

## **Attachment 2 - Index of Documentation**

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Pipeline Attachment 7 - Ten Clearing Principles Assessment

# Attachment 3 - Certificate of Title



Government of Western Australia  
Department of Mines, Industry Regulation and Safety



## MINING TENEMENT SUMMARY REPORT

**MISCELLANEOUS LICENCE 45/584**

Status: Live

### TENEMENT SUMMARY

**Area:** 66.43036 HA      **Death Reason :**  
**Mark Out :** N/A      **Death Date :**  
**Received :** 26/10/2020 15:55:56      **Commence :** 21/04/2021  
**Term Granted :** 21 Years

### CURRENT HOLDER DETAILS

#### Name and Address

KERAS (PILBARA) GOLD PTY LTD  
NINA MAS, C/- ANDERSON'S TENEMENT MANAGEMENT, PO BOX 2162, WARWICK, WA, 6024,  
xxxxx@atmwa.net.au, xxxxxxx699

### DESCRIPTION

**Locality:** MOOLYELLA 1  
**Datum:** Datum situated at GDA94, Zone 50 coordinates Point ID East North 1 798995.5 7668009.7  
**Boundary:** Point ID East North 2 799250.9 7668057.0 3 799299.5 7667731.4 4 799315.2 7667662.0 5 799461.4 7667055.9 6 799995.7 7667400.3 7 800449.7 7667695.9 8 800940.9 7668003.5 9 800987.2 7667913.6 10 800477.2 7667595.9 11 799483.2 7666953.1 12 799704.4 7666009.1 13 799925.1 7665544.3 14 800140.3 7665197.9 15 800350.8 7664825.6 16 800698.2 7664049.1 17 800586.5 7664051.3 18 800261.5 7664780.5 19 800055.1 7665145.5 20 799827.1 7665487.0 21 799609.2 7665977.1 22 799202.2 7667708.3 23 799053.2 7667669.2 Back To Datum at 798995.5 7668009.7

Area :	Type	Dealing No	Start Date	Area
	Granted		21/04/2021	66.43036 HA
	Applied For		26/10/2020	66.33000 HA

### SHIRE DETAILS

Shire	Shire No	Start	End	Area
EAST PILBARA SHIRE	3220	26/10/2020		66.43038 HA



## MINING TENEMENT SUMMARY REPORT

**MISCELLANEOUS LICENCE 45/585**

Status: Live

### TENEMENT SUMMARY

<b>Area:</b> 115.27346 HA	<b>Death Reason :</b>
<b>Mark Out :</b> N/A	<b>Death Date :</b>
<b>Received :</b> 26/10/2020 15:55:56	<b>Commence :</b> 07/04/2021
<b>Term Granted :</b> 21 Years	

### CURRENT HOLDER DETAILS

**Name and Address**

KERAS (PILBARA) GOLD PTY LTD  
NINA MAS, C/- ANDERSON'S TENEMENT MANAGEMENT, PO BOX 2162, WARWICK, WA, 6024,  
xxxxx@atmwa.net.au, xxxxxxx699

