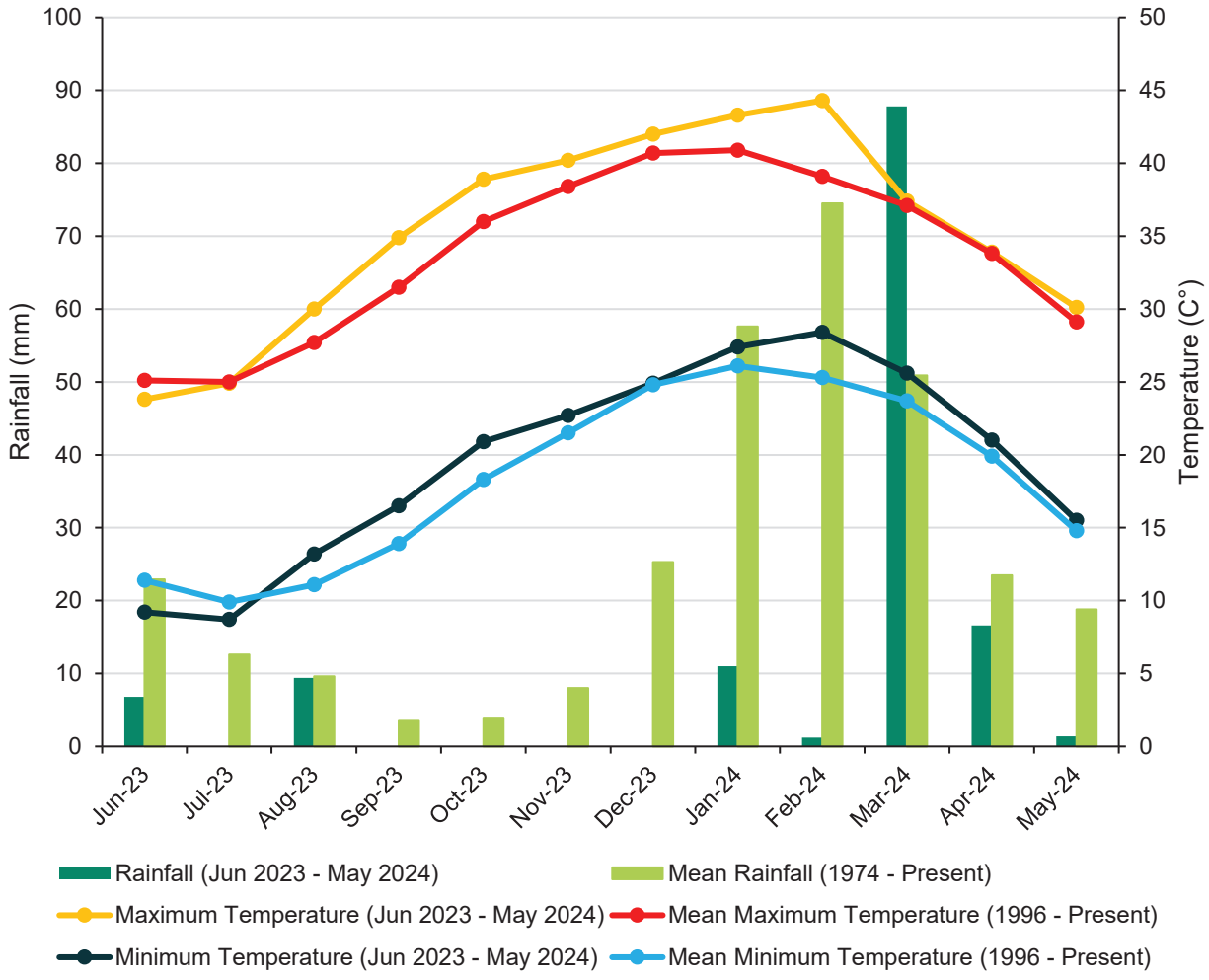


Figure 2 Rainfall data from Paraburdoo Aero (station 007185) (BOM, 2024)

3.2 IBRA Region

The largest regional vegetation classification scheme recognised by Environmental Protection Authority (EPA) is the Interim Biogeographical Region of Australia (IBRA). The IBRA regions provide the planning framework for the systematic development of a comprehensive, adequate, and representative (CAR) national reserve system. There are 89 recognised IBRA regions across Australia that have been defined based on climate, geology, landforms and characteristic vegetation and fauna (IBRA7, 2012). The survey area occurs in the Pilbara Craton IBRA region, within the Hamersley subregion.

The Pilbara Craton bioregion, described in CALM (2002), has an active drainage system including Fortescue, De Grey and Ashburton River systems. Special values of the bioregion includes the geological complexity of the Marble Bar-Nulagine mineral province, populations of threatened and endangered species, refugial ecosystems associated with gorges, waterfalls and mountain tops, coastal islands, rock piles of the Burrup Peninsula, and Indigenous culturally significant sites. The bioregion is divided into four subregions including Chichester, Fortescue Plains, Hamersley and Roebourne.

The Hamersley subregion, described by Kendrick (2001), is the southern section of the Pilbara Craton and consists of a mountainous area of Proterozoic sedimentary ranges and plateaux dissected by gorges. The vegetation consists of Mulga low woodland over bunch grasses on valley floors with *Eucalyptus leucophloia* over Triodia on skeletal soils of ranges. Rare features of the subregion include the gorges of the Hamersley Range (particularly in Karijini National Park), Palm Spring and Duck Creek, Themeda grasslands of the Pilbara, and Red Hill Station Mulga stands in the extreme west of the subregion. Dominant land use includes grazing, unallocated Crown Land and Crown Reserve, native pastures, conservation and mining.

3.3 Land Systems

The survey area is situated across three land systems (van Vreeswyk et al., 2004) (Figure 3):

- Marandoo system, described as basalt hills and restricted stony plains supporting grassy mulga shrublands
- Paraburdoo system, described as basalt derived stony gilgai plains and stony plains supporting snakewood and mulga shrublands with spinifex, chenopods and tussock grasses
- River system, described as narrow, seasonally active flood plains and major river channels supporting moderately close, tall shrublands or woodlands of acacias and fringing communities of eucalypts sometimes with tussock grasses or spinifex.

3.4 Geology

Five geological units have been mapped across the survey area (Figure 4):

- Qa alluvium 38485: channel and flood plain alluvium; gravel, sand, silt, clay, locally calcreted
- AbfbBunjinah Formation: metabasaltic pillow lava and breccia; metatuff and minor chert
- Qrc colluvium 38491: colluvium, sheetwash, talus; gravel piedmonts and aprons over and around bedrock; clay-silt-sand with sheet and nodular kankar; alluvial and aeolian sand-silt-gravel in depressions and broad valleys in Canning Basin; local calcrete, reworked laterite
- Awfh Hardey Formation: sandstone, siltstone, shale, lithic wacke, mudstone, arkose, calcareous beds, conglomerate; porphyry, porphyry breccia; quartzite; dacitic to rhyolitic lavas; quartz-feldspar-mica schist; boulder breccia; basalt; felsic pyroclastics, ultramafic lava
- Abfr Mount Roe Basalt: massive, porphyritic, vesicular, amygdaloidal and doleritic basalt; some high-Mg basalt, agglomerate, volcanic breccia, tuff, mafic wacke, shale, polymictic conglomerate and sandstone, siliceous limestone and dolomite.

3.5 Vegetation

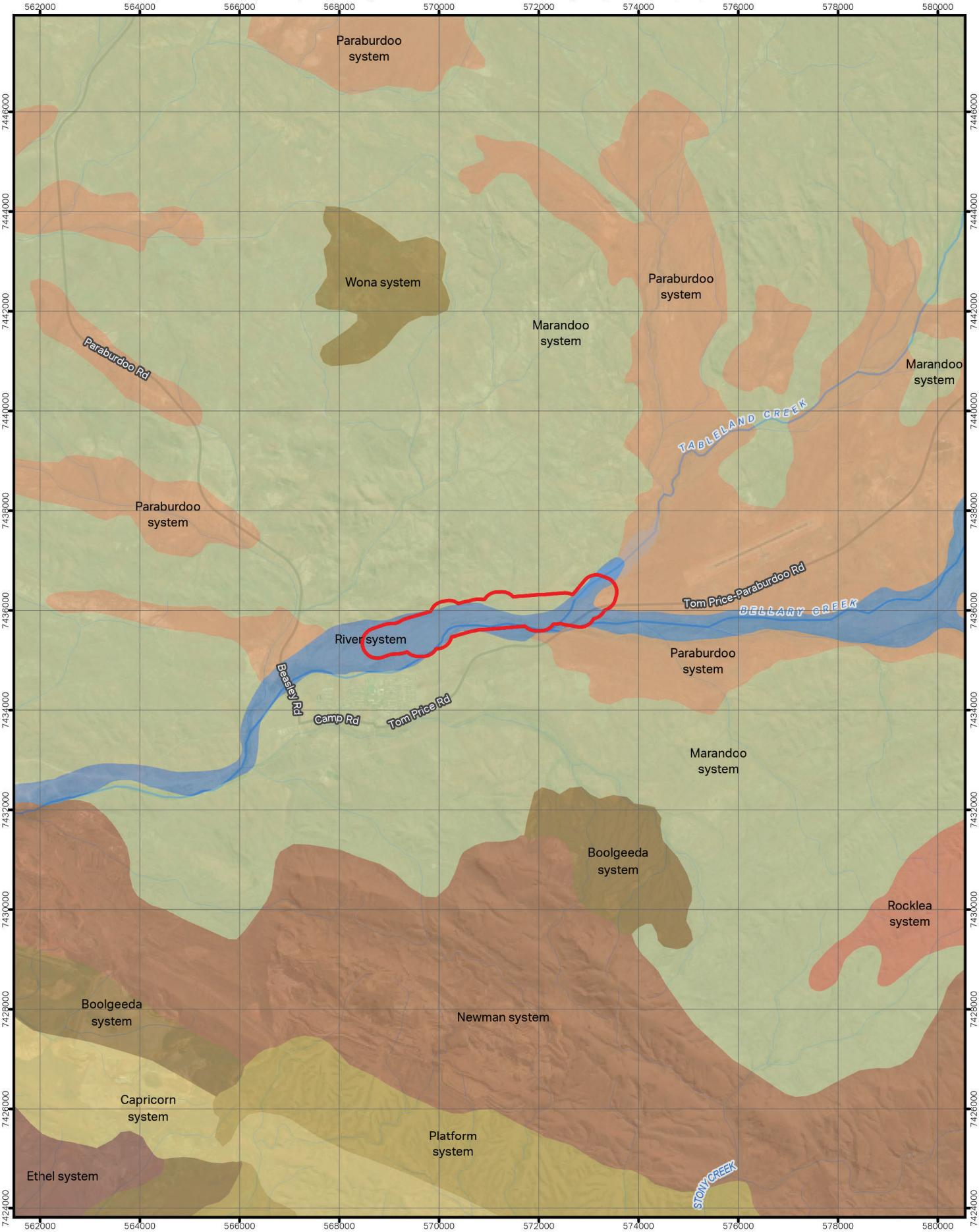
Beard et al. (2013) mapping is used to determine the current extent of remnant vegetation remaining when compared to Pre-European vegetation extent. There are four vegetation associations recorded across the survey area. Table 7 describes the vegetation associations and the percentage remaining across different boundaries. This is mapped in Figure 5.

Table 7 Beard et al. (2013) vegetation associations and percent remaining (Govt. of Western Australia, 2019)

Vegetation Association	Description	Percentage Remaining (%)			
		Western Australia	Pilbara IBRA Region	Hamersley IBRA Subregion	Shire of Ashburton
181	Shrublands; mulga & snakewood scrub	46.39	97.10	97.10	99.77
567	Hummock grasslands, shrub steppe; mulga & kanji over soft spinifex & *Triodia basedowii*	99.66	99.66	99.66	99.66

3.6 Conservation Reserves and Environmentally Sensitive Areas

No reserves or Environmentally Sensitive Areas (ESAs) occur within the survey area. The closest reserve, Karijini National Park, is located 29 km east (Figure 6).



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GDA2020 MGA ZONE 50

LEGEND

- Survey Area
- Soil Landscape Mapping - Best Available (DPIRD-027)
- River system,Narrow, seasonally active flood plains and major river channels supporting moderately close, tall shrublands or woodlands of acacias and fringing communities of eucalypts sometimes with tussock grasses or spinifex
- Paraburdoo system,Basalt derived stony gilgai plains and stony plains supporting snakewood and mulga shrublands with spinifex, chenopods and tussock grasses
- Marandoo system,Basalt hills and restricted stony plains supporting grassy mulga shrublands
- Capricorn system,Rugged sandstone hills, ridges, stony footslopes and interfluves supporting low acacia shrublands or hard spinifex grasslands with scattered shrubs
- Boolgeeda system,Stony lower slopes and plains below hill systems supporting hard and soft spinifex grasslands or mulga shrublands
- Newman system,Rugged jaspilite plateaux, ridges and mountains supporting hard spinifex grasslands
- Ethel system,Cobble plains with sparse mulga and other acacia shrublands
- Platform system,Dissected slopes and raised plains supporting shrubby hard spinifex grasslands
- Rocklea system,Basalt hills, plateaux, lower slopes and minor stony plains supporting hard spinifex and occasionally soft spinifex grasslands with scattered shrubs
- Wona system,Basalt upland gilgai plains supporting Roebourne Plains grass and Mitchell grass tussock grasslands, minor hard spinifex grasslands or annual grasslands/ herbfields

Soil Landscape Mapping

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PARABURDOO AR-24-18597 FLORA, VEGETATION AND FAUNA ASSESSMENT

Figure 3

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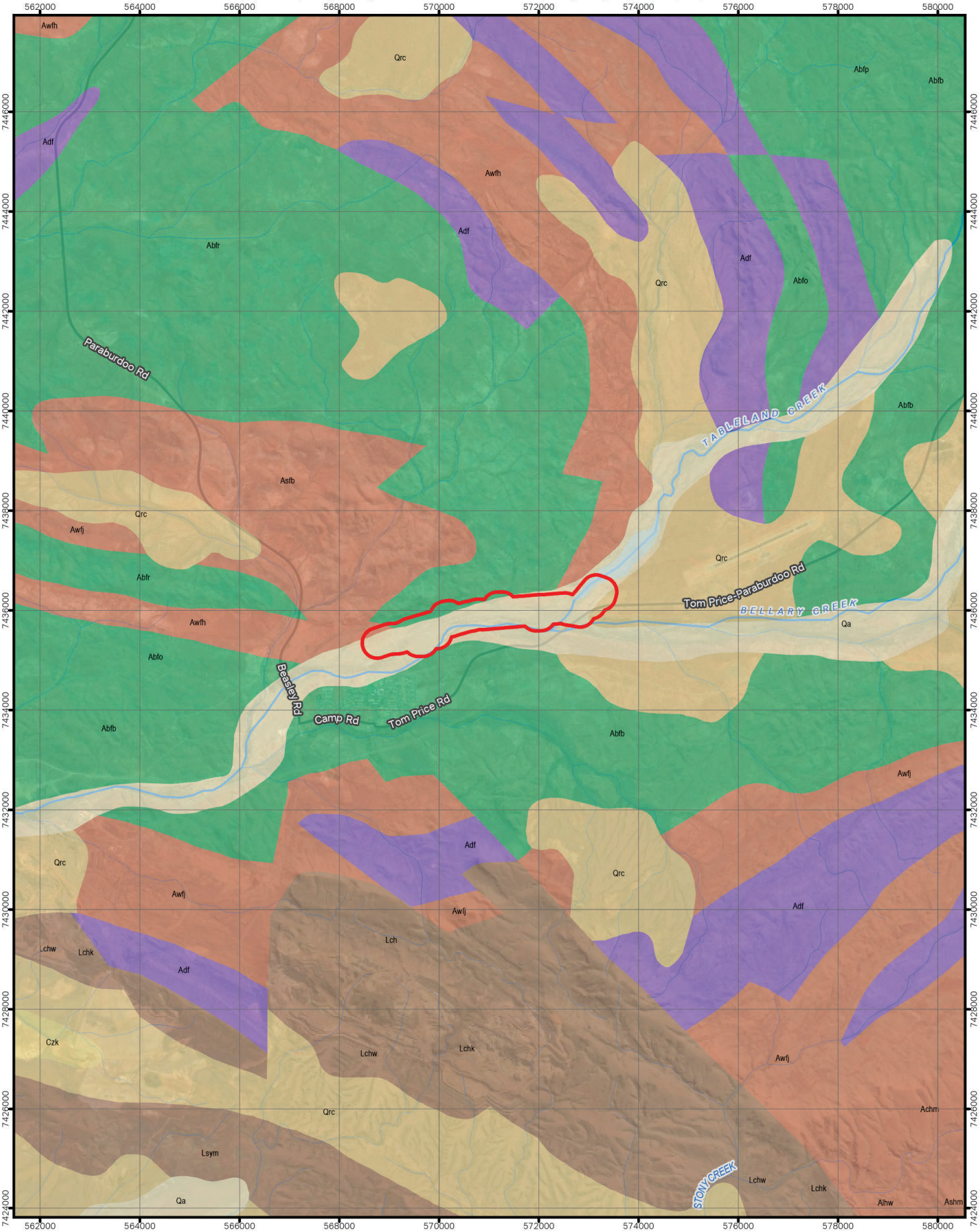

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metres

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GDA2020 MGA ZONE 50

LEGEND

Survey Area

Geoscience Australia (2012) Surface Geology of Australia, 1:1 000 000 scale, 2012 edition