### DESCRIPTION

**Locality:** MOOLYELLA 2  
**Datum:** Datum situated at GDA94, Zone 50 coordinates Point ID East North 1 796738.9 7658580.2  
**Boundary:** Point ID East North 2 796868.9 7658577.8 3 796674.5 7658297.2 4 796637.9 7657693.5 5 796690.1 7657435.3 6 796513.8 7657406.3 7 796614.5 7656272.8 8 796719.9 7654697.2 9 796614.1 7654191.4 10 796484.0 7653967.7 11 796456.7 7653872.8 12 796442.1 7653715.8 13 796483.3 7653529.8 14 796540.7 7653410.8 15 796616.8 7653161.6 16 796767.6 7652956.8 17 796816.3 7652818.1 18 796811.0 7652770.0 19 796998.5 7652447.7 20 797024.5 7652391.9 21 797202.0 7652155.3 22 797732.7 7651944.7 23 797903.7 7651679.2 24 798101.8 7651452.6 25 798180.8 7651275.4 26 798416.0 7651042.2 27 798570.9 7650905.2 28 798792.1 7650633.5 29 799036.6 7650414.1 30 799258.8 7650185.2 31 799379.0 7650093.5 32 799688.8 7649756.3 33 799703.5 7649663.8 34 799810.0 7649489.6 35 799977.4 7649331.4 36 799999.4 7649286.4 37 799884.3 7649288.3 38 799734.8 7649422.4 39 799608.4 7649627.5 40 799507.0 7649771.2 41 799375.5 7649929.4 42 799190.0 7650054.9 43 799109.2 7650170.8 44 798662.1 7650620.7 45 798494.0 7650839.9 46 798329.0 7650980.5 47 798112.7 7651198.8 48 798030.1 7651317.9 49 797916.9 7651529.1 50 797827.8 7651613.8 51 797657.6 7651873.0 52 797479.2 7651923.9 53 797215.5 7652030.7 54 797072.4 7652124.4 55 796960.1 7652289.3 56 796875.4 7652438.5 57 796714.1 7652740.9 58 796678.9 7652909.8 59 796510.4 7653148.7 60 796426.1

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Area :	Type	Dealing No	Start Date	Area
	Granted		07/04/2021	115.27346 HA
	Applied For		26/10/2020	115.11000 HA

SHIRE DETAILS
---------------

Shire	Shire No	Start	End	Area
EAST PILBARA SHIRE	3220	26/10/2020		115.27321 HA





## MINING TENEMENT SUMMARY REPORT

**MISCELLANEOUS LICENCE 45/586**

Status: Live

### TENEMENT SUMMARY

<b>Area:</b> 56.36048 HA	<b>Death Reason :</b>
<b>Mark Out :</b> N/A	<b>Death Date :</b>
<b>Received :</b> 26/10/2020 15:55:56	<b>Commence :</b> 23/02/2021
<b>Term Granted :</b> 21 Years	

### CURRENT HOLDER DETAILS

**Name and Address**

KERAS (PILBARA) GOLD PTY LTD  
NINA MAS, C/- ANDERSON'S TENEMENT MANAGEMENT, PO BOX 2162, WARWICK, WA, 6024,  
xxxxx@atmwa.net.au, xxxxxxx699

### DESCRIPTION

**Locality:** MOOLYELLA 3  
**Datum:** Datum situated at GDA94, Zone 50 coordinates Point ID East North 1 799884.3 7649288.3  
**Boundary:** Point ID East North 2 799999.4 7649286.4 3 800051.2 7649220.0 4 800230.2 7649079.8 5 800386.9 7648907.9 6 800502.6 7648857.0 7 800837.3 7648556.4 8 800943.3 7648451.5 9 801046.2 7648319.1 10 801154.5 7648208.6 11 801294.5 7648114.9 12 801438.9 7648067.1 13 801593.9 7647867.9 14 801863.9 7647665.8 15 802051.3 7647581.6 16 802185.5 7647471.7 17 802296.5 7647382.9 18 802291.7 7647179.8 19 802198.4 7646825.8 20 802188.0 7646629.0 21 802115.5 7646459.0 22 802112.8 7646145.6 23 802240.4 7645987.3 24 802370.6 7645830.1 25 802499.8 7645739.2 26 802708.0 7645663.5 27 802941.0 7645661.7 28 802987.0 7645537.5 29 802677.9 7645543.2 30 802406.7 7645654.9 31 802271.1 7645796.7 32 802019.3 7646105.3 33 802005.1 7646211.2 34 802019.9 7646490.2 35 802089.0 7646644.7 36 802099.8 7646845.0 37 802191.8 7647189.3 38 802201.8 7647334.9 39 801914.0 7647546.7 40 801805.6 7647582.2 41 801525.6 7647794.5 42 801428.2 7647891.0 43 801257.9 7648009.7 44 801085.0 7648135.2 45 800944.0 7648273.2 46 800881.9 7648366.9 47 800679.0 7648573.1 48 800449.9 7648770.5 49 800336.7 7648821.2 50 800210.9 7648922.3 51 800155.3 7649012.4 52 799996.5 7649134.5 53 799935.5 7649189.7 Back To Datum at 799884.3 7649288.3

Area :	Type	Dealing No	Start Date	Area
	Granted		23/02/2021	56.36048 HA
	Applied For		26/10/2020	56.27000 HA

**SHIRE DETAILS**

Shire	Shire No	Start	End	Area
EAST PILBARA SHIRE	3220	26/10/2020		56.36038 HA



## MINING TENEMENT SUMMARY REPORT

**MISCELLANEOUS LICENCE 45/587**

Status: Live

### TENEMENT SUMMARY

<b>Area:</b> 72.91024 HA	<b>Death Reason :</b>
<b>Mark Out :</b> N/A	<b>Death Date :</b>
<b>Received :</b> 26/10/2020 15:55:56	<b>Commence :</b> 07/04/2021
<b>Term Granted :</b> 21 Years	

### CURRENT HOLDER DETAILS

**Name and Address**

KERAS (PILBARA) GOLD PTY LTD  
NINA MAS, C/- ANDERSON'S TENEMENT MANAGEMENT, PO BOX 2162, WARWICK, WA, 6024,  
xxxxx@atmwa.net.au, xxxxxxx699

### DESCRIPTION

**Locality:** MOOLYELLA 4  
**Datum:** Datum situated at GDA94, Zone 50 coordinates Point ID East North 1 800586.5 7664051.3  
**Boundary:** Point ID East North 2 800698.2 7664049.1 3 800743.2 7663947.1 4 800760.6 7663857.9 5 800739.7 7663598.6 6 800720.3 7663552.9 7 800215.9 7663124.8 8 800033.8 7662976.8 9 799787.4 7662773.7 10 799599.0 7662638.7 11 799462.6 7662554.7 12 799397.5 7662487.8 13 799270.0 7662238.0 14 799139.8 7661978.5 15 799074.4 7661792.5 16 798984.0 7661629.5 17 798850.6 7661389.0 18 798793.6 7661092.1 19 798763.4 7660991.7 20 798679.6 7660822.5 21 798364.6 7660367.6 22 798197.5 7660152.9 23 798022.7 7659813.1 24 797892.8 7659453.2 25 797808.1 7659299.7 26 797720.4 7659167.8 27 797559.7 7658962.8 28 797481.4 7658870.5 29 797406.9 7658801.3 30 797005.7 7658638.8 31 796907.8 7658606.0 32 796868.9 7658577.8 33 796738.9 7658580.2 34 796791.6 7658644.9 35 796860.3 7658695.1 36 797349.9 7658884.9 37 797652.9 7659248.5 38 797802.5 7659497.7 39 797929.1 7659849.7 40 798114.5 7660209.1 41 798401.9 7660605.8 42 798641.2 7660952.6 43 798754.1 7661417.1 44 798812.9 7661545.9 45 798962.2 7661789.4 46 799069.9 7662081.6 47 799258.3 7662459.7 48 799318.0 7662549.2 49 799397.6 7662631.1 50 799660.9 7662823.6 51 799807.5 7662912.6 52 800637.1 7663612.8 53 800660.0 7663851.5 Back To Datum at 800586.5 7664051.3

<b>Area :</b>	<b>Type</b>	<b>Dealing No</b>	<b>Start Date</b>	<b>Area</b>
	Granted		07/04/2021	72.91024 HA
	Applied For		26/10/2020	72.80000 HA

<b>SHIRE DETAILS</b>
----------------------

<b>Shire</b>	<b>Shire No</b>	<b>Start</b>	<b>End</b>	<b>Area</b>
EAST PILBARA SHIRE	3220	26/10/2020		72.91032 HA