QUATERNARY
- Qa
- Qrc

CENOZOIC
- Czk

PALEOPROTEROZOIC
- Lsym
- Lch
- Lchk
- Lchw

ARCHEAN
- Abfb
- Abfp
- Abfo
- Asfb
- Alhw
- Ashm
- Adf
- Abfr
- Awfj
- Awfh
- Achm

Geology

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PARABURDOO AR-24-18597 FLORA, VEGETATION AND FAUNA ASSESSMENT

Figure 4

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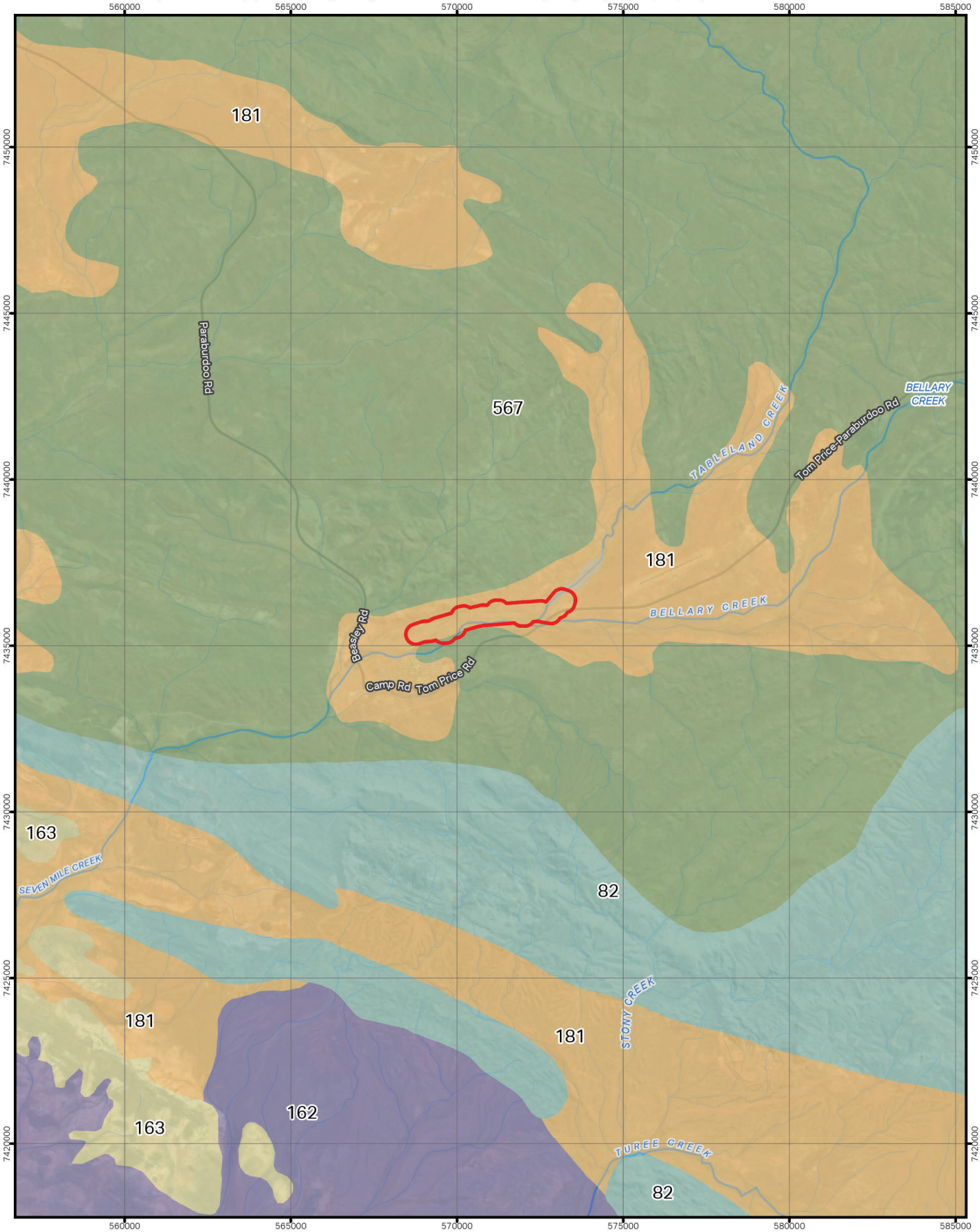

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APPROVED BY	F DE WIT

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GDA2020 MGA ZONE 50

LEGEND

- Survey Area

Pre-European Vegetation (DPIRD-006)

- 82, Low tree-steppe,Hummock grassland with scattered bloodwoods and snappy gum *Triodia* spp., *Corymbia dichromophloia*, *Eucalyptus leucophloia*
- 162, Scrub, open scrub or sparse scrub,Wattle, teatree and other species *Acacia* spp. *Melaleuca* spp.
- 163, Dwarf scrub or open low shrub,*Acacia* spp., *Eremophila* spp., *Senna* spp.
- 181, Scrub, open scrub or sparse scrub,Wattle, teatree and other species *Acacia* spp. *Melaleuca* spp.
- 567, Shrub-steppe,Hummock grassland with scattered shrubs or mallee *Triodia* spp. *Acacia* spp., *Grevillea* spp. *Eucalyptus* spp

Pre-European Vegetation

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PARABURDOO AR-24-18597 FLORA, VEGETATION AND FAUNA ASSESSMENT

Figure 5

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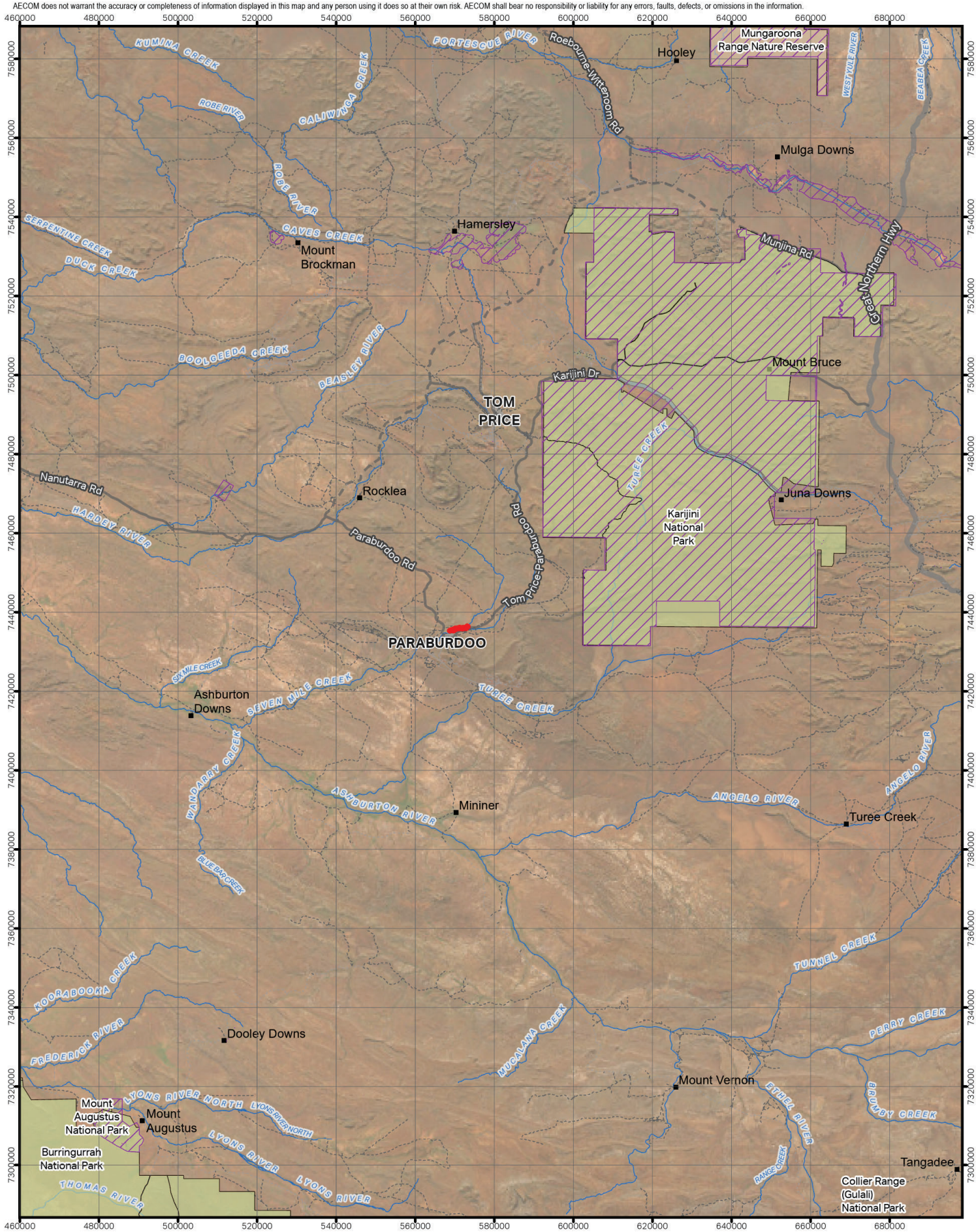

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PROJECT ID 60726828 CREATED BY WYATTK2
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GDA2020 MGA ZONE 50

DATA SOURCES Base Data: (c) Based on information provided by and with the permission of the Western Australian Land Information Authority trading as Landgate (2010) Service Layer Credits: World Imagery: Earthstar Geographics,WMS:

LEGEND

- Survey Area
- DBCA - Legislated Lands and Waters (DBCA-011)
  - National Park
  - Nature Reserve
  - Section 5(1)(g) Reserve
- Clearing Regulations - Environmentally Sensitive Areas (DWER-046)

Conservation Reserves and Environmentally Sensitive Areas

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PARABURDOO AR-24-18597 FLORA, VEGETATION AND FAUNA ASSESSMENT

Figure 6

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4.0 Previous Surveys

Six ecological surveys have been undertaken in the vicinity of the survey area (Table 8).

Table 8 Previous surveys conducted in the vicinity of the survey area

Report	Size (ha)	Number of taxa	Conservation listed flora/fauna recorded	Habitats Identified	Weeds	Vegetation of significance
Pilbara Iron (2006) Pilbara Iron: Regional Drilling Program (GD-06_01350) Paraburdoo Rare Flora Survey (RTIO-HSE-0015959)	8.60	99	No conservation significant flora recorded.	NA	**Aerva javanica* **Cenchrus ciliaris* **Cenchrus setiger* **Echinochloa colona* **Malvastrum americanum* **Rumex vesicarius* **Setaria verticillata*	None
Rio Tinto (2017) Flora Vegetation and Fauna Habitat Assessment Paraburdoo Additional Water Pipeline (RTIO-HSE-0317979)	3.00	NA	No conservation significant flora recorded. Four conservation significant fauna species are considered to have the potential to occur, and one species is considered likely to occur. None of the conservation significant species would be dependent on the habitats present.	Minor creeks Stony plain Disturbed	**Aerva javanica* **Cenchrus ciliaris*	None
Rio Tinto (2019) Metadata Statement – Targeted survey Paraburdoo PTP2 Bore to Town Water Main Upgrade (RTIO-HSE-0331992)	10.58	NA	No conservation significant flora recorded.	NA	**Cenchrus* sp.	None
AECOM (2023) Targeted Flora Surveys – Rail Mobile Communications Project, Paraburdoo to Tom Price	457	NA	Six Priority flora species were recorded: • *Dampiera anonyma* (P3) • *Goodenia* sp. East Pilbara (A.A. Mitchell PRP 727) (P3) • *Grevillea saxicola* (P3) • *Lepidium catapycnon* (P4) • *Pentalepis trichodesmoides* subsp. *hispida* (P2) • *Rostellularia adscendens* var. *latifolia* (P3)	NA	NA	NA

Report	Size (ha)	Number of taxa	Conservation listed flora/fauna recorded	Habitats Identified	Weeds	Vegetation of significance
Rio Tinto (2023a) Desktop, Reconnaissance and Targeted Flora, Vegetation and Fauna Habitat assessment – Construction of Water and Monitoring Bores at Paraburdoo AR-23-17965	0.54	18 flora species from 10 families	No conservation significant flora recorded.	• Alluvial plain • Disturbed No significant fauna habitats of specific dependence to the *Biodiversity Conservation Act 2016* (BC Act) fauna were observed during the survey or are considered likely to occur within the study area.	**Aerva javanica* **Cenchrus ciliaris* **Cenchrus setiger*	None
Rio Tinto (2023b) Desktop, Reconnaissance and Targeted Flora, Vegetation and Fauna Habitat assessment - Upgrades to the Water Bore and Powerlines in Paraburdoo AR-20-15923 and AR-21-16545 (RTIO-1001152)	1.97	34 flora species from 15 families	No conservation significant flora recorded.	• Alluvial plain • Disturbed Fauna habitat is considered to have little value to most fauna, including BC Act listed fauna.	**Aerva javanica* **Cenchrus ciliaris* **Cenchrus setiger* **Cynodon dactylon* **Malvastrum americanum*	None

5.0 Methodology

5.1 Desktop Assessment

A desktop assessment was undertaken to identify significant environmental values that are likely to be present in the survey area, including threatened and priority flora, fauna and vegetation communities. Desktop database searches were requested from the following government databases:

- Department of Biodiversity Conservation and Attractions (DBCA) Threatened Species and Communities database including Threatened and Priority flora with a 60 km buffer, communities with a 70 km buffer, and fauna with a 50 km buffer
- Western Australian Herbarium (WAH) records
- Protected Matters Search Tool (PMST) with a 50 km buffer
- Rio Tinto Flora Database
- previous surveys outlined in Section 4.0.

All conservation significant matters including flora, fauna and communities were reviewed, and a likelihood of occurrence was completed based on the categories outlined in Table 9 (flora) and Table 10 (fauna). Fauna species that are restricted to a marine environment including turtles, dolphins, whales and fish species were not included in the desktop assessment.

Significant flora species' likelihood of occurrence was assessed systematically using a point-based system (Table 9). The assessment considers proximity of records, date of record, and habitat presence. For the purpose of this assessment flora records are considered to occur locally if they are within 5 km, known regionally if they are within 20 km, and considered a recent record if the record is less than 20 years old. The likelihood of significant ecological communities occurring depends on the presence of suitable landforms, land systems, known occurrences and distance of known occurrences.

The fauna assessment used a similar approach, however, proximity of records was broadened to 20 km to account for the mobility of fauna species (Table 10). For the purpose of this assessment, a recent record refers to less than 20 years old.

Table 9 Categories of likelihood of occurrence for flora species

Likelihood of Occurrence	Score	Definition
Known	6	Species known to occur in survey area.
High (Likely)	4, 5	Recent record of species in local area and habitat is suitable. Species with a habitat score of 2, have a recent record in the vicinity, AND are known within 20 km OR 5 km
Moderate (Possible)	3, 4	Suitable habitat present (score of 2) and record in region AND/OR recent record. OR Habitat marginal (score of 1) AND record in region AND/OR recent record.
Low (Unlikely)	2, 3	Suitable habitat present (score of 2) NO recent records NO records within 5 km. Habitat marginal (score of 1) NO recent records NO records within 5 km, MAYBE records within 20 km
Negligible (Suitable Habitat not Present)	0, 1, 2, 3	No suitable habitat (score of 0) automatically means it is negligible despite recent record AND/OR record within 5 km AND/OR record within 20 km. Marginal habitat (score of 1) NO recent record NO record within 20 km.

Table 10 Categories of likelihood of occurrence for fauna species

Likelihood of Occurrence	Definition
Known	Species is known to occur in the survey area
High (Likely)	Not known to occur in the survey area but there are records within close proximity of the survey area AND/OR recent records and suitable habitat for the species is known to be, or likely to be, present within the survey area
Moderate (Possible)	Not known to occur within the survey area but there are records in close proximity of the survey area and recent records 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 suitable habitat for the species is known to be, or likely to be present within the survey area.
Low (Unlikely)	Not known to occur within the survey area but there are records in close proximity OR recent records and suitable habitat for the species may be present (marginal habitat)
Negligible (Suitable habitat not present)	Despite records in close proximity or recent records, no suitable habitat is present within the survey area, therefore the likelihood of the species occurring there is negligible

5.2 Flora and Vegetation Assessment

The field survey was undertaken by Celia Mitchell (collection permit FB62000077-2), supported by Nina Sergeev (collection permit FB62000544). Celia has completed a Master of Science in Conservation Biology and Botany. She is a Botanist with five years' experience undertaking flora and vegetation surveys across WA, including baseline, monitoring and targeted surveys.

A detailed flora and vegetation assessment was undertaken utilising methods outlined in the Flora Survey Technical Guide (EPA, 2016). The survey was undertaken on 14-18 June 2024. Data were collected from ten 50x50 m unbounded quadrats. Data collected included the presence of plant species, their cover abundance, structural composition of vegetation, physical environment, and presence/absence of disturbance.

Each site was given a unique site number, and the following parameters recorded:

- date
- recorder details
- location using hand-held GPS (accuracy of 5 m) (MGA50, GDA94)
- sample site type and size
- photograph (north-west corner)
- soil details (type, colour, moisture)
- landform
- species – representative list of vascular plant species present, including weed species.
- habitat - a broad description of the surrounding landscape based on landform, topography and soil
- disturbance records - fire history, tracks, weed infestation, and other evidence that may be present
- locations of Weeds of National Significance (WoNS) or Declared Pests will be recorded. Photographs will be taken of any significant flora and WoNS or Declared Pests recorded.
- species list including:
  - estimated height
  - estimated percentage cover (for trees both percentage within quadrat and within community was recorded to enable better description of vegetation community).