## MINING TENEMENT SUMMARY REPORT

**MISCELLANEOUS LICENCE 45/588**

Status: Live

### TENEMENT SUMMARY

**Area:** 101.83134 HA      **Death Reason :**  
**Mark Out :** N/A      **Death Date :**  
**Received :** 26/10/2020 15:55:56      **Commence :** 04/03/2021  
**Term Granted :** 21 Years

### CURRENT HOLDER DETAILS

**Name and Address**

KERAS (PILBARA) GOLD PTY LTD  
 NINA MAS, C/- ANDERSON'S TENEMENT MANAGEMENT, PO BOX 2162, WARWICK, WA, 6024,  
 xxxxx@atmwa.net.au, xxxxxxx699

### DESCRIPTION

**Locality:** MOOLYELLA 5  
**Datum:** Datum situated at GDA94, Zone 50 coordinates Point ID East North 1 802677.9 7645543.2  
**Boundary:** Point ID East North 2 802799.4 7645540.7 3 803065.5 7645120.2 4 803058.4 7645066.6 5 802653.3 7644691.8 6 802465.1 7644426.7 7 802042.4 7644192.2 8 801913.3 7643888.3 9 801683.5 7643402.0 10 801541.0 7643153.1 11 801451.3 7642785.3 12 801574.8 7642234.8 13 802673.6 7641305.2 14 802545.0 7640548.4 15 802735.2 7639800.3 16 802667.6 7638032.2 17 802636.6 7637819.7 18 802674.7 7637606.2 19 802622.0 7637515.7 20 802482.2 7637441.7 21 802257.8 7637135.4 22 802170.5 7637182.8 23 802233.6 7637308.7 24 802413.5 7637518.5 25 802570.6 7637626.0 26 802535.1 7637816.7 27 802567.9 7638041.2 28 802632.8 7639797.0 29 802446.6 7640545.5 30 802567.2 7641263.7 31 801488.1 7642180.2 32 801415.8 7642428.1 33 801351.0 7642778.5 34 801354.9 7642895.5 35 801466.8 7643284.4 36 801569.3 7643435.9 37 801714.2 7643735.3 38 801846.6 7643980.1 39 801855.5 7644120.8 40 802096.5 7644400.8 41 802286.3 7644430.8 42 802392.5 7644496.9 43 802493.2 7644656.9 44 802584.2 7644764.2 45 802959.5 7645099.6 Back To Datum at 802677.9 7645543.2

Area :	Type	Dealing No	Start Date	Area
	Granted		04/03/2021	101.83134 HA
	Applied For		26/10/2020	101.68000 HA

**SHIRE DETAILS**

<b>Shire</b>	<b>Shire No</b>	<b>Start</b>	<b>End</b>	<b>Area</b>
EAST PILBARA SHIRE	3220	26/10/2020		101.83121 HA



780000.000

790000.000


800000.000

7670000.000

7660000.000

7650000.000

7640000.000

 NVCP Application - Moolyella Pipeline

 Ministerial Statement Approval Envelope (MS 1150)

L 4500584

L 4500587

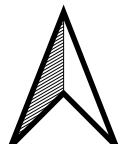
L 4500585

L 4500586

L 4500588

Attachment 4. Project Map.

0 5 10 km







Warrawoona Gold Project: Moolyella pipeline and road

NVCP Application, Supplementary Information Report





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Calidus Resources Limited

Warrawoona Gold Project: Moolyella Pipeline Infrastructure

Native Vegetation Clearing Permit (NVCP), Supplementary Information Report

10 May 2021

Calidus Resources Limited

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This document has been prepared based on assumptions as reported throughout and upon information and data supplied by others.



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# 1. INTRODUCTION

## 1.1. Purpose and Scope

Calidus Resources Limited (Calidus) is currently developing the Warrawoona Gold Project (WGP), a gold mining and processing operation 20km south of Marble Bar in the Pilbara Region of Western Australia (WA) (Attachment 1).

This document is to support a native vegetation clearing permit application for a borefield pipeline and associated road required to facilitate development of the WGP. The area representing this clearing permit application (herein, application area) is a total disturbance of 51.67ha within a total disturbance envelope of 414.10ha:

- Construction of a pipeline
- Construction of a road to service the pipeline, using existing pastoral tracks where possible

## 1.2. Environmental Approvals Status

On the 29<sup>th</sup> of October 2019, the project was referred to the Western Australian (WA) Environmental Protection Authority (EPA) under Section 38 of the *Environmental Protection Act 1986* (WA) (EP Act). Approval was granted 20<sup>th</sup> August 2020 (Statement No. 1150).

On the 22<sup>nd</sup> November 2019, the project was referred to the Commonwealth Department of Agriculture, Water and the Environment (DAWE) under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Approval was granted 12<sup>th</sup> February 2021 (EPBC 2019/8584).

An early works native vegetation clearing permit application was submitted to DMIRS and approved 30<sup>th</sup> July 2020 (CPS 8862/1). This approval has since been surrendered (4<sup>th</sup> March 2021) to prevent duplication with the Ministerial Statement.

An early works MP and MCP (Reg ID 87218) along with a 5C Licence to take water (GWL204411(1)) were approved on 12<sup>th</sup> August 2020 and 9<sup>th</sup> June 2020 respectively.

On the 20<sup>th</sup> September, Calidus submitted a Mining Proposal (MP) and Mine Closure Plan (MCP) to Department of Mining, Industry Regulation and Safety (DMIRS). Approval was granted 26<sup>th</sup> February 2021 (Reg ID 90033).

A 5C Licence to take water application was submitted to Department of Water and Environment Regulation (DWER) on the 18<sup>th</sup> January 2021. Approval was granted 21 April 2021 (GWL204411(2)).

A Works Approval application was submitted to DWER 6<sup>th</sup> October 2020 (W6464/2020/1). Approval was granted 21st April 2021.

## 1.3. Proponent

Calidus is a company incorporated in Australia and has shares listed on the ASX (ABN 98 006 640 553). All compliance and regulatory requirements regarding this assessment should be forwarded to the following address:

Name:	Paul Brennan
Company:	Calidus Resources Limited
Title:	Chief Operating Officer
Address:	Level 1,11 Ventnor Ave, West Perth WA 6005
Phone:	+61 8 6245 2050
Mobile:	+61 400 510 966
Email:	<a href="mailto:paul@calidus.com.au">paul@calidus.com.au</a>

### 1.3.1. Environmental record

Calidus is committed to the protection of the environment. The business objective is to plan and implement the Warrawoona Gold Project (WGP) in a way that minimises the impact on the environment. To meet environmental objectives, Calidus are committed to the following actions and practices:

- Maintaining an environmental management standard.
- All staff and contractors will be made aware of the environmental policy and procedures with an appropriate level of training provided
- Act within the business towards reducing greenhouse gas emissions and environmental impact wherever possible
- Reduce and where possible, prevent pollution
- Facilitate recycling of materials and resources wherever possible
- Pursue a progressive rehabilitation program by returning disturbed areas where possible to pre-existing conditions
- Working to identify, assess and control environmental risks
- Encourage open dialogue with employees, regulators and the public on environmental issues and be responsive to their concerns
- Monitoring and review for continual improvement of the Company's environmental performance Specific environmental initiatives include:
  - Developed a Significant Species Management Plan

Calidus Executive and Management have held Statutory Positions at operating mine sites throughout Western Australia. No Calidus Director or Manager has previously been convicted, or paid a penalty, for an offence under a provision of the EPBC Act or the (WA) EP Act, or similar environmental protection or health-related legislation in Western Australia or elsewhere in Australia. Furthermore, Calidus Executive and Management have not had a licence or other authority suspended or revoked due to a breach of conditions or an offence under the EPBC Act or the (WA) EP Act or similar environmental protection or health-related legislation in Western Australia or elsewhere in Australia.

### 1.4. Supporting Studies

Calidus has undertaken substantial investigations across a wide range of environmental factors and has completed a detailed assessment of the risks that the project poses to the environment. Studies that have been completed are shown in Table 1.