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, 1998-).

5.2.1 Vegetation Mapping

Vegetation is described according to the NVIS association level 5 (DEEE 2018). At this level, vegetation is described to 'association' where up to three dominant genera for each of the upper, mid, and ground strata are categorised based on dominant growth form, cover and height

Vegetation condition was mapped using the Trudgen (1988) vegetation condition scale, informed by quadrat data, survey observations, and weed infestations recorded, as recommended in the Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment (EPA, 2016).

5.2.2 Targeted Flora Searches

Targeted searches were undertaken for significant flora species that were known or likely to occur, informed by the desktop assessment. A detailed field guide was produced which included photographs and key morphological features that would assist in identifying the species in the survey area. Targeted searches were focused on habitats considered likely or potential to support significant species.

Where a potential Priority species was encountered, the following was recorded:

- location (using a hand-held GPS accuracy 5m)
- 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 plant height
- vegetation condition
- associated dominant species
- soil type and colour
- topography
- additional information relevant to the area including key characteristics and landforms.

5.3 Fauna Habitat Mapping Assessment

The fauna habitat assessment was undertaken simultaneously with the flora and vegetation assessment. The survey was undertaken by Nina Sergeev who has over three years' experience undertaking fauna habitat surveys across WA. Nina has completed a Bachelor of Science in Biology (Zoology) and has been involved in various projects across remote locations.

Fauna habitat assessments were conducted throughout the survey area and were used to define the structure, complexity, and continuity of the habitat present, and documented the presence and abundance of habitat features that included but were not limited to presence or absence of large mature trees, water bodies, dense vegetation, hollows, and leaf litter.

The habitat assessment was used to verify the findings in the desktop assessment as per the EPA (2020) Technical Guidance. Potential usage within the survey area by conservation significant fauna species was recorded, primarily focusing on suitable and/or core habitat and any ecological values that may support likelihood of occurrence. Any observations were recorded using a hand-held GPS (accuracy of 5 m), and track logs were used to quantify field survey effort.

The taxonomy and nomenclature of vertebrate species is consistent with the Western Australian Museum's Checklist of Vertebrates in the Western Australian Museum (WAM) (2024) and the Australian Faunal Directory for bird species.

5.4 Limitations

No significant limitations were identified that may impact on the ability to use the data to inform the environmental impact assessments. Limitations of the survey are discussed in Table 11.

Table 11 Limitations of the surveys

Limitation	Outcome
Availability of contextual information on the region	**Nil** Sufficient resources were available through publicly available data such as PMST results, taxonomic guides including the Pilbara Priority Flora (DPaW and Rio Tinto, 2015) and FloraBase dataset (WAH, 1998-). DBCA databases and results from several Rio Tinto surveys in the adjacent area were utilised.
Competency/experience of consultant conducting survey	**Nil** The flora and vegetation assessment was led by Celia Mitchell, an experienced Pilbara botanist who has five years' experience undertaking surveys of a similar scope. The fauna habitat assessment was undertaken by Nina Sergeev who has over three years' experience undertaking fauna habitat surveys across WA. The fauna assessment focused on identifying unique habitat features and assessing habitat suitability for significant fauna species.
Proportion of flora/fauna identified, recorded and/or collected (based on sampling, timing and intensity)	**Nil** All flora species encountered in quadrats and during targeted searches were either collected or recorded. The survey was conducted during the ideal survey time as per the EPA (2016) technical guidance.
Completion (is further work needed)	**Nil** The field survey did not identify any unusual or surprising results. The survey effort is considered adequate to meet the objective.
Remoteness and/or access problems	**Nil** The entire survey area was accessible by foot.
Timing, weather, season, cycle	**Minor** The survey was conducted during the ideal detection period for flora (EPA, Environmental Factor Guideline - Flora and Vegetation, 2016). The survey area experienced lower than average rainfall and higher than average temperatures for the 12 months preceding the survey. Majority (95%) of the species were able to be identified to species level, with many species flowering at time of survey. Diversity appeared to be lower than average, with 93 species recorded from 354.48 ha, compared to a survey completed nearby where 99 taxa were recorded from 8.6 ha.
Disturbances (e.g. fire, flood, accidental human intervention) which affected the results of the survey	**Nil** No disturbances occurred that may have influenced the outcome of the survey.

6.0 Desktop Assessment

6.1 Significant Communities

No TECs or PECs listed under the EPBC Act, the BC Act, or by DBCA are known to occur within 70 km of the survey area. No significant communities are anticipated to occur.

6.2 Flora Diversity

The Dandjoo database returned 497 flora species representing 78 families. This includes 52 species listed as Priority by DBCA and 22 weed species.

The Protected Matters Search Results did not return any significant flora results.

6.3 Significant Flora

A total of 56 significant flora species were identified during the desktop assessment, including 53 Priority flora species, two Threatened flora species, one plant of species interest (PSI).

The likelihood assessment determined that:

- seven species had a high likelihood of occurrence
- 14 species had a moderate likelihood of occurrence
- 35 species had a low or negligible likelihood of occurrence.

The species with a high likelihood of occurrence are described with their habitats in Table 12 and mapped on Figure 7. The comprehensive desktop assessment is presented in Appendix A.

Table 12 Significant flora with a high likelihood of occurrence

Taxon	Habitat[1]	Cons. Code DBCA[2]
Goodenia sp. East Pilbara (A.A. Mitchell PRP 727)	Red-brown clay soil, calcrete pebbles. Low undulating plain, swampy plains.	P3
Isotropis forrestii	Stony clay loam, sandy alluvium. Along drainage lines.	P1
Nicotiana karijini	No habitat information available.	PSI
Ptilotus trichocephalus	Clay flats, sandy colluvial soils and gibber plains. Often with Mulga.	P4
Sida sp. Hamersley Range (K. Newbey 10692)	Low open woodland over hummock grassland of Triodia sp.	P3
Streptoglossa sp. Cracking clays (S. van Leeuwen et al. PBS 7353)	*Acacia aneura*, high open shrubland. Tussock grassland. Gentle slopes. Margin between an area of Mulga woodland and an open area.	P3
Themeda sp. Hamersley Station (M.E. Trudgen 11431)	Drainage lines, clay flats, crabhole flats and dark self mulching clays.	P3

1. Habitat information derived from (WAH, 1998-) unless stated otherwise
2. Conservation codes: P Priority, PSI Plant of Special Interest

6.4 Significant Fauna

A total of 25 Threatened, Priority and Migratory fauna species were identified in the desktop database searches. This included bird, fish, mammal, and reptile species. Oceanic or strictly marine species were excluded from the desktop assessment as the survey does not include marine waters.

The likelihood assessment determined that:

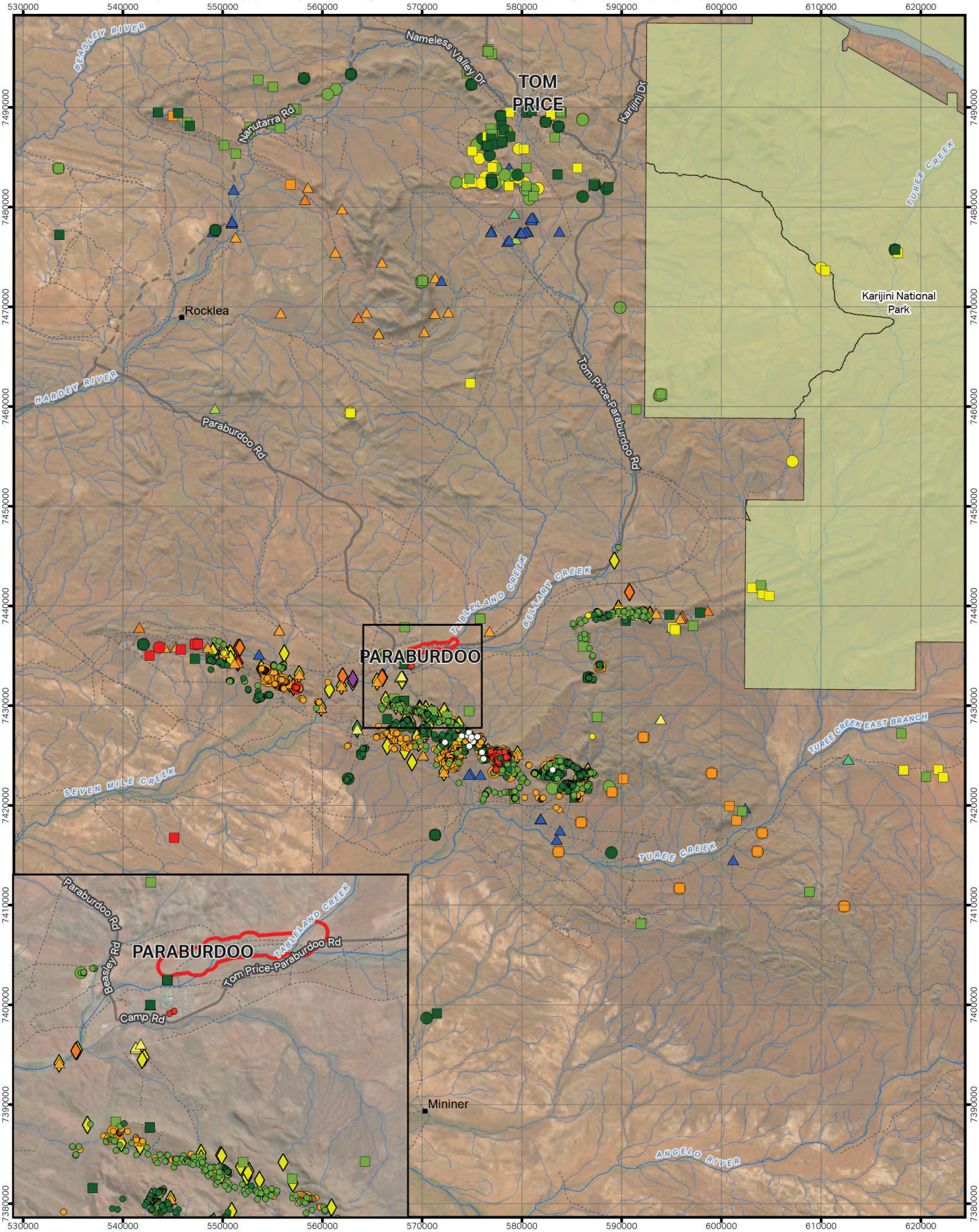
- four species had a moderate likelihood of occurrence
- seven species had a low likelihood of occurrence
- 14 species were considered negligible in the absence of suitable habitat.

The species with a moderate likelihood of occurrence are presented below in Table 13 and locations are mapped in Figure 7. Database search results and the analysis of these are provided in Appendix B.

Table 13 Significant fauna with a moderate likelihood of occurrence

Class	Taxon	Common Name	Habitat	Cons. Code[1]	
				BC Act / DBCA	EPBC Act
Bird	*Falco hypoleucos*	Grey Falcon	Timbered lowland plains, including Acacia shrublands (particularly with tree-lined watercourses), tussock grassland and open woodland (TSSC, 2020).	VU	V
Mammal	*Dasyurus hallucatus*	Northern Quoll	Occupies the Pilbara and further north through to the Kimberley (DSEWPaC, 2011). The species occupies rocky areas, deserts, eucalypt forests and woodlands, hummock grass (Triodia spp.), basalt hills, mesas, high and low plateaux, lower slopes, occasional tor fields and stony plains supporting spinifex grasslands (Braithwaite & Griffiths, 1994; Van Vreeswyk AME, 2004).	EN	E
Mammal	*Macroderma gigas*	Ghost Bat	Northern Australia, inhabiting arid Pilbara to tropical savanna woodlands and rainforests rainforest, monsoon and vine thicket, open woodlands and arid areas and reside in caves, rock crevices and disused mine adits (DoE, 2016).	VU	V
Reptile	*Liasis olivaceus barroni*	Olive Python	Prefers deep gorges and water holes in the ranges of the Pilbara region. Cooler winter months individuals spend hiding in caves and rock crevices away from water sources, warmer summer months the pythons move around, usually in close proximity to water and rock outcrops.	VU	V

1. Conservation codes: E Endangered, VU V Vulnerable



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GDA2020 MGA ZONE 50

DATA SOURCES Base Data: (c) Based on information provided by and with the permission of the Western Australian Land Information Authority trading as Landgate (2010)
Service Layer Credits: World Imagery: Earthstar Geographics,WMS:

LEGEND

Survey Area

WA Herbarium database (WAHERB)
- Threatened
- P1
- P2
- P3
- P4

Threatened and Priority Flora database (TPFL)
- Threatened
- P1
- P2
- P3
- P4

Flora (Rio Tinto)
- EN
- P1
- P2
- P3
- P4
- PSI

Threatened Fauna database (DBCA)
- Endangered
- Vulnerable
- Migratory Species
- Specially Protected
- Priority 1
- Priority 4

Fauna (Rio Tinto)
- EN
- VU
- MI
- OS
- P4

Conservation Significant Flora and Fauna Desktop Results

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Figure 7

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7.0 Field Survey Results

7.1 Vegetation

7.1.1 Condition

Vegetation condition is mapped on Figure 8 and the extent of each condition rating is presented in Table 14. The survey was predominately mapped in Degraded condition with disturbances from weeds, tracks and previous clearing evident.

Table 14 Vegetation condition extent

Condition Rating	Extent (ha)	Percent of Total Area (%)
0.6 - Good	53.46	15
0.4 - Poor	67.31	19
0.2 - Degraded	216.18	61
0.1 - Completely Degraded	17.53	5
Total	**354.48**	**100**

7.1.2 Communities

Five vegetation communities were mapped in the survey area. These include:

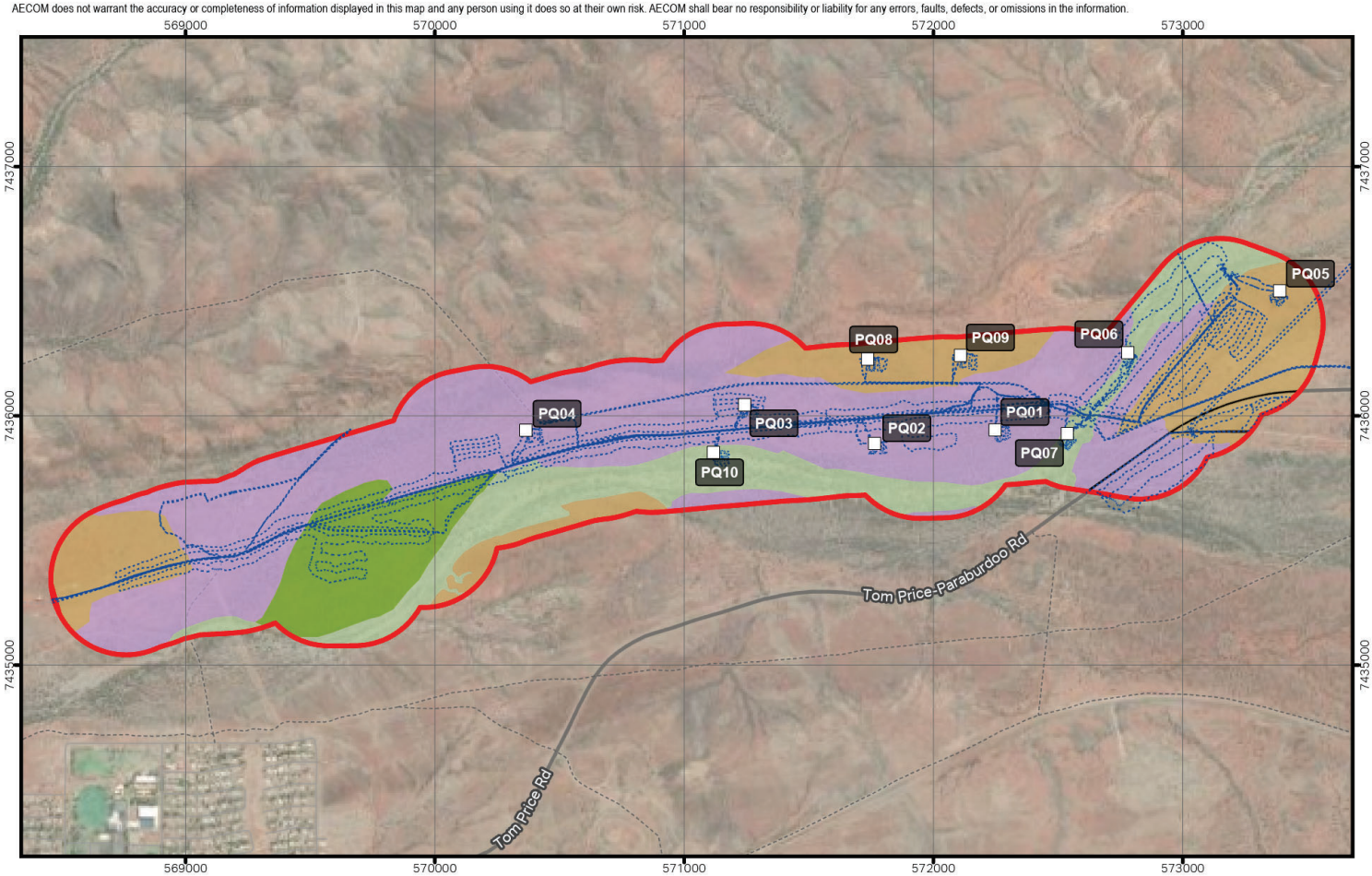
- one minor drainage community
- three plains communities
- one heavily disturbed community.