*Table 1. Summary of studies completed across the project area.*

Investigation/Study	Year	Reference	Appendix
<b>1. Terrestrial fauna</b>			
Level 1 Vertebrate Fauna, Desktop SRE and Subterranean Assessment	2017-18	(Biologic 2017b)	On request
Monitoring bats of conservation significance near Marble Bar, Western Australia: November 2016	2016	(Specialised Zoological 2017a)	On request

Monitoring bats of conservation significance near Marble Bar, Western Australia: April 2017	2017	(Specialised Zoological 2017b)	On request
Targeted Bat Assessment, September 2017	2017	(Biologic 2018a)	On request
Targeted Bat Assessment, July 2018	2018	(Biologic 2018b)	On request
Flora and Vertebrate Fauna Assessment of the Moolyella Pipeline	2020	(Rapallo 2021)	Attachment 7

Investigation/Study	Year	Reference	Appendix
Targeted Bat Assessment, April 2019	2019	(Biologic 2019a)	On request
VHF Bat Foraging Studies 2018	2018	(Biologic 2018c)	On request
VHF Bat Foraging Studies 2019	2019	(Biologic 2019b)	On request
Habitat Assessment and Targeted Vertebrate Fauna Survey	2018-19	(Biologic 2019c)	On request
Significant Species Monitoring Survey Report (June 2019)	2019	(Biologic 2019d)	On request
<b>2. Invertebrate fauna</b>			
Short Range Endemic (SRE) Invertebrate Fauna Survey	2018	(Biologic 2018d)	On request
Subterranean Fauna Survey	2018-19	(Biologic 2019g)	On request
<b>3. Significant fauna impact assessment</b>			
Conservation Significant Bat Species Impact Assessment	2019	(Biologic 2019e)	On request
Conservation Significant Vertebrate Fauna Impact Assessment	2019	(Biologic 2019h)	On request
Assessment of Blasting at the Klondyke Queen for Pilbara Leaf-nosed Bat and Ghost Bat (including 2019 underground mining addendum)	2019	(Blast It Global 2018)	On request
Warrawoona Project – Klondyke Deposit Geotechnical Review of Blasting Report	2019	(Peter O'Bryan and Associates 2019)	On request
Environmental Noise Assessment: Warrawoona Gold Project, Marble Bar	2019	(Lloyd George Acoustics 2019)	On request

Assessment of Dust Emissions	2019	(Environmental Technologies and Analytics 2019)	On request
<b>4. Hydrology and Hydrogeology</b>			
Hydro-Meteorological and Surface Water Management Study	2019	(Groundwater Resource Management 2019a)	On request
Hydrogeological Investigations	2019	(Groundwater Resource Management 2019b)	On request
<b>5. Waste Characterisation and Management</b>			
Characterisation of Mine-Waste and Ore Samples: Implications for Mining-Stream Management	2019	(GCA 2019a)	On request
Characterisation of Mine-Tailings Slurry Sample and Implications for Mining-Stream Management	2019	(GCA 2019b)	On request
Tailings Storage Facility Design Report	2019	(ATC Williams 2019)	On request

Investigation/Study	Year	Reference	Appendix
<b>6. Soils and Landforms</b>			
Soils and landform assessment	2019	(Mine Earth 2019)	On request
<b>7. Flora and vegetation</b>			
Warrawoona Gold Project Flora and Vegetation Survey	2018-2019	(Woodman Environmental 2019a)	On request
Memo of recommendations for referral of Warrawoona Gold Project, assessment against Clearing Principles	2019	(Woodman Environmental 2019b)	On request
Flora and Vertebrate Fauna Assessment of the Moolyella Pipeline	2020	(Rapallo 2021)	Attachment 7
<b>8. Aboriginal Culture and Heritage</b>			
2019 Calidus Warrawoona Gold Project Archaeological Site Avoidance Survey	2019	(Sands CRM 2019)	On request
2018 Calidus Warrawoona Gold Project Ethnographic Site Avoidance Survey	2018	(Sands CRM 2018)	On request



## 2. PROJECT DESCRIPTION

### 2.1. Background

#### 2.1.1. Warrawoona Gold Project (WGP)

The WGP is located in the Pilbara region of Western Australia, approximately 20km south of Marble Bar (Attachment 4). The resource is within the Warrawoona greenstone belt, which contains over 200 historic workings (mostly small shafts, stopes, and diggings) that have operated since the late 1800s. It comprises part of the Warrawoona Syncline, which accommodates several quartz lode gold deposits. Mineralisation generally comprises thick sub-vertical shear zones potentially amenable to both open-pit and underground mining, with mineralisation outcropping at surface.

The deposits are hosted within three main shear zones: the Klondyke, Copenhagen and Fielding's Find shear zones. The project is based on resources at the Klondyke deposit, which contains a number of old mine workings, and the Copenhagen deposit, which includes a historic open pit. The Klondyke pit and underground prospect has a current 2012 JORC Code compliant Inferred Resource of 20 Mt at 1.79g/t Au for 1.15 million ounces. The Copenhagen satellite deposit has a current 2012 JORC Code compliant Inferred Resource of 0.3 Mt @ 4.65g/t Au for 39,000 ounces. All approvals have been granted in relation to the WGP, see section 1.2.

#### 2.1.2. NVCP Application - Borefield and roads

This NVCP Application is to seek permission to construct a pipeline and road to access the northern borefield. It will comprise of 51.67ha of disturbance within a larger disturbance envelope of 414.10ha.

## 2.2. Land Tenure

The application area is situated within the miscellaneous tenements listed in Table 2.

Table 2. Warrawoona Gold Project tenements

Tenement	Holder(s)	Grant date	End date	Disturbance Footprint (ha)	Disturbance Envelope (ha)
L45/584	Keras (Pilbara) Gold Pty Ltd	21/04/2021	20/04/2042	8.62	66.33
L45/585	Keras (Pilbara) Gold Pty Ltd	07/04/2021	06/04/2042	13.88	115.11
L45/586	Keras (Pilbara) Gold Pty Ltd	23/02/2021	22/02/2042	7.82	56.28
L45/587	Keras (Pilbara) Gold Pty Ltd	07/04/2021	06/04/2042	8.94	72.81
L45/588	Keras (Pilbara) Gold Pty Ltd	04/03/2021	03/03/2042	12.41	101.68

### 2.3. Application Area

The indicative disturbance footprint for the application area is approximately 51.67ha, as summarised in Table 3 and presented in Attachment 1.

Table 3. Estimated land disturbance

NVCP Application area components	Estimated Total Disturbance Area (ha)
Road and pipeline	50.05
Laydown and hardstand areas (bore locations)	1.62
<b>Total</b>	<b>51.67ha</b>

The location of each component considered the following factors:

- Known Heritage sites.
- Presence of conservation significant flora and fauna habitats.
- Locations of watercourses and associated flood zones.
- Potential mineralised areas.
- Landform and topography.
- Distances to other future project elements.
- Separation distances to protect human health.
- Minimising disturbance by using existing pastoral tracks and roads

#### **2.3.1. Construction Camp**

Not applicable to this application.

#### **2.3.2. Access Road**

Calidus proposes to construct a 40 km pipeline and pipeline access road. This road will be used by light vehicles for construction of the pipeline and for pipeline inspections. The roads will be approximately 10 m wide. This will require the disturbance of 51.67ha of vegetation (Attachment 4).

To minimise clearing, where possible, Calidus will widen existing exploration and pastoral tracks.

#### **2.3.3. Borrow Pits**

Not applicable to this application.

#### **2.3.4. Topsoil Stockpiles**

Due to the expected short term nature of the borefields, topsoil will not be collected.

#### **2.3.5. Construction Material Stockpiles**

Not applicable to this application.

#### **2.3.6. Mobile Crushing and Screening**

Not applicable to this application.