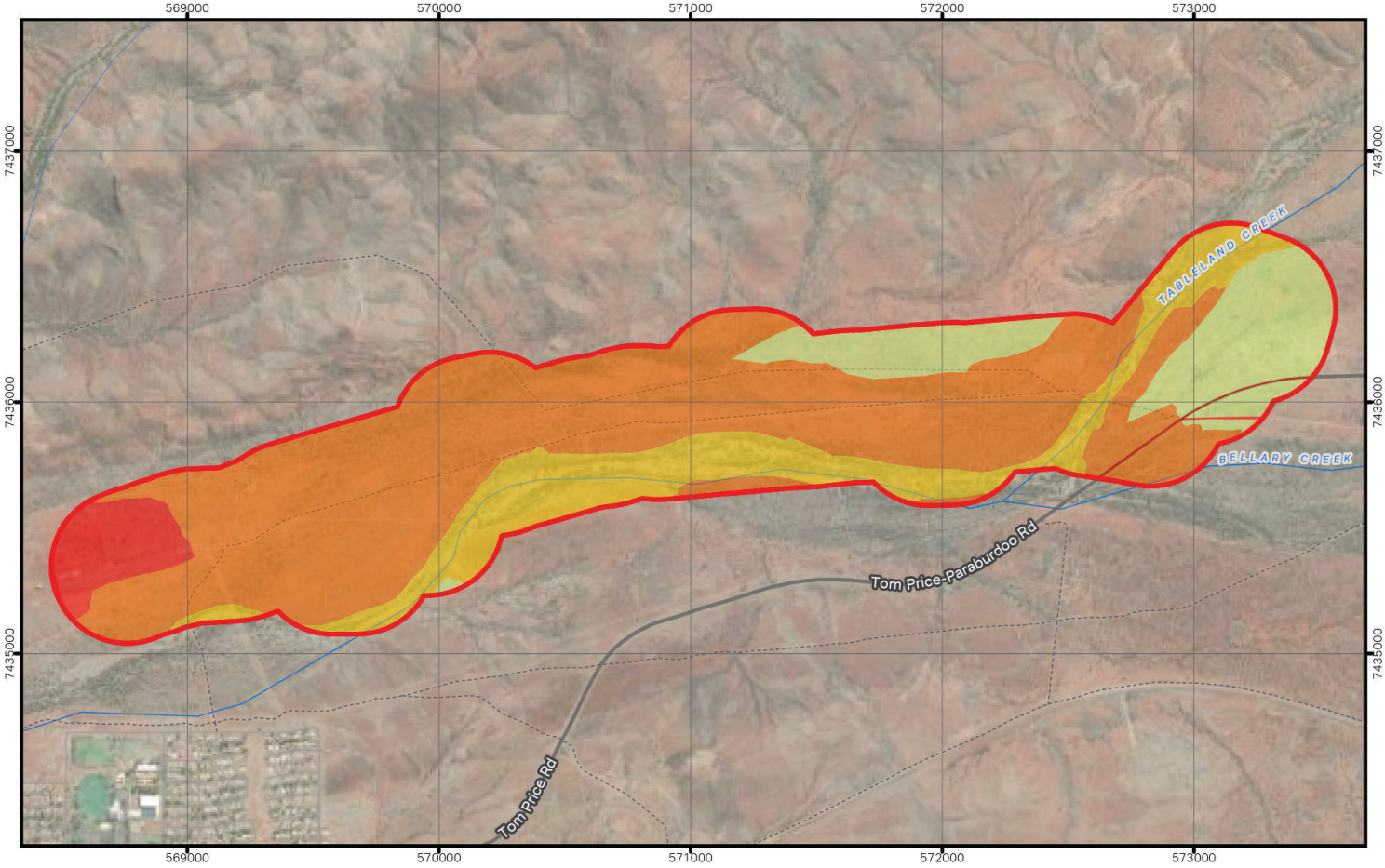
Vegetation community descriptions are presented in Table 15 and mapped on Figure 8.

Table 15 Vegetation communities in the survey area

Description	Additional Detail	Photograph
Minor Drainage		
C1 EvAcCc Eucalyptus open woodland *Eucalyptus victrix* and *Eucalyptus camaldulensis* open woodland, over *Acacia citrinoviridis, Melaleuca lasiandra* and *Acacia pyrifolia* tall shrubland over **Cenchrus ciliaris and *Cenchrus setiger* open to very open tussock grassland. Represents an ephemeral creek lined with Coolabah trees. Recorded on orange sandy clay soils.	Survey effort: PQ06, PQ07, PQ10 Species richness: 59 species, 52 native, 7 introduced species Condition: 0.4 Poor Extent: 60.12 ha	
Plains		
P1 GsAcCc Acacia open shrubland *Grevillea striata* open woodland over *Acacia citrinoviridis, Acacia ligulata* and *Acacia synchronicia* tall open shrubland over **Cenchrus ciliaris* and **Cenchrus setiger* tussock grassland. Recorded on red-brown sandy clay loam soils on flat plains adjacent to a creekline.	Survey effort: PQ01, PQ02, PQ03, PQ04 Species richness: 35 species, 31 native species and 4 introduced species. Condition: 0.2 Degraded Extent: 184 ha	

Description	Additional Detail	Photograph
P2 AcAjCc Acacia shrubland *Acacia citrinoviridis* tall shrubland over **Aerva javanica, Eremophila fraseri* and *Corchorus crozophorifolius* open shrubland over **Cenchrus ciliaris* and **Cenchrus setiger* closed tussock grassland. Recorded on flat terrain adjacent to the ephemeral creek. Predominantly scattered native trees and shrubs over grassy weeds.	Survey effort: observational notes, mapping aligns with Rio Tinto (2023a) survey. Species richness: NA Condition: 0.2 Degraded Extent: 32.18 ha	
S1 AxEcEtEe Acacia open shrubland *Acacia xiphophylla, Acacia synchronicia and Acacia aptaneura x paraneura* tall open shrubland over *Eremophila cuneifolia* and *Eremophila exilifolia* open shrubland over *Enchylaena tomentosa* var. *tomentosa* scattered low shrubs over *Eragrostis eriopoda* and **Cenchrus setiger* very open tussock grassland on stony plains. Recorded on red-brown stony plain soils on flat terrain. Has quartz and ironstone on surface.	Survey effort: PQ05, PQ08, PQ09 Species richness: 52 species, 45 native and 7 introduced species. Condition: 0.6 Good – 0.1 Completely Degraded Extent: 77.18 ha	
Other		
Heavily Disturbed Areas Areas which have been previously cleared (bare ground) or heavily disturbed areas, often with significant weed invasion. Includes roads, drill tracks and infrastructure.	Condition: 0.1 Completely Degraded Extent: 1 ha	No photo available.





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DATA SOURCES Base Data: (c) Based on information provided by and with the permission of the Western Australian Land Information Authority trading as Landgate (2010)
Service Layer Credits: World Imagery: Maxar,VMS.

LEGEND

- Survey Area
- Tracklog
- Quadrat

Vegetation Unit

- C1
- HD
- P1
- P2
- S1

Vegetation Condition

- 0.1 - Completely Degraded
- 0.2 - Degraded
- 0.4 - Poor
- 0.6 - Good

Vegetation Communities, Condition and Survey Effort

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PARABURDOO AR-24-18597 FLORA, VEGETATION AND FAUNA ASSESSMENT

Figure 8

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7.2 Flora

No species listed under the EPBC Act, BC Act, or by DBCA as Priority flora were recorded within the survey area. A total of 93 flora species were confidently identified to species level. An additional five species were denoted with a “?” or “sp.” due to insufficient material for identification.

This total includes 83 native and 10 weed species. Native species were best represented by Fabaceae (17 species), Poaceae (15 species) and Amaranthaceae (8 species). No Declared Pests or Weeds of National Significance were recorded.

The comprehensive list of vascular flora species recorded, organised by family and the community they occur in is presented in Appendix C. Quantitative data recorded from sample sites is presented in Appendix D.

7.3 Fauna Habitat

Four fauna habitats were defined and mapped for the survey area based on the results of the field assessment and previous surveys conducted. Habitats were distinguished based on a difference in substrate, landform and/or vegetation. Habitats identified include:

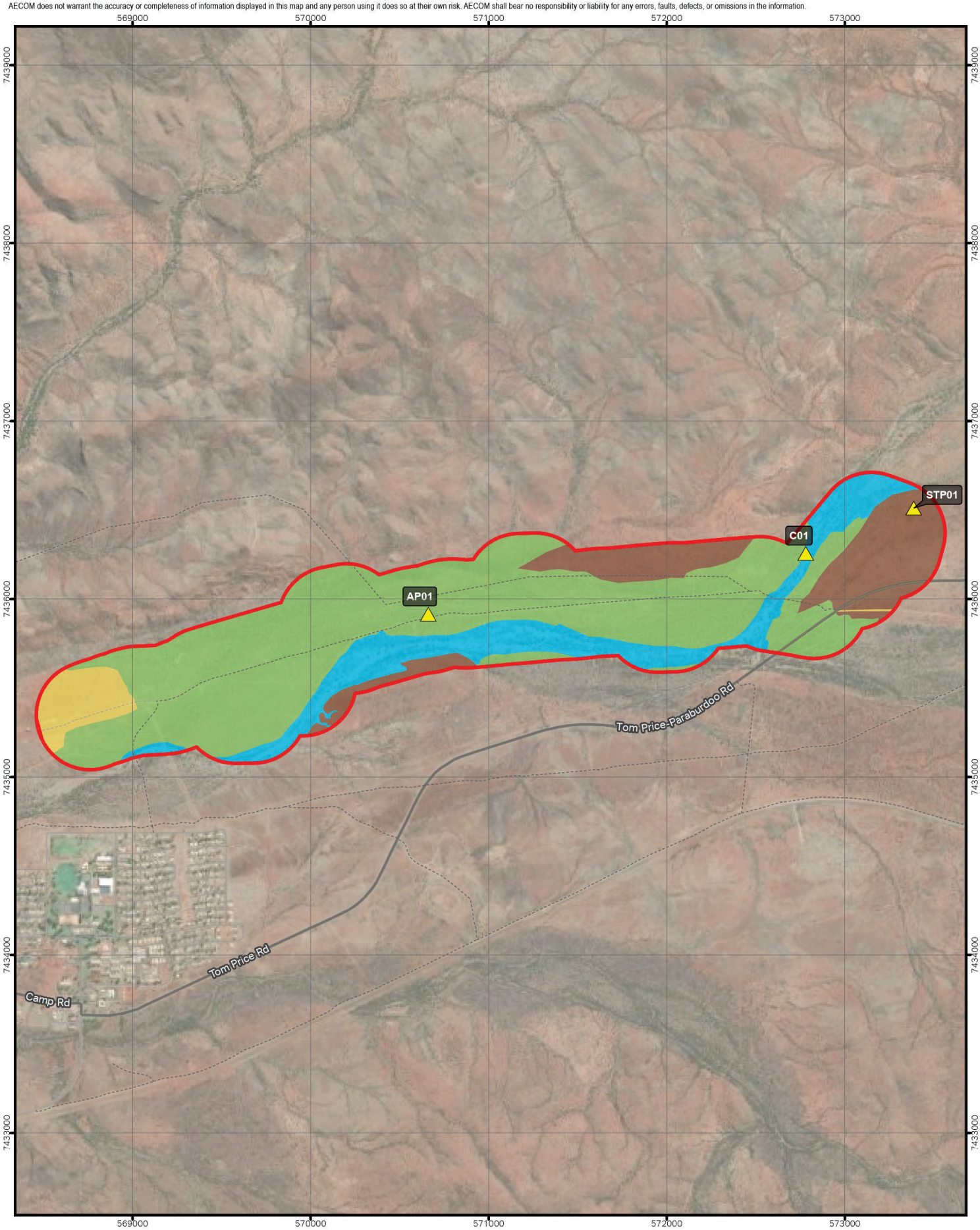
- Alluvial plain
- Stony plain
- Minor drainage

The remaining area has been mapped as Disturbed. Fauna habitats are described in Table 16 and mapped on Figure 9.

Table 16 Fauna habitats of the survey area

Description	Conservation Significant Fauna Habitat	Photograph
Alluvial Plain (Extent: 216.03 ha) This habitat is characterised by disturbed vegetation including tussock grasses with scattered native shrubs on a floodplain. The landscape is low lying with slight to no gradient. Some areas may be seasonally inundated with water but do not provide a permanent water source for fauna. Typical substrate of this habitat includes alluvial, silt and/or loamy/clay. Habitat connectivity is considered good with linear infrastructure present throughout this habitat providing minor barriers to ground dwelling fauna movement. The soft soil strata may be suitable for some soil dwelling/burrowing/digging fauna however little other microhabitats are expected to occur. This habitat is Degraded, with high weed invasion present.	Grey Falcon moderate value habitat: provides suitable foraging and hunting habitat for the Grey Falcon, habitat is not considered critical for the survival of the species. Northern Quoll low value habitat: provides potential dispersal and foraging resources for the Northern Quoll, however the species is unlikely to depend on the fauna habitat present. Pilbara Olive Python low value habitat: may provide transient habitat for the species, does not represent core suitable habitat for the species.	
Stony Plain (Extent: 60.61 ha) This habitat is characterised by scattered native shrubs over sparse tussock grasses on rocky flat plains. Vegetation cover was low. No permanent or seasonally inundated pools were present. Habitat connectivity is considered good with linear infrastructure present throughout this habitat providing minor barriers to ground dwelling fauna movement. Few microhabitats are expected to occur in this habitat within the study area, with the rock cover likely a restriction for burrowing/digging fauna. This habitat ranged from Good to Poor condition, dependent primarily on the level of weed invasion.	Grey Falcon moderate value habitat: provides suitable foraging and hunting habitat for the Grey Falcon, habitat is not considered critical for the survival of the species. Northern Quoll low value habitat: provides potential dispersal and foraging resources for the Northern Quoll, however the species is unlikely to depend on the fauna habitat present. Pilbara Olive Python low value habitat: may provide transient habitat for the species, does not represent core suitable habitat for the species.	

Description	Conservation Significant Fauna Habitat	Photograph
Minor Drainage (Extent: 60.08 ha) This habitat is characterised by native trees (*Eucalyptus camaldulensis* and *E. victrix* with *Acacia* trees (not Mulga) along a largely bare creek bed. The substrate is predominantly rocky/cobbled with soil and organic matter often washed away in channel. Standing water may be present for a short period after significant rainfall events. Habitat connectivity is considered good along the drainage channel bed and in moderately dense vegetation on the banks. Fauna species are likely to utilise the open terrain as transient habitat to traverse between vegetated habitats. Microhabitats present include tree hollows, potential seasonal inundation and clearings that may support foraging and hunting. This habitat was considered to be in Poor condition with high weed invasion and evidence of grazing.	Grey Falcon moderate value habitat: provides suitable foraging and hunting habitat for the Grey Falcon, habitat is not considered critical for the survival of the species. Pilbara Olive Python moderate value habitat: may provide transient habitat for the species where it may potentially utilise the linear nature of the drainage to traverse between more preferred habitats. Northern Quoll low value habitat: provides potential dispersal and foraging resources for the Northern Quoll, however the species is unlikely to depend on the fauna habitat present.	
Disturbed (17.52 ha) Areas where the natural vegetation and microhabitats have been disrupted.	None of the significant fauna species identified in the desktop assessment are likely to have a specific dependence on this habitat.	No photo available.



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DATA SOURCES Base Data: (c) Based on information provided by and with the permission of the Western Australian Land Information Authority trading as Landgate (2010)
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LEGEND

- Survey Area
- Habitat Assessment Site

Fauna Habitat

- Alluvial Plain
- Disturbed
- Minor Drainage
- Stony Plain

Fauna Habitat

RIO TINTO

PARABURDOO AR-24-18597 FLORA, VEGETATION AND FAUNA ASSESSMENT

Figure

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8.0 Discussion

8.1 Vegetation

Four native vegetation communities have been mapped in the survey area. These communities represent three plains and a drainage line. One disturbed community was mapped for 1 ha and represented areas that have been previously cleared or heavily disturbed, often with significant weed invasion. None of the vegetation communities observed represent a TEC or PEC. Vegetation within the survey area was considered common throughout the region and did not include any unique landforms.

Vegetation condition was predominately Degraded, with the lower stratum dominated by **Cenchrus ciliaris* and **Cenchrus setiger* in many instances. A total of 53.46 ha was mapped as Good condition and represented areas with lower weed abundance and little historical disturbance.

8.2 Flora

A total of 93 taxa from 28 families were recorded in the 354.48 ha survey area. Diversity appears low compared to previous surveys completed, where 99 taxa were recorded from 8.6 ha (Pilbara Iron, 2006). Low diversity may be a result of lower-than-average rainfall in the 12 months preceding the survey, or the level of disturbance observed in the survey area. Majority of the survey area was dominated by **Cenchrus ciliaris* and **Cenchrus setiger* in the lower stratum, with 85 % (300.81 ha) mapped as Poor, Degraded or Completely Degraded condition.

An additional five species were denoted with a “?” or “sp.” due to insufficient material for confident identification. These species include:

- *Cucumis* sp.
- *Eremophila ?platycalyx*
- *Sclerolaena* sp.
- *Streptoglossa* sp.
- *Tephrosia ?supina*

Based on the appearance of the dried plant material it is unlikely that these specimens represent a significant flora species identified in the desktop assessment. No conservation significant flora were recorded. This is not unexpected, with all surveys in the vicinity of the survey area bar AECOM (2023) not recording any significant flora.

The likelihood assessment was reviewed following field survey completion. The pre and post survey likelihood assessment is presented in Appendix A. The reduction in likelihood was attributed to the degraded vegetation present, lack of suitable landforms (i.e. scree slopes and gibber plains), and lack of known records in proximity to the survey area. This was supported by other Rio Tinto surveys completed in the area where no Priority flora were recorded.

8.3 Fauna Habitats

Four fauna habitats were mapped across the survey area. All of these habitats are extensive outside in the locality and broader Pilbara region. Four conservation significant fauna species were considered to have a moderate likelihood of occurrence in the desktop assessment. These species are discussed below.

8.3.1 Ghost Bat (*Macroderma gigas*)

The Ghost bat inhabits arid areas in the Pilbara, the species resides in caves, rock crevices and disused mine adits (DoE, 2016).

The desktop assessment identified 17 records from within 50 km, with the closest record 6.16 km away. No caves were recorded in proximity to the survey area therefore no roosting habitat is present in the survey area. To persist in an area, Ghost bat colonies require a group of caves/shelters that provide alternative day and night roost sites, and a gully or gorge system that opens onto a plain or riparian line that provides good foraging opportunities, typically less than 5 km from the diurnal roost site (TSSC, 2016). The closest known sighting of a Ghost bat in a roosting location was recorded 13 km west of the survey area. Therefore, the habitat present is unlikely to provide suitable foraging habitat as it is beyond the 5 km radius from a diurnal roost site.

8.3.2 Pilbara Olive Python (*Liasis olivaceus barroni*)

The Pilbara Olive Python prefers deep gorges and water holes in the ranges on the Pilbara region. This species typically shelters in logs, flood debris, caves, tree hollows and thick vegetation close to water and rock outcrops (Burbidge A. , 2004).

The desktop assessment identified four records of the species within 50 km, with the closest record 1.22 km away in 1977. The survey area did not include any large rock outcrops, caves or deep gorges that would likely provide core habitat for the species. However, the minor drainage habitat may provide transient habitat for the species where it may potentially utilise the linear nature of the drainage to traverse between more preferred habitats. The Pilbara Olive Python is unlikely to depend on the fauna habitat present in the survey area.

8.3.3 Northern Quoll (*Dasyurus hallucatus*)

The Northern Quoll occupies rocky areas, deserts, eucalypt woodland and forests, hummock grasslands, basalt hills, mesas, high and low plateaux, lower slopes, occasional fields and stony plains supporting spinifex grasslands (Braithwaite & Griffiths, 1994; Van Vreeswyk AME, 2004).

The desktop assessment identified thirteen records of the species within 50 km, with the closest record 1.22 km away. The survey area likely provides potential dispersal and foraging resources for the Northern Quoll, however the species is unlikely to depend on the fauna habitat present in the survey area.

8.3.4 Grey Falcon (*Falco hypoleucos*)

The Grey Falcon occupies timbered lowland plains, including Acacia shrublands (particularly with tree-lined watercourses), tussock grasslands and open woodlands (TSSC, 2020).

The desktop assessment identified four records of the species within 50 km, with the closest record 3.6 km away at Paraburdoo Airport in 2017. The Alluvial Plain, Stony Plain and Minor Drainage fauna habitats provide suitable foraging and hunting habitat for the Grey Falcon. This habitat is not considered critical for the survival of the species.

9.0 Conclusion

A flora, vegetation and fauna habitat survey was undertaken for a 354.48 ha linear corridor near Paraburdoo in WA's Pilbara region. The objective of the survey was to define and map significant environmental values in line with regulatory requirements to support a Native Vegetation Clearing Permit (NVCP) application. The survey targeted Threatened and Priority flora, communities and fauna habitats that may support conservation significant species.

A field survey was undertaken between 14 and 18 June 2024 by Celia Mitchell, supported by Nina Sergeev. A summary of the results is presented below:

- No significant flora species were recorded. Seven species listed as Priority had a 'high' likelihood of occurring, which was reduced to a 'low' or 'negligible' 'post'-survey likelihood in the absence of suitable habitat and the considerable degradation of vegetation in the survey area.
- No communities listed as Threatened or Priority under federal or state legislation were recorded, and none were anticipated to occur.
- Three fauna habitats were defined and mapped including Alluvial Plain, Stony Plain, and Minor Drainage.
- Three significant fauna species have the potential to occur in the survey area:
    - Pilbara Olive Python (*Liasis olivaceus barroni*) listed as Vulnerable under the EPBC Act and BC Act may utilise the Minor Drainage as transient habitat to move between preferable habitats
    - Northern Quoll (*Dasyurus hallucatus*) listed as Endangered under the EPBC Act and BC Act may use habitats for dispersal and foraging resources but no core habitat
    - Grey Falcon (*Falco hypoleucos*) listed as Vulnerable under the EPBC Act and BC Act may utilise the Alluvial Plain, Stony Plain and Minor Drainage as foraging and hunting habitat.

The survey was successfully undertaken with no significant limitations identified that could influence the outcome of the survey. The survey was conducted during the ideal detection period for flora. The majority (95%) of the species were able to be identified to species level, with many species flowering at time of survey.

10.0 References

AECOM Australia Pty Ltd. (2023). *Targeted Flora Surveys - Rail Mobile Communications Project, Paraburdoo to Tom Price.* Unpublished report prepared for Rio Tinto.

Astron. (2018, 4). *Greater Paraburdoo Detailed Flora and Vegetation Survey.* Retrieved from https://www.epa.wa.gov.au/sites/default/files/PER_documentation2/A4_2%20GPO%20Detailed%20Flora%20and%20Veg%20Survey%20(Astron%202018b)%20Part%201.pdf

Beard, J., Beeston, G., Harvey, J., Hopkins, A., & Shepherd, D. (2013). *The vegetation of Western Australia at the 1:3,000,000 scale. Explanatory memoir. Second edition.*

Biota Environmental Sciences. (2018, 1). *Eliwana Consolidated Detailed Flora and Vegetation Phase 2.* Retrieved from https://www.epa.wa.gov.au/sites/default/files/PER_documentation2/Appendix%2016%20Eliwana%20Consolidated%20Flora%20and%20Vegetation%20Survey%20Biota%202017.pdf

Birdlife Australia. (2024). *Species Profiles.* Available from https://birdlife.org.au. Retrieved from https://birdlife.org.au/bird-profiles/

BOM. (2024). *Climate Statistics for Australian Bureau of Meteorology.* Retrieved from http://www.bom.gov.au/climate

Braithwaite, R., & Griffiths, A. (1994, 1). *Demographic Variation and Range Contraction in the Northern Quoll, Dasyurus hallucatus (Marsupialia: Dasyuridae).*

Buirchell, B., & Brown, A. (2016, 12). New species of Eremophila (Scrophulariaceae): thirteen geographically restricted species from Western Australia. *Nuytsia - The Journal of the Western Australian Herbarium, 27*, 253-283. Retrieved from https://florabase.dbca.wa.gov.au/science/nuytsia/780.pdf

Burbidge, A. (2004). *Threatened Animals of Western Australia.* Kensington, Western Australia: Department of Conservation and Land Management.

Burbidge, A. (2016). *Western Pebble Mouse - Pseudomys chapmani.* Retrieved from https://www.iucnredlist.org/species/42648/115198963

CALM. (2002). *Bioregional Summary of the 2002 Biodiversity Audit for Western Australia.* Perth, Western Australia. Retrieved from https://docslib.org/doc/11362383/bioregional-summary-of-the-2002-biodiversity-audit-for-western-australia

Davis, R., & Hurter, P. (2013). Swainsona thompsoniana (Fabaceae: Faboideae: Galegeae), a new species endemic to the Pilbara bioregion of Western Australia. *Nuytsia - The Journal of the Western Australian Herbarium, 23*, 1-4. Retrieved from https://florabase.dbca.wa.gov.au/science/nuytsia/652.pdf

DCCEEW. (2024). *Species profile and threats database.* Department of Climate Change, Energy, and the Environment and Water.

DEWHA. (2008). *Approved Conservation Advice for Thryptomene wittweri (Mountain Thryptomene).* Canberra, ACT. Retrieved from https://www.environment.gov.au/biodiversity/threatened/species/pubs/16645-conservation-advice.pdf

Dillon, S. (2014). Grevillea saxicola (Proteaceae), a new species from the Pilbara of Western Australia. *Nuytsia: The journal of the Western Australian Herbarium, 24*, 103-108. Retrieved from https://florabase.dbca.wa.gov.au/science/nuytsia/709.pdf

DoE. (2016). *Consultation Document on Listing Eligibility and Conservation Actions: Macroderma gigas (Ghost Bat).* Canberra, ACT. Retrieved from https://www.dcceew.gov.au/sites/default/files/env/pages/049564f9-5c96-43a0-88c5-ee3dec26c622/files/consultation-document-ghost-bat.pdf

DPaW and Rio Tinto. (2015). *Rare and Priority Plants of the Pilbara mobile app edition.* Retrieved from https://apps.apple.com/au/app/rare-and-priority-plants-of-the-pilbara/id945178469.

DSEWPaC. (2011). *EPBC Act - Referral guidelines for the northern quoll, Dasyurus hallucatus.* Department of Sustainability, Environment, Water, Population and Communities.

EPA. (2016). *Environmental Factor Guideline - Flora and Vegetation.*

EPA. (2020). *Technical Guidance Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment.* Perth, Western Australia. Retrieved from www.epa.wa.gov.au

Govt. of Western Australia. (2019). *2018 Statewide Vegetation Statistics (formerly the CAR Reserve Analysis) - Full report.* Perth, Western Australia. Retrieved from https://catalogue.data.wa.gov.au/dataset/dbca-statewide-vegetation-statistics/resource/0fc225fa-b06b-4da4-b5ed-62a146842389

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

Kendrick, P. (2001). *'Pilbara 3 (PIL3 – Hamersley subregion)' in CALM 2002. Bioregional Summary of the 2002 Biodiversity Audit for Western Australia.* Perth, Western Australia.

Kitchener, D. (1983). Pebble-mound Mouse Pseudomys chapmani. In R. Strahan, *Complete book of Australian mammals* (pp. 416-417). Australian Museum: the National Photographic Index of Australian Wildlife.

Knight, F., Pizzey, G., & Pizzey S. (2012, 9). *The Field Guide to the Birds of Australia* (9 ed.). Sydney, New South Wales: Harper Collins Publishers.

Lewandrowski, W., Tudor, E., Ajduk, H., Tomlinson, S., & Stevens, J. (2024). Spatiotemporal variation in ecophysiological traits align with high resolution niche modelling in the short-range banded ironstone endemic Aluta quadrata. *Conservation Physiology, 12*(1).

Orchard, A., & Cross, E. (2012). A revision of the Australian endemic genus Pentalepis (Asteraceae: Ecliptinae). *Nuytsia - The Journal of the Western Australian Herbarium, 22*(6), 371-392. Retrieved from https://florabase.dbca.wa.gov.au/science/nuytsia/646.pdf

Palmer, J. (2009). A conspectus of the genus Amaranthus L. (Amaranthaceae) in Australia. *Nuytsia - The Journal of the Western Australian Herbarium, 19*(1), 107-128. Retrieved from https://florabase.dbca.wa.gov.au/science/nuytsia/559.pdf

Pilbara Iron. (2006). *Pilbara Iron: Regional Drilling Program (GD_06_01350) Paraburdoo Rare Flora Survey.* Perth, Western Australia.

Rio Tinto. (2017). *Flora Vegetation and Fauna Habitat Assessment Paraburdoo Additional Water Pipeline. Native Vegetation Clearing Permit - Supporting Report.* Perth, Western Australia.

Rio Tinto. (2019). *Metadata Statement - Paraburdoo PTP2 Bore to Town Water Main Upgrade (RTIO-HSE-0331992).* Perth, Western Australia.

Rio Tinto. (2023a). *Desktop, Reconnaissance and Targeted Flora, Vegetation and Fauna Habitat assessment - Construction of Water and Monitoring Bores at Paraburdoo AR-23-17965.* Perth, Western Australia.

Rio Tinto. (2023b). *Desktop, Reconnaissance and Targeted Flora, Vegetation and Fauna Habitat assessment - Upgrades to the Water Bore and Powerlines in Paraburdoo AR-20-15923 and AR-21-16545.* Perth, Western Australia.

Trudgen, M. (1988). *A Report on the Flora and Vegetation of the Port Kennedy Area.* West Perth.

TSSC. (2016). *Conservation advice Macroderma gigas Ghost bat.* Canberra: Department of the Environment.

TSSC. (2020). *Conservation Advice: Falco hypoleucos - Grey Falcon.* Canberra, ACT. Retrieved from https://environment.gov.au/biodiversity/threatened/species/pubs/929-conservation-advice-09072020.pdf

Van Vreeswyk AME, L. K. (2004). *An inventory and condition survey and condition survey of the Pilbara region, Western Australia.* Perth, Western Australia. Retrieved from https://library.dpird.wa.gov.au/cgi/viewcontent.cgi?httpsredir=1&article=1006&context=tech_bull

WAH. (1998-). *Florabase: Online Resource.* Retrieved from https://florabase.dpaw.wa.gov.au/

WAM. (2024). *Checklist of the Terrestrial Vertebrate Fauna of Western Australia.* Retrieved from https://museum.wa.gov.au/research/departments/terrestrial-zoology/checklist-terrestrial-vertebrate-fauna-western-australia

Appendix A

Conservation Significant Flora Desktop Assessment

Appendix A Flora Desktop Results

Taxon	Habitat[1]	Cons. Code		Distance from Survey Area			Max Date	PMST	Likelihood Assessment					Total Score	Pre-survey Likelihood	Post-survey Likelihood	Comments
		EPBC	BC / DBCA	WAHerb	TPFL	Rio			Recorded in the survey area	Known occurrence <5km	Known occurrence <20km	Recent Record (Last 20 years)	Habitat suitability (0,1,2)				
Acacia bromilowiana	Red skeletal stony loam, orange-brown pebbly, gravel loam, laterite, banded ironstone, basalt. Rocky hills, breakaways, scree slopes, gorges, creek beds.		P4	45.89	45.89	46.27	2011		0	0	0	1	2	3	Moderate	Negligible	No suitable habitat present. No recent records in the vicinity.
Aluta quadrata	The species grows in habitat including steep rocky slopes, steep gorges, and gullies, with a preference for southern facing slopes of rugged topography in skeletal soils, including Brockman Iron Formation substrates. The species prefers soils with higher clay content. It is constrained to a narrow range along the southern fringe of the Hamersley Range (Lewandrowski, Tudor, Tomlinson & Stevens, 2023).		EN	11.12	11.54	11.00	2020		0	0	1	1	0	2	Negligible	Negligible	No suitable habitat present.
Amaranthus centralis	Red sand in ephemeral watercourses, sandy to clayey loam on river banks and edges of permanent pools in eucalypt lined channels, or Acacia shrubland. Also occurs in areas of permanent watering, e.g. bore overflows, gardens and cultivation (Palmer, 2009).		P3			43.75	2011		0	0	0	1	2	3	Moderate	Low	Marginal disturbed habitat present. Not recorded during survey. No records nearby.
Astrebla lappacea	Associated with Gilgai's, depressions on cracking clay soils and crabhole plains in Tussock grassland or Snakewood shrubland over Tussock grassland.		P3	55.17			2018		0	0	0	1	2	3	Moderate	Negligible	No suitable habitat present. No recent records in the vicinity.
Bothriochloa decipiens var. *cloncurrensis*	Associated with floodplains, clays and seasonally wet grasslands (DPaW and Rio Tinto, 2015)		P1				1900		0	0	0	0	2	2	Low	Negligible	No recent records in the vicinity. Perennial species would have been identifiable at time of survey.
Bulbostylis burbidgeae	Granitic soils. Granite outcrops, cliff bases.		P4			17.87	2014		0	0	1	1	0	2	Negligible	Negligible	No suitable habitat present.
Dampiera anonyma	Skeletal red-brown to brown gravelly soil over banded ironstone, basalt, shale and jaspilite. Hill summits, upper slopes (above 1000m).		P3	31.83	31.83	34.57	2011		0	0	0	1	0	1	Negligible	Negligible	No suitable habitat present. No recent records in the vicinity.
Dolichocarpa sp. Hamersley Station (A.A. Mitchell PRP 1479)	Cracking clay, basalt. Gently undulating plain with large surface rocks, flat crabholed plain.		P3			70.48	2011		0	0	0	1	1	2	Low	Negligible	No suitable habitat present. No recent records in the vicinity.
Eremophila coacta	Laterite, shale soils. Ironstone hills, creeklines.		P3	6.47	12.83	11.07	2018		0	0	1	1	1	3	Low	Negligible	Perennial species would have been identifiable at time of survey.
Eremophila magnifica subsp. *magnifica*	Skeletal soils over ironstone. Rocky screes.		P4	0.12		44.60	2014		0	1	1	1	1	4	Moderate	Negligible	No suitable habitat present.
Eremophila magnifica subsp. *velutina*	Skeletal soils over ironstone. Summits.		P3	57.32		57.57	2014		0	0	0	1	0	1	Negligible	Negligible	No suitable habitat present. No recent records in the vicinity.
Eremophila naaykensii	Rocky slopes, gullies and rock faces associated with large hills and cliffs.		P3	5.79		6.53	2022		0	0	1	1	0	2	Negligible	Negligible	No suitable habitat present.
Eremophila pusilliflora	Found on seasonally inundated alluvial plains between Turee Creek, Pingandy Creek and drainage systems leading into the Ashburton River, growing in red-brown sandy loams soils in open low shrubland (Buirchell and Brown, 2016).		P2	46.49	38.11		2012		0	0	0	1	2	3	Moderate	Negligible	No suitable habitat present.
Eremophila rigens	Clay flats, stony slopes.		P3	59.83			1977		0	0	0	0	2	2	Low	Negligible	No suitable habitat present. No recent records in the vicinity.

Appendix A Flora Desktop Results

Taxon	Habitat[1]	Cons. Code		Distance from Survey Area			Max Date	PMST	Likelihood Assessment					Total Score	Pre-survey Likelihood	Post-survey Likelihood	Comments
		EPBC	BC / DBCA	WAHerb	TPFL	Rio			Recorded in the survey area	Known occurrence <5km	Known occurrence <20km	Recent Record (Last 20 years)	Habitat suitability (0,1,2)				
Eremophila sp. Mt Channar Range (C. Keating & M.E. Trudgen CK 408)	Rocky slope, south facing slope (Astron, 2018).		P1	21.43			2022		0	0	0	1	0	1	Negligible	Negligible	No suitable habitat present. No recent records in the vicinity.
Eremophila sp. Pingandy dentate (B. Buirchell BB 331)	No habitat information available.		P1	56.98			1977		0	0	0	0	2	2	Low	Negligible	No information, precautionary principle applied to habitat suitability. Perennial species would have been identifiable at time of survey.
Eremophila sp. Snowy Mountain (S. van Leeuwen 3737)	Summit of hill, high in the landscape, skeletal red gritty soils over massive ironstone of the Brockman Iron Formation (Astron, 2018).		P1	43.18			1998		0	0	0	0	0	0	Negligible	Negligible	No suitable habitat present. No recent records in the vicinity.
Eremophila youngii subsp. *lepidota*	Stony red sandy loam. Flats plains, floodplains, sometimes semi-saline, clay flats.		P4	19.32			1977		0	0	1	0	2	3	Low	Negligible	No recent records in the vicinity. Perennial species would have been identifiable at time of survey.
Eucalyptus lucens	Ironstone. Rocky slopes and mountain tops, high in the landscape.		P1	50.52		50.49	2012		0	0	0	1	0	1	Negligible	Negligible	No suitable habitat present. No recent records in the vicinity.
Geijera salicifolia	Skeletal soils, stony soils. Massive rock scree, gorges.		P3	46.15		34.12	2012		0	0	0	1	1	2	Low	Negligible	No suitable habitat present. No recent records in the vicinity.
Glycine falcata	Black clayey sand. Along drainage depressions in crabhole plains on river floodplains.		P3			65.44	2009		0	0	0	1	2	3	Moderate	Negligible	No suitable habitat present. No recent records in the vicinity.
Goodenia obscurata	Occurs on floodplains or low rocky ridges, growing in red-brown sandy clay or lateritic loam over banded ironstone. Associated with low open woodland of Acacia over Triodia, or open shrubland with a sparse overstorey of Corymbia hamersleyana and Hakea chordophylla over Triodia		P3	47.79			1980		0	0	0	0	2	2	Low	Negligible	No recent records in the vicinity.
Goodenia sp. East Pilbara (A.A. Mitchell PRP 727)	Red-brown clay soil, calcrete pebbles. Low undulating plain, swampy plains.		P3	16.28	2.33	1.91	2018		0	1	1	1	2	5	High	Low	Records nearby from 2006. Not recorded during survey. Majority of survey area degraded.
Grevillea saxicola	Orange-brown to red-brown loam soils on the upper scree/breakaway slopes and crests often associated with banded iron formation outcropping. Often found growing in Mulga woodland (Dillon, 2014).		P3	4.58		4.72	2021		0	1	1	1	1	4	Moderate	Negligible	No suitable habitat present.
Helichrysum oligochaetum	Depressions and floodplains in clay soils.		P1	58.68			1977		0	0	0	0	2	2	Low	Negligible	Habitat in survey area mostly degraded. No recent records in the vicinity.
Hibiscus campanulatus	Hill slopes and base of slopes, sheltered or rocky drainage lines below associated cliff-lines or rocky ridges, soils often associated with Canga detrital formations (Astron, 2018).		P1	0.09	4.92	4.78	2021		0	1	1	1	0	3	Negligible	Negligible	No suitable habitat present.
Hibiscus sp. Gurinbiddy Range (M.E. Trudgen MET 15708)	Sheltered or rocky drainage lines below associated cliff-lines or rocky ridges, skeletal red-brown stony soil over massive ironstone of the Brockman Iron Formation (Astron, 2018).		P2	16.49		13.35	2020		0	0	1	1	0	2	Negligible	Negligible	No suitable habitat present. No recent records in the vicinity.

Appendix A Flora Desktop Results

Taxon	Habitat[1]	Cons. Code		Distance from Survey Area			Max Date	PMST	Likelihood Assessment					Total Score	Pre-survey Likelihood	Post-survey Likelihood	Comments
		EPBC	BC / DBCA	WAHerb	TPFL	Rio			Recorded in the survey area	Known occurrence <5km	Known occurrence <20km	Recent Record (Last 20 years)	Habitat suitability (0,1,2)				
Hibiscus sp. Mt Brockman (E. Thoma ET 1354)	Rocky drainage lines below cliff-lines or rocky gorges.		P1	47.95		31.84	2014		0	0	0	1	0	1	Negligible	Negligible	No suitable habitat present. No recent records in the vicinity.
Indigofera ixocarpa	Skeletal red soils over massive ironstone.		P2	45.73	45.73	38.91	2014		0	0	0	1	1	2	Low	Negligible	No suitable habitat present. No recent records in the vicinity.
Indigofera rivularis	Creek lines or along steep slopes in skeletal soils from the Brockman Ironstone Formation. Used to be known as sp. Bungaroo Creek.		P3			51.00	2007		0	0	0	1	2	3	Moderate	Negligible	No suitable habitat present. No recent records in the vicinity.
Ipomoea racemigera	Creek bed and banks. *Eucalyptus camaldulensis, E. limitaris* open woodland over *Arundinella nepalensis*, *Heteropogon contortus, Dichanthium fecundum, Sorghum plumosum, Bothriochloa pertusa, Cenchrus ciliaris* tussock grassland with *Cyperus vaginatus* scattered sedges.		P2	58.84			2022		0	0	0	1	2	3	Moderate	Negligible	Habitat in survey area mostly degraded. No recent records in the vicinity.
Isotropis forrestii	Stony clay loam, sandy alluvium. Along drainage lines.		P1	11.21		11.21	2018		0	0	1	1	2	4	High	Low	Not recorded during survey. Majority of survey area degraded.
Lepidium catapycnon	Skeletal soils. Hillsides. Open low woodlands of *Eucalyptus leucophloia*. Open hummock grassland.		P4	47.58	46.18	46.09	2014		0	0	0	1	1	2	Low	Negligible	No suitable habitat present. No recent records in the vicinity.
Nicotiana karijini	No habitat information available.		PSI			9.18	2015		0	0	1	1	2	4	High	Low	Not recorded during survey.
Olearia mucronata	Schistose hills, along drainage channels.		P3	12.59	44.73	43.82	2013		0	0	1	1	1	3	Low	Negligible	No suitable habitat present. No recent records in the vicinity.
Oxalis sp. Pilbara (M.E. Trudgen 12725)	Shaded areas around rock outcrops and gullies and on gully walls (Astron, 2018).		P2			24.82	2009		0	0	0	1	0	1	Negligible	Negligible	No suitable habitat present. No recent records in the vicinity.
Pentalepis trichodesmoides subsp. *hispida*	Found in Triodia hummock grassland, often in the understorey of a shrubland of Acacia spp., Gossypium spp., Senna spp., Brachychiton spp. and Eucalyptus spp., on summits and slopes of low hills, on basaltic soils, at altitudes to 1150 m (Orchard and Cross, 2012).		P2	48.80		53.41	2013		0	0	0	1	0	1	Negligible	Negligible	No suitable habitat present. No recent records in the vicinity.
Pilbara trudgenii	Skeletal, red stony soil over ironstone. Hill summits, steep slopes, screes, cliff faces.		P3	2.26		11.71	2014		0	1	1	1	0	3	Negligible	Negligible	No suitable habitat present.
Ptilotus mollis	Stony hills and screes.		P4	16.20		14.06	2014		0	0	1	1	1	3	Low	Negligible	No suitable habitat present. No recent records in the vicinity.
Ptilotus subspinescens	Hummock grasslands between mesas of ironstone on rocky and scree slopes.		P3	53.84	55.95	55.95	2007		0	0	0	1	0	1	Negligible	Negligible	No suitable habitat present. No recent records in the vicinity.
Ptilotus trichocephalus	Clay flats, sandy colluvial soils and gibber plains. Often with Mulga.		P4	0.98	13.79	10.21	2015		0	1	1	1	2	5	High	Negligible	No suitable habitat present.
Rhagodia sp. Hamersley (M. Trudgen 17794)	Commonly recorded from hardpand plains dominated by mulga shrubs and trees with the understorey consisting of scattered Eremophila spp., Ptilotus spp., Senna spp. shrubs over annual and perennial grasses. Individuals have been recorded from low hillslopes, stony plains, gullies, low hills, floodplains and claypans.		P3	48.86			2012		0	0	0	1	2	3	Moderate	Negligible	No suitable habitat present.

Appendix A Flora Desktop Results

Taxon	Habitat[1]	Cons. Code		Distance from Survey Area			Max Date	PMST	Likelihood Assessment					Total Score	Pre-survey Likelihood	Post-survey Likelihood	Comments
		EPBC	BC / DBCA	WAHerb	TPFL	Rio			Recorded in the survey area	Known occurrence <5km	Known occurrence <20km	Recent Record (Last 20 years)	Habitat suitability (0,1,2)				
Rostellularia adscendens var. *latifolia*	Ironstone soils. Near creeks, rocky hills.		P3	29.28		29.28	2012		0	0	0	1	1	2	Low	Negligible	No suitable habitat present. No recent records in the vicinity.
Scaevola sp. Hamersley Range basalts (S. van Leeuwen 3675)	Skeletal, brown gritty soil over basalt. Summits of hills, steep hills.		P2	24.29	24.29	53.66	2006		0	0	0	1	0	1	Negligible	Negligible	No suitable habitat present. No recent records in the vicinity.
Senna sp. Barlee Range (S. van Leeuwen 1520)	Skeletal soils in rocky areas especially scree slopes and rock piles in small chines and gullies.		P2	25.66			1984		0	0	0	0	1	1	Negligible	Negligible	No suitable habitat present. No recent records in the vicinity.
Sida sp. Barlee Range (S. van Leeuwen 1642)	Skeletal red soils pockets. Steep slope.		P3	0.12	13.58	4.60	2022		0	1	1	1	1	4	Moderate	Negligible	No suitable habitat present.
Sida sp. Hamersley Range (K. Newbey 10692)	Low open woodland over hummock grassland of Triodia sp.		P3	36.03	13.16	13.16	2013		0	0	1	1	2	4	High	Negligible	No suitable habitat present.
Solanum kentrocaule	Endemic to WA, has been found only in the Hamersley Range between 700m to 1250m altitude. Inhabits hillsides and mountaintops, or occasionally creek-beds, in skeletal red-brown soil over ironstone or on basalt scree.		P3	32.03		11.05	2017		0	0	1	1	1	3	Low	Negligible	No suitable habitat present. No recent records in the vicinity.
Solanum octona	Gorge tops, red sandy soils with Triodia and skeletal soils. Also recorded in riverine area with gritty sand.		P2			8.49	2015		0	0	1	1	1	3	Low	Negligible	No suitable habitat present. Perennial species would have been identifiable at time of survey.
Streptoglossa sp. Cracking clays (S. van Leeuwen et al. PBS 7353)	Acacia anuera, high open shrubland. Tussock grassland. Gentle slopes. Margin between an area of Mulga woodland and an open area.		P3	3.15			2021		0	1	1	1	2	5	High	Negligible	No suitable habitat present.
Stylidium weeliwolli	Gritty sand soil, sandy clay. Edge of watercourses.		P3		53.62	53.62	2006		0	0	0	1	2	3	Moderate	Negligible	No suitable habitat present. No recent records in the vicinity.
Swainsona thompsoniana	Recorded on gibber plains, crabhole plains and gilgai usually at elevation in association with tussock grasses (DPaW and Rio Tinto, 2015).		P3	3.15			1997		0	1	1	0	2	4	Moderate	Negligible	No suitable habitat present.
Themeda sp. Hamersley Station (M.E. Trudgen 11431)	Drainage lines, clay flats, crabhole flats and dark self mulching clays.		P3	3.15		59.27	2011		0	1	1	1	2	5	High	Negligible	No suitable habitat present.
Thryptomene wittweri	This species inhabits steep slopes, rock scree and breakaways near the summits of prominent hills. Plants often grow from ledges and fissures along rock faces and walls, and the species often occurs with several other scrubby species, usually in open situations under a sparse canopy of mallee and acacia, and is located from Wiluna and Karratha (DEWHA, 2008).	V	VU				1900	May	0	0	0	0	0	0	Negligible	Negligible	No suitable habitat present. No recent records in the vicinity.
Triodia basitricha	Grows on crests and nearby slopes of rocky hills (DPaW and Rio Tinto, 2015).		P3	56.71			2015		0	0	0	1	0	1	Negligible	Negligible	No suitable habitat present. No recent records in the vicinity.
Vittadinia sp. Coondewanna Flats (S. van Leeuwen 4684)	Floodplains (Biota, 2018).		P1			71.51	2011		0	0	0	1	2	3	Moderate	Low	Suitable degraded habitat present. Not recorded during survey.
1. Habitat information derived from WAH (1998-) unless stated otherwise																	

Appendix B

Conservation Significant Fauna Desktop Assessment

Appendix B Fauna Desktop Results

Type	Taxon	Common Name	Habitat	Cons. Code		Date		Records		Distance (km)		PMST	Likelihood Assessment				Total Score	Pre-survey Likelihood	Post-survey Likelihood	Comments
				BC Act / DBCA	EPBC Act	DBCA	Rio	DBCA	Rio	DBCA	Rio		Recorded in Survey Area	Known Occurrence <20km	Recent Record <20 years	Habitat Suitability (0,1,2)				
Bird	*Actitis hypoleucos*	Common Sandpiper	Wide range of coastal wetlands, around muddy margins or rocky shores, some inland wetlands and rarely on mudflats (DCCEEW, 2024)	IA	MI & MA	2018		7		2.61			0	1	1	0	2	Low	Negligible	No suitable habitat.
Reptile	*Anilios ganei*	Gane's Blind Snake	Preferred natural habitat is grassland. The type locality is Cathedral Gorge, 30 km west of Newman.	P1		2005		2		41.10			0	0	1	0	1	Negligible	Negligible	No suitable habitat.
Bird	*Apus pacificus*	Fork-tailed Swift	Over inland plains, sometimes boave foothills or in coastal areas (DCCEEW, 2024).	IA	MI & MA								0	0	0	0	0	Negligible	Negligible	No known records nearby.
Bird	*Calidris acuminata*	Sharp-tailed Sandpiper	Occurs along muddy edges of shallow fresh or brackish wetlands with inundated or emergent sedges, grass, saltmarsh or other low vegetation (DCCEEW, 2024).	VU	V & MI & MA	2010		4		2.42			0	1	1	0	2	Low	Negligible	No suitable habitat.
Bird	*Calidris ferruginea*	Curlew Sandpiper	Intertidal mudflats in sheltered coastal areas and inland around ephemeral and permanent lakes, dams, waterholes and bore drains with bare edges of mud and sand (DCCEEW, 2024).	CR & IA	CE & MI & MA								0	0	0	0	0	Negligible	Negligible	No known records nearby.
Bird	*Calidris melanotos*	Pectoral Sandpiper	Occupies shallow, fresh waters often containing low grass or other small herbs, swamp margins, flooded pastures and saltmarshes (Pizzey & Knight, 2007;DCCEEW, 2024).	IA	MI & MA								0	0	0	0	0	Negligible	Negligible	No known records nearby.
Bird	*Calidris ruficollis*	Red-necked Stint	Coastal sheltered areas and exposed or ocean beaches, sometimes on stony or rocky shores, reefs or shoals (DCCEEW, 2024).	IA	Mi	1980		1		38.36			0	0	0	0	0	Negligible	Negligible	No suitable habitat.
Bird	*Calidris subminuta*	Long-toed Stint	Freshwater wetlands (DCCEEW, 2024).	IA	Mi	2010		2		2.42			0	1	1	0	2	Low	Negligible	No suitable habitat.
Bird	*Charadrius veredus*	Oriental Plover	Coastal and northern inland Australia, ploughed land, bare claypans, margins of coastal margins and open plains (Pizzey & Knight, 2007).	IA	Mi								0	0	0	1	1	Low	Negligible	No known records nearby.
Reptile	*Ctenotus nigrilineatus*	Pin-striped Finesnout Ctenotus		P1		2011		1		43.34			0	0	1	0	1	Negligible	Negligible	No suitable habitat.
Mammal	*Dasyurus hallucatus*	Northern Quoll	Occupies the Pilbara and further north through to the Kimberley (DSEWPaC, 2011). The species occupies rocky areas, deserts, eucalypt forests and woodlands, hummock grass (Triodia spp.), basalt hills, mesas, high and low plateaux, lower slopes, occasional fields and stony plains supporting spinifex grasslands (Braithwaite & Griffiths 1994; Van Vreeswyk et al. 2004).	EN	E	2021	2018	13	1	1.22	8.14		0	1	1	1	3	Moderate	Low	Transient only
Bird	*Falco hypoleucos*	Grey Falcon	Timbered lowland plains, including Acacia shrublands (particularly with tree-lined watercourses), tussock grassland and open woodland (TSSC, 2020).	VU	V	2018	2018	4	1	3.62	6.72		0	1	1	1	3	Moderate	Low	Transient only
Bird	*Falco peregrinus*	Peregrine Falcon	Rainforests, arid zones and coastal to alpine areas (BirdLife, 2024).	OS		2004	2020	2	1	31.26	6.00		0	1	1	0	1	Negligible	Negligible	No suitable habitat.
Bird	*Hirundo rustica*	Barn Swallow	Widespread throughout northern Australia during the summer months in open country, agricultural land, especially near water, railyards and towns (Pizzey & Knight, 2007).	IA	Mi								0	0	0	0	0	Negligible	Negligible	No known records nearby.
Mammal	*Leggadina lakedownensis*	Short-tailed mouse, Lakeland Downs mouse	Sandy soils and cracking clays.	P4		2001		6		41.45			0	0	0	0	0	Negligible	Negligible	No suitable habitat.
Fish	*Leiopotherapon aheneus*	Fortescue Grunter	Restricted to the Ashburton river and the upper reaches of the Fortescue River. Inhabits slow to fast flowing clear freshwater streams and pools over sandy and rocky bottoms (Museum of Victoria, 2024).	P4			2019		2		3.46		0	1	1	0	2	Negligible	Negligible	No suitable habitat.
Reptile	*Liasis olivaceus barroni*	Olive Python	Prefers deep gorges and water holes in the ranges of the Pilbara region. Cooler winter months individuals spend hiding in caves and rock crevices away from water sources, warmer summer months the pythons move around, usually in close proximity to water and rock outcrops.	VU	V	2017		4		1.22			0	1	1	1	3	Moderate	Low	Transient only
Mammal	*Macroderma gigas*	Ghost Bat	Northern Australia, inhabiting arid Pilbara to tropical savanna woodlands and rainforests rainforest, monsoon and vine thicket, open woodlands and arid areas and reside in caves, rock crevices and disused mine adits (DoE 2016).	VU	V	2022	2017	17	3	6.17	5.04		0	1	1	1	3	Moderate	Low	Transient only
Bird	*Motacilla cinerea*	Grey Wagtail	Found across a wide variety of wetlands, watercourses and on the banks of lakes and marshes (DCCEEW, 2024).	IA	MI & MA								0	0	0	0	0	Negligible	Negligible	No suitable habitat.
Bird	*Motacilla flava*	Yellow Wagtail	Open country near water, such as wet meadows (DCCEEW, 2024).	IA	Mi								0	0	0	0	0	Negligible	Negligible	No suitable habitat.
Bird	*Plegadis falcinellus*	Glossy Ibis	Well vegetated wetlands, wet pastures, floodwaters, brackish wetlands and mudflats (Pizzey & Knight, 2007).	IA	Mi	1979		3		21.98			0	0	0	0	0	Negligible	Negligible	No suitable habitat.

Appendix B Fauna Desktop Results

Type	Taxon	Common Name	Habitat	Cons. Code		Date		Records		Distance (km)		PMST	Likelihood Assessment				Total Score	Pre-survey Likelihood	Post-survey Likelihood	Comments
				BC Act / DBCA	EPBC Act	DBCA	Rio	DBCA	Rio	DBCA	Rio		Recorded in Survey Area	Known Occurrence <20km	Recent Record <20 years	Habitat Suitability (0,1,2)				
Mammal	*Pseudomys chapmani*	Western Pebble-mound Mouse	Pebbly soils in arid tussock grassland and acacia woodland of Western Australia, in hummock grasslands, Triodia basedowii, Acacia spp. and Ptilotus. It is associated with erroding sands and can be found in the Pilbara region in areas of rocky hummock grassland with little or no soil and an overstorey of Acacia spp. (Kitchener 1983; Burbidge 2016).	P4		2015	2020	49	1	12.84	6.85		0	1	1	0	2	Low	Negligible	No suitable habitat.
Mammal	*Rhinonicteris aurantia (Pilbara form)*	Pilbara leaf-nosed bat	Hunts through riparian vegetation in gorges, and over hummock grassland and sparse tree-and-shrub savannah. It roosts in caves and abandoned, deep and partially flooded mines that trap pockets of warm, humid air; it may also occupy smaller, less complex mines for part of the year.	VU		2019	2018	94	34	4.33	2.53		0	1	1	0	2	Low	Negligible	No suitable habitat.
Mammal	*Sminthopsis longicaudata*	Long-Tailed Dunnart	Acacia, rocky screes with hummock grass and shrubs, and tall open shrubland and woodlands	P4		2006		1		35.36			0	0	1	0	1	Negligible	Negligible	No suitable habitat.
Bird	*Tringa glareola*	Wood Sandpiper	Common in Northern Australia, a casual visitor to southern parts, occuping wetland margins, saltmarshes and sewage ponds (Pizzey & Knight, 2007).	IA	Mi	2010		5		2.42			0	1	1	0	2	Low	Negligible	No suitable habitat.

Appendix C

Flora Species by Community Matrix

Family	Weed	Taxon	C1			P1				S1		
			PQ06	PQ07	PQ10	PQ01	PQ02	PQ03	PQ04	PQ05	PQ08	PQ09
Aizoaceae												
	*	*Trianthema portulacastrum*								X	X	X
Amaranthaceae												
	*	*Aerva javanica*	X	X	X	X			X			X
		Amaranthus undulatus	X	X	X							
		Gomphrena cunninghamii		X	X							
		Gomphrena kanisii	X	X	X		X	X		X	X	X
		Ptilotus aervoides	X	X							X	
		Ptilotus obovatus			X		X	X	X	X		X
		Ptilotus calostachyus									X	
		Ptilotus exaltatus		X		X				X	X	X
		Ptilotus helipteroides					X					
Araliaceae												
		Trachymene oleracea		X								
Asteraceae												
		Streptoglossa sp.	X	X			X					
Boraginaceae												
		Euploca tanythrix					X		X			
		Trichodesma zeylanicum var. *zeylanicum*	X	X	X	X						
Capparaceae												
		Capparis spinosa		X								
Caryophyllaceae												
		Polycarpaea corymbosa	X									
		Polycarpaea longiflora		X	X							
Chenopodiaceae												
		Dissocarpus paradoxus								X	X	
		Enchylaena tomentosa var. tomentosa		X					X	X	X	
		Rhagodia eremaea		X		X	X	X	X	X	X	X
		Salsola australis		X						X	X	X
		Sclerolaena costata		X								X
		Sclerolaena cuneata								X	X	X
		Sclerolaena gardneri			X						X	X
		Sclerolaena sp.									X	
Cleomaceae												
		Arivela viscosa	X	X	X	X	X	X	X	X		X
Convolvulaceae												
		Bonamia pilbarensis	X	X				X				
		Convolvulus clementii	X				X					
		Duperreya commixta									X	
		Evolvulus alsinoides var. *decumbens*	X	X								
		Evolvulus alsinoides var. *villosicalyx*					X			X		
Cucurbitaceae												
	*	*Citrullus colocynthis*	X	X	X							
		Cucumis sp.		X		X						
	*	*Cucumis myriocarpus*									X	
		Cucumis variabilis			X							
Euphorbiaceae												
		Euphorbia australis var. *subtomentosa*					X					
		Euphorbia biconvexa	X	X		X						
Fabaceae												
		Acacia aptaneura x paraneura								X		X
		Acacia ligulata						X				

Family	Weed	Taxon	C1			P1				S1		
			PQ06	PQ07	PQ10	PQ01	PQ02	PQ03	PQ04	PQ05	PQ08	PQ09
		Acacia citrinoviridis	X	X	X	X	X	X	X			
		Acacia pyrifolia	X	X	X							
		Acacia synchronicia					X			X		X
		Acacia tetragonophylla	X				X		X	X		X
		Acacia xiphophylla								X	X	X
		Crotalaria medicaginea	X			X	X					
		Indigofera colutea	X	X		X	X	X	X			X
		Indigofera monophylla	X	X	X	X		X				
		Rhynchosia minima			X							
		Senna hamersleyensis									X	
		Senna artemisioides subsp. *helmsii*										X
		Senna artemisioides subsp. *oligophylla*					X	X		X	X	
		Senna glutinosa subsp. ×*luerssenii*								X	X	X
		Senna sp. Meekatharra									X	
		Tephrosia ?supina	X									
		Tephrosia rosea var. *clementii*	X	X	X							
Goodeniaceae												
		Goodenia muelleriana	X								X	
Lamiaceae												
		Clerodendrum floribundum var. *angustifolium*			X							
Malvaceae												
		Abutilon leucopetalum		X								
		Corchorus crozophorifolius	X	X	X	X	X	X	X	X		X
	*	*Malvastrum americanum*									X	
		Sida fibulifera									X	
		Waltheria indica			X							
Molluginaceae												
		Trigastrotheca molluginea										X
Myrtaceae												
		Eucalyptus camaldulensis	X		X							
		Eucalyptus victrix	X	X	X							
		Melaleuca lasiandra	X		X							
Nyctaginaceae												
		Boerhavia gardneri	X	X	X		X		X	X	X	X
Papaveraceae												
	*	*Argemone ochroleuca*		X	X							
Phyllanthaceae												
		Nellica maderaspatensis	X	X	X							
		Notoleptopus decaisnei			X							
Poaceae												
		Aristida contorta	X		X				X		X	X
	*	*Cenchrus ciliaris*	X	X	X	X	X	X	X	X	X	X
	*	*Cenchrus setiger*		X	X	X	X	X		X	X	
		Cynodon prostratus								X	X	X
		Dactyloctenium radulans	X							X	X	X
		Digitaria ctenantha		X								
		Enneapogon caerulescens	X	X	X						X	X
		Enteropogon ramosus								X	X	
		Eragrostis eriopoda								X	X	
		Eriachne pulchella subsp. *dominii*	X	X	X							
		Eriachne aristidea								X		
		Eriachne mucronata	X				X					

Family	Weed	Taxon	C1			P1				S1		
			PQ06	PQ07	PQ10	PQ01	PQ02	PQ03	PQ04	PQ05	PQ08	PQ09
		Paspalidium clementii			X							
		Setaria dielsii			X							
		Sporobolus australasicus	X	X						X	X	X
		Themeda triandra				X						
		Tragus australianus									X	
Portulacaceae												
	*	*Portulaca oleracea*	X	X	X		X		X	X	X	X
Proteaceae												
		Grevillea striata						X				
Scrophulariaceae												
		Eremophila ?platycalyx								X		X
		Eremophila cuneifolia					X		X	X	X	X
		Eremophila exilifolia								X		
		Eremophila forrestii					X					X
Solanaceae												
		Solanum lasiophyllum			X					X		X
Violaceae												
		Afrohybanthus aurantiacus		X								
Zygophyllaceae												
		Tribulus suberosus					X		X	X	X	X
	*	*Tribulus terrestris*		X								

Appendix D

Site Data

1.0 Site Data

Site No: PQ01	**Date**: 15/06/2024	**Easting**: 572246.06	**Northing:** 7435942.03

Type: Quadrat
Soil Type: Sandy clay loam
Outcrops: River stones
Soil Colour: Red-brown
Vegetation Condition: 0.2 - Degraded
Landform: Clay plain
Vegetation Association: P1
Fire: 10+ years

Vegetation Description: *Grevillea striata* open woodland over *Acacia citrinoviridis, Acacia ligulata* and *Acacia synchronicia* tall open shrubland over **Cenchrus ciliaris* and **Cenchrus setiger* tussock grassland.

Collection No.	Cons. Status	Taxon	Height (m)	Cover (%)
		Acacia citrinoviridis	3.9	17
	*	*Aerva javanica*	0.5	0.1
		Arivela viscosa	0.3	0.1
	*	*Cenchrus ciliaris*	0.8	18
	*	*Cenchrus setiger*	0.8	17
NS240615-03		*Corchorus crozophorifolius*	1.5	0.5
		Crotalaria medicaginea	0.3	0.1

Collection No.	Cons. Status	Taxon	Height (m)	Cover (%)
		Cucumis sp.	0	0.1
NS240615-04		*Euphorbia biconvexa*	0.3	0.1
NS240615-01		*Indigofera colutea*	0.1	0.1
NS240615-02		*Indigofera monophylla*	0.6	0.1
		Ptilotus exaltatus	0.05	0.1
		Rhagodia eremaea	0.8	0.1
		Themeda triandra	0.6	0.1
		Trichodesma zeylanicum var. *zeylanicum*	0.3	0.1

Site No: PQ02	**Date**: 15/06/2024	**Easting**: 571762.67	**Northing:** 7435888.16

Type: Quadrat
Soil Type: Sandy clay loam
Outcrops: River stones
Soil Colour: Red-brown
Vegetation Condition: 0.2 - Degraded
Landform: Clay plain
Vegetation Association: P1
Fire: 10+ years

Vegetation Description: *Grevillea striata* open woodland over *Acacia citrinoviridis, Acacia ligulata* and *Acacia synchronicia* tall open shrubland over **Cenchrus ciliaris* and **Cenchrus setiger* tussock grassland.

Collection No.	Cons. Status	Taxon	Height (m)	Cover (%)
		Acacia citrinoviridis	4.5	5
		Acacia synchronicia	3.6	0.5
		Acacia tetragonophylla	2.9	0.5
		Arivela viscosa	0.3	0.1
		Boerhavia gardneri	0.01	0.1
	*	*Cenchrus ciliaris*	0.5	19
	*	*Cenchrus setiger*	0.8	5
		Convolvulus clementii	0	0.1
		Corchorus crozophorifolius	1.1	0.1

Collection No.	Cons. Status	Taxon	Height (m)	Cover (%)
		Crotalaria medicaginea	0.1	0.1
		Eremophila cuneifolia	1.3	0.1
		Eremophila forrestii	1.6	0.1
		Eriachne mucronata	0.7	0.1
NS240615-05		*Euphorbia australis* var. *subtomentosa*	0.5	0.1
		Euploca tanythrix	0.1	0.1
		Evolvulus alsinoides var. *villosicalyx*	0.1	0.1
NS240615-06		*Gomphrena kanisii*	0.3	0.1
		Indigofera colutea	0.05	0.1
	*	*Portulaca oleracea*	0.01	0.1
		Ptilotus obovatus	0.8	0.1
		Ptilotus helipteroides	0.2	0.1
		Rhagodia eremaea	1.5	0.1
		Senna artemisioides subsp. *oligophylla*	0.1	0.1
		Streptoglossa sp.	0.1	0.1
		Tribulus suberosus	0.3	0.1

Site No: PQ03	**Date**: 15/06/2024	**Easting**: 571241.07	**Northing:** 7436042.57

Type: Quadrat
Soil Type: Sandy clay loam
Outcrops: River stones
Soil Colour: Red-brown
Vegetation Condition: 0.2 - Degraded
Landform: Clay plain
Vegetation Association: P1
Fire: 10+ years

Vegetation Description: *Grevillea striata* open woodland over *Acacia citrinoviridis, Acacia ligulata* and *Acacia synchronicia* tall open shrubland over **Cenchrus ciliaris* and **Cenchrus setiger* tussock grassland.

Collection No.	Cons. Status	Taxon	Height (m)	Cover (%)
NS240615-07		*Acacia ligulata*	4	1
		Acacia citrinoviridis	4.6	2
		Arivela viscosa	0.5	0.1
		Bonamia pilbarensis	0.01	0.1
	*	*Cenchrus ciliaris*	0.7	11
	*	*Cenchrus setiger*	0.8	11
		Corchorus crozophorifolius	0.4	0.1
		Gomphrena kanisii	0.1	0.1
		Grevillea striata	12	5

Collection No.	Cons. Status	Taxon	Height (m)	Cover (%)
		Indigofera colutea	0.05	0.1
		Indigofera monophylla	0.3	0.1
		Ptilotus obovatus	0.8	0.3
		Rhagodia eremaea	1.2	0.1
		Senna artemisioides subsp. *oligophylla*	0.1	0.1

Site No: PQ04	**Date**: 15/06/2024	**Easting**: 570363.76	**Northing:** 7435940.41

Type: Quadrat
Soil Type: Sandy clay loam
Outcrops: River stones
Soil Colour: Red-brown
Vegetation Condition: 0.2 - Degraded
Landform: Clay plain
Vegetation Association: P1
Fire: 10+ years

Vegetation Description: *Grevillea striata* open woodland over *Acacia citrinoviridis, Acacia ligulata* and *Acacia synchronicia* tall open shrubland over **Cenchrus ciliaris* and **Cenchrus setiger* tussock grassland.

Collection No.	Cons. Status	Taxon	Height (m)	Cover (%)
		Acacia citrinoviridis	4	5
		Acacia tetragonophylla	3	0.1
	*	*Aerva javanica*	0.8	0.1
		Aristida contorta	0.1	0.1
		Arivela viscosa	0.5	0.1
NS240615-09		*Boerhavia gardneri*	0.01	0.1
	*	*Cenchrus ciliaris*	1	18
		Corchorus crozophorifolius	0.5	0.1
NS240615-08		*Enchylaena tomentosa* var. *tomentosa*	0.4	0.1

Collection No.	Cons. Status	Taxon	Height (m)	Cover (%)
		Eremophila cuneifolia	0.7	0.1
NS240615-10		*Euploca tanythrix*	0.2	0.1
		Indigofera colutea	0.05	0.1
	*	*Portulaca oleracea*	0.01	0.1
		Ptilotus obovatus	1.3	0.1
		Rhagodia eremaea	1.8	0.1
		Tribulus suberosus	0.2	0.1

Site No: PQ05	**Date**: 16/06/2024	**Easting**: 573387.94	**Northing:** 7436500.43

Type: Quadrat
Soil Type: Sandy clay loam
Outcrops: Quartz and ironstone
Soil Colour: Red-brown
Vegetation Condition: 0.6 – Good
Landform: Stony plain
Vegetation Association: S1
Fire: 10+ years

Vegetation Description: *Acacia xiphophylla, Acacia synchronicia and Acacia aptaneura x paraneura* tall open shrubland over *Eremophila cuneifolia* and *Eremophila exilifolia* open shrubland over *Enchylaena tomentosa* var. *tomentosa* scattered low shrubs over *Eragrostis eriopoda* and **Cenchrus setiger* very open tussock grassland on stony plains.

Collection No.	Cons. Status	Taxon	Height (m)	Cover (%)
NS240616-12		*Acacia aptaneura x paraneura*	4.8	0.5
		Acacia synchronicia	2.3	0.5
		Acacia tetragonophylla	2.5	0.1
		Acacia xiphophylla	3	7
		Arivela viscosa	0.1	0.1
		Boerhavia gardneri	0.1	0.1
	*	*Cenchrus ciliaris*	0.3	0.1
	*	*Cenchrus setiger*	0.2	0.1

Collection No.	Cons. Status	Taxon	Height (m)	Cover (%)
		Corchorus crozophorifolius	0.2	0.1
NS240616-11		*Cynodon prostratus*	0.01	0.1
		Dactyloctenium radulans	0.05	0.1
		Dissocarpus paradoxus	0.2	0.1
		Enchylaena tomentosa var. *tomentosa*	1	0.2
		Enteropogon ramosus	0.1	0.1
		Eragrostis eriopoda	0.5	0.5
NS240616-15		*Eremophila ?platycalyx*	1.2	0.1
		Eremophila cuneifolia	0.5	3
		Eremophila exilifolia	1	0.25
		Eriachne aristidea	0.05	0.1
		Evolvulus alsinoides var. *villosicalyx*	0.03	0.1
		Gomphrena kanisii	0.1	0.1
	*	*Portulaca oleracea*	0.01	0.1
		Ptilotus obovatus	0.05	0.1
		Ptilotus exaltatus	0.03	0.1
		Rhagodia eremaea	0.8	0.1
		Salsola australis	0.1	0.1
NS240616-14		*Sclerolaena cuneata*	0.2	0.1
		Senna artemisioides subsp. *oligophylla*	0.2	0.1
		Senna glutinosa subsp. *×luerssenii*	0.3	0.1
		Solanum lasiophyllum	0.2	0.1
		Sporobolus australasicus	0.1	0.1
NS240616-13	*	*Trianthema portulacastrum*	0.01	0.1
		Tribulus suberosus	0.1	0.1

Site No: PQ06	**Date**: 16/06/2024	**Easting**: 572778.65	**Northing:** 7436251.98

Type: Quadrat
Soil Type: Sandy clay
Outcrops: River stones
Soil Colour: Orange
Vegetation Condition: 0.4 – Poor
Landform: Minor drainage
Vegetation Association: C1
Fire: 10+ years

Vegetation Description: *Eucalyptus victrix* and *Eucalyptus camaldulensis* open woodland, over *Acacia citrinoviridis, Melaleuca lasiandra* and *Acacia pyrifolia* tall shrubland over **Cenchrus ciliaris and* **Cenchrus setiger* open to very open tussock grassland.

Collection No.	Cons. Status	Taxon	Height (m)	Cover (%)
		Acacia citrinoviridis	5.1	4
		Acacia pyrifolia	0.6	0.1
		Acacia tetragonophylla	1.4	0.1
	*	*Aerva javanica*	0.5	0.1
NS240616-24		*Amaranthus undulatus*	0.4	0.1
NS240616-16		*Aristida contorta*	0.2	0.1
		Arivela viscosa	0.4	0.5
		Boerhavia gardneri	0.1	0.1

Collection No.	Cons. Status	Taxon	Height (m)	Cover (%)
		Bonamia pilbarensis	0.1	0.1
	*	*Cenchrus ciliaris*	0.3	0.1
	*	*Citrullus colocynthis*	0.01	0.1
		Convolvulus clementii	0.01	0.1
		Corchorus crozophorifolius	1.2	0.1
		Crotalaria medicaginea	0.1	0.1
		Dactyloctenium radulans	0.03	0.1
NS240616-23		*Enneapogon caerulescens*	0.05	0.1
NS240616-22		*Enneapogon caerulescens*	0.1	0.1
NS240616-21		*Eriachne pulchella* subsp. *dominii*	0.05	0.1
		Eriachne mucronata	0.4	0.1
		Eucalyptus camaldulensis	11	4
		Eucalyptus victrix	13	4
		Euphorbia biconvexa	0.3	0.1
		Evolvulus alsinoides var. *decumbens*	0.2	0.1
		Gomphrena kanisii	0.5	0.1
NS240616-20		*Goodenia muelleriana*	0.3	0.1
		Indigofera colutea	0.05	0.1
		Indigofera monophylla	0.2	0.1
NS240616-19		*Melaleuca lasiandra*	3.5	12
NS240616-17		*Nellica maderaspatensis*	0.1	0.1
		Polycarpaea corymbosa	0.1	0.1
	*	*Portulaca oleracea*	0.01	0.1
		Ptilotus aervoides	0.05	0.1
		Sporobolus australasicus	0.1	0.1
		Streptoglossa sp.	0.05	0.1
NS240616-18		*Tephrosia ?supina*	0.05	0.1
		Tephrosia rosea var. *clementii*	0.2	0.1
		Trichodesma zeylanicum var. *zeylanicum*	0.3	0.1

Site No: PQ07	**Date**: 16/06/2024	**Easting**: 572535.66	**Northing:** 7435927.03

Type: Quadrat
Soil Type: Sandy clay
Outcrops: River stones
Soil Colour: Orange
Vegetation Condition: 0.4 – Poor
Landform: Minor drainage
Vegetation Association: C1
Fire: 10+ years

Vegetation Description: *Eucalyptus victrix* and *Eucalyptus camaldulensis* open woodland, over *Acacia citrinoviridis, Melaleuca lasiandra* and *Acacia pyrifolia* tall shrubland over **Cenchrus ciliaris and* **Cenchrus setiger* open to very open tussock grassland.

Collection No.	Cons. Status	Taxon	Height (m)	Cover (%)
NS240616-28		*Abutilon leucopetalum*	0.8	0.1
		Acacia citrinoviridis	6	2
		Acacia pyrifolia	1.3	0.1
	*	*Aerva javanica*	1.3	0.1
		Afrohybanthus aurantiacus	0.3	0.1
		Amaranthus undulatus	0.2	0.1
	*	*Argemone ochroleuca*	0.01	0.1
		Arivela viscosa	0.4	1

Collection No.	Cons. Status	Taxon	Height (m)	Cover (%)
		Boerhavia gardneri	0.01	0.1
		Bonamia pilbarensis	0.01	0.1
		Capparis spinosa	0.1	0.1
	*	*Cenchrus ciliaris*	0.7	3
	*	*Cenchrus setiger*	1	1.5
	*	*Citrullus colocynthis*	0.01	0.1
		Corchorus crozophorifolius	1.2	0.1
		Cucumis sp.	0.01	0.1
		Digitaria ctenantha	0.3	0.2
		Enchylaena tomentosa var. *tomentosa*	0.3	0.1
		Enneapogon caerulescens	0.05	0.1
		Eriachne pulchella subsp. *dominii*	0.1	0.1
		Eucalyptus victrix	18	6
		Euphorbia biconvexa	0.2	0.1
		Evolvulus alsinoides var. *decumbens*	0.1	0.1
NS240616-25		*Gomphrena cunninghamii*	0.4	0.1
		Gomphrena kanisii	0.2	0.1
		Indigofera colutea	0.05	0.1
		Indigofera monophylla	0.2	0.1
		Nellica maderaspatensis	0.01	0.1
		Polycarpaea longiflora	0.2	0.1
	*	*Portulaca oleracea*	0.01	0.1
NS240616-26		*Ptilotus aervoides*	0.01	0.1
		Ptilotus exaltatus	0.1	0.1
		Rhagodia eremaea	0.4	0.1
		Salsola australis	0.6	0.1
NS240616-27		*Sclerolaena costata*	0.3	0.1
		Sporobolus australasicus	0.1	0.1
		Streptoglossa sp.	0.1	0.1
NS240616-29		*Tephrosia rosea* var. *clementii*	1.2	0.5
		Trachymene oleracea	0.1	0.1
	*	*Tribulus terrestris*	0.01	0.1
		Trichodesma zeylanicum var. *zeylanicum*	0.5	0.1

Site No: PQ08	**Date**: 16/06/2024	**Easting**: 571734.91	**Northing:** 7436226.18

Type: Quadrat
Soil Type: Sandy clay loam
Outcrops: Quartz and ironstone
Soil Colour: Red-brown
Vegetation Condition: 0.6 - Good
Landform: Stony plain
Vegetation Association: S1
Fire: 10+ years

Vegetation Description: *Acacia xiphophylla, Acacia synchronicia* and *Acacia aptaneura x paraneura* tall open shrubland over *Eremophila cuneifolia* and *Eremophila exilifolia* open shrubland over *Enchylaena tomentosa* var. *tomentosa* scattered low shrubs over *Eragrostis eriopoda* and **Cenchrus setiger* very open tussock grassland on stony plains.

Collection No.	Cons. Status	Taxon	Height (m)	Cover (%)
		Acacia xiphophylla	3.8	6
		Aristida contorta	0.1	0.1
		Boerhavia gardneri	0.01	0.1
	*	*Cenchrus ciliaris*	0.2	0.1
	*	*Cenchrus setiger*	0.3	0.5
	*	*Cucumis myriocarpus*	0.05	0.1
		Cynodon prostratus	0.01	0.1
		Dactyloctenium radulans	0.01	0.1

Collection No.	Cons. Status	Taxon	Height (m)	Cover (%)
		Dissocarpus paradoxus	0.2	0.1
		Duperreya commixta	0.01	0.1
		Enchylaena tomentosa var. *tomentosa*	1	2
		Enneapogon caerulescens	0.1	0.1
		Enteropogon ramosus	0.3	1
		Eragrostis eriopoda	0.3	0.5
		Eremophila cuneifolia	1.2	5
		Gomphrena kanisii	0.05	0.1
		Goodenia muelleriana	0.1	0.1
NS240616-31	*	*Malvastrum americanum*	0.3	0.1
	*	*Portulaca oleracea*	0.01	0.1
		Ptilotus aervoides	0.01	0.1
		Ptilotus calostachyus	0.5	0.1
		Ptilotus exaltatus	0.5	0.1
		Rhagodia eremaea	1.5	0.1
		Salsola australis	0.1	0.1
		Sclerolaena cuneata	0.2	0.1
NS240616-33		*Sclerolaena gardneri*	0.2	0.1
NS240616-30		*Sclerolaena* sp.	0.1	0.1
NS240616-32		*Senna hamersleyensis*	0.1	0.1
		Senna artemisioides subsp. *oligophylla*	0.6	0.1
		Senna glutinosa subsp. *×luerssenii*	0.7	0.1
		Senna sp. Meekatharra	0.4	0.1
		Sida fibulifera	0.2	0.1
		Sporobolus australasicus	0.01	0.1
		Tragus australianus	0.1	0.1
	*	*Trianthema portulacastrum*	0.01	0.1
		Tribulus suberosus	0.4	0.1

Site No: PQ09	**Date**: 16/06/2024	**Easting**: 572107.52	**Northing:** 7436241.10

Type: Quadrat
Soil Type: Sandy clay loam
Outcrops: Quartz and ironstone
Soil Colour: Red-brown
Vegetation Condition: 0.6 - Good
Landform: Stony plain
Vegetation Association: S1
Fire: 10+ years

Vegetation Description: *Acacia xiphophylla, Acacia synchronicia* and *Acacia aptaneura x paraneura* tall open shrubland over *Eremophila cuneifolia* and *Eremophila exilifolia* open shrubland over *Enchylaena tomentosa* var. *tomentosa* scattered low shrubs over *Eragrostis eriopoda* and **Cenchrus setiger* very open tussock grassland on stony plains.

Collection No.	Cons. Status	Taxon	Height (m)	Cover (%)
		Acacia aptaneura x paraneura	3.2	0.1
		Acacia synchronicia	3.6	0.5
		Acacia tetragonophylla	1.7	0.1
		Acacia xiphophylla	3.8	5
	*	*Aerva javanica*	0.4	0.1
		Aristida contorta	0.1	0.1
		Arivela viscosa	0.2	0.1
		Boerhavia gardneri	0.01	0.1

Collection No.	Cons. Status	Taxon	Height (m)	Cover (%)
	*	*Cenchrus ciliaris*	0.1	0.1
		Corchorus crozophorifolius	0.8	0.1
		Cynodon prostratus	0.01	0.1
		Dactyloctenium radulans	0.05	0.1
		Enneapogon caerulescens	0.1	0.1
		Eremophila ?platycalyx	0.3	0.1
		Eremophila cuneifolia	2.1	0.1
		Eremophila forrestii	0.7	0.1
		Gomphrena kanisii	0.05	0.1
		Indigofera colutea	0.05	0.1
	*	*Portulaca oleracea*	0.01	0.1
		Ptilotus obovatus	0.1	0.1
		Ptilotus exaltatus	0.05	0.1
		Rhagodia eremaea	0.7	0.1
		Salsola australis	0.1	0.1
		Sclerolaena costata	0.1	0.1
		Sclerolaena cuneata	0.4	0.1
		Sclerolaena gardneri	0.1	0.1
		Senna artemisioides subsp. *helmsii*	0.2	0.1
		Senna glutinosa subsp. *×luerssenii*	0.5	0.1
		Solanum lasiophyllum	0.2	0.1
		Sporobolus australasicus	0.1	0.1
	*	*Trianthema portulacastrum*	0.01	0.1
		Tribulus suberosus	0.2	0.1
		Trigastrotheca molluginea	0.05	0.1

Site No: PQ10	**Date**: 16/06/2024	**Easting**: 571116.46	**Northing:** 7435851.62

Type: Quadrat
Soil Type: Sandy clay
Outcrops: River stones
Soil Colour: Orange
Vegetation Condition: 0.4 - Poor
Landform: Minor drainage
Vegetation Association: C1
Fire: 10+ years

Vegetation Description: *Eucalyptus victrix* and *Eucalyptus camaldulensis* open woodland, over *Acacia citrinoviridis, Melaleuca lasiandra* and *Acacia pyrifolia* tall shrubland over **Cenchrus ciliaris and* **Cenchrus setiger* open to very open tussock grassland.

Collection No.	Cons. Status	Taxon	Height (m)	Cover (%)
		Acacia citrinoviridis	6	8
		Acacia pyrifolia	3.2	0.5
	*	*Aerva javanica*	1.3	1
		Amaranthus undulatus	0.1	0.1
	*	*Argemone ochroleuca*	0.01	0.1
		Aristida contorta	0.2	0.1
		Arivela viscosa	0.4	1
		Boerhavia gardneri	0.1	0.1

Collection No.	Cons. Status	Taxon	Height (m)	Cover (%)
	*	*Cenchrus ciliaris*	0.6	1
	*	*Cenchrus setiger*	0.4	1
	*	*Citrullus colocynthis*	0.01	0.1
NS240616-36		*Clerodendrum floribundum* var. *angustifolium*	1.9	0.1
		Corchorus crozophorifolius	0.3	0.5
		Cucumis variabilis	0.01	0.1
		Enneapogon caerulescens	0.2	0.2
		Eriachne pulchella subsp. *dominii*	0.2	0.1
		Eucalyptus camaldulensis	14	3
		Eucalyptus victrix	16	5
		Gomphrena cunninghamii	0.1	0.1
		Gomphrena kanisii	0.3	0.1
		Indigofera monophylla	0.5	0.1
		Melaleuca lasiandra	3	1
		Nellica maderaspatensis	0.1	0.1
NS240616-37		*Notoleptopus decaisnei*	0.1	0.1
NS240616-34		*Paspalidium clementii*	0.1	0.1
		Polycarpaea longiflora	0.4	0.1
	*	*Portulaca oleracea*	0.01	0.1
		Ptilotus obovatus	0.1	0.1
		Rhynchosia minima	0.01	0.1
		Sclerolaena gardneri	0.1	0.1
NS240616-35		*Setaria dielsii*	0.2	0.1
		Solanum lasiophyllum	0.5	0.1
		Tephrosia rosea var. *clementii*	0.4	0.1
		Trichodesma zeylanicum var. *zeylanicum*	0.3	0.1
		Waltheria indica	0.5	0.1

About AECOM

AECOM is the world's trusted infrastructure consulting firm, delivering professional services throughout the project lifecycle – from advisory, planning, design and engineering to program and construction management. On projects spanning transportation, buildings, water, new energy and the environment, our public- and private-sector clients trust us to solve their most complex challenges. Our teams are driven by a common purpose to deliver a better world through our unrivaled technical and digital expertise, a culture of equity, diversity and inclusion, and a commitment to environmental, social and governance priorities. AECOM is a Fortune 500 firm and its Professional Services business had revenue of $14.1 billion in fiscal year 2024. See how we are delivering sustainable legacies for generations to come at aecom.com and @AECOM.

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