#### **2.3.7. Power**

Not applicable to this application.

#### **2.3.8. Construction Water Supply and Storage Infrastructure**

Development of the pipeline infrastructure will facilitate mining.

### 2.3.9. Water Requirements

An Early Works 5C Licence to take water has been approved by DWER (204411(1)) and is supplying water for the initial stages of construction. To facilitate processing operations in early 2022, additional water supply from a regional borefield is required. A 5C Licence to take water application that is associated with the pipeline and road described in this native vegetation clearing permit application has been submitted and approved (204411(2)).

## 2.4. Closure and Rehabilitation

The Project is subject to an approved MCP (Reg ID 90033), prepared in accordance with the *Guidelines for Preparing Mine Closure Plans* (DMP and EPA 2015). The MCP is a dynamic document, which after having identified post-mining land use objectives, is reviewed, and updated regularly, taking into consideration ongoing stakeholder consultation and further studies and research.

The MP and MCP are currently being updated to include the borfield pipeline and road, and will be submitted shortly after this native vegetation clearing permit application.

The integration of rehabilitation and closure planning into operating mine planning will ensure cost-effective measures to reduce liability and risks with mine closure are identified and implemented.

The MCP was submitted to DMIRS as part of the Mining Proposal approval process and includes detailed information relating to key elements of mine closure including:

- Closure specific obligations and commitments;
- Key closure issues and management;
- Stakeholder consultation;
- Site-specific closure implementation plan including closure related tasks, materials required and allows for planned and unplanned scenarios;
- Post-mining land use and closure objectives;
- Site-specific and measurable completion criteria and monitoring program; and □ Financial costs associated with closure and rehabilitation.

The life of mine for the project is expected to be initially 6 years. Mining of each pit will occur concurrently and consecutively with some areas available for rehabilitation whilst mining is occurring. Rehabilitation will be implemented wherever possible during the operation of the project as areas become available.

## 3. EXISTING ENVIRONMENT

### 3.1. Physical Environment

#### 3.1.1. Climate

The Pilbara climate is highly variable and can either be dominated by tropical cyclones or severe drought conditions.

Marble Bar has a desert climate and is one of the hottest towns in Australia. The mean maximum daily temperatures range from 38°C to 42°C in summer and 27°C to 36°C in winter.

Precipitation in the Marble Bar area occurs mainly in the summer months with the peak of the wet season between December and March. Most of the rainfall results from thunderstorms and occasional tropical cyclones that cross the coast intermittently. The average monthly rainfall varies from 0.5 mm to 104 mm, with the mean long-term annual precipitation for the Marble Bar area about 386 mm. The highest average number of rainy days occurs in January (6.9), with the lowest number of rainy days in August (0.2).

An assessment of cyclones in the vicinity of the project area showed that over the last 48-year recording period, 22 cyclones crossed within 100km (approximately one every two or three years) and ten cyclones passed within 50km of the project area (approximately one every five years). In the majority of cases, cyclones bring heavy rainfall, causing runoff to occur in local watercourses (Groundwater Resource Management 2019a).

### 3.1.2. Geology

The survey area is situated within the Eastern Pilbara Domain of the Archean Pilbara Craton within the Abydos Plains and Hills Zone, north of the Warrawoona Klondyke deposit. The area is dominated by granite-greenstone terrain and subdivided into two major stratigraphic units, the Warrawoona Group and the George Creek Group.

### 3.1.3. Landforms and soils

The majority of the survey area falls within the soil unit Fa12 described as gently undulating plain with frequent low granite tors and coalescing pediplains. Chief soils are earthy loams (Um5.51), and coarse sands (Uc5.21) overlying granite. There are considerable areas of red earths (Gn2.12), which may assume dominance in some places; some hard red soils (Dr2) together with coarse (Uc1) soils along creek lines; and minor areas of calcareous loams (Um1) associated with calcrete (kunkar) (CSIRO Australia 2018)..

Soils at the southern end of the survey area are influenced by the Warrawoona Group as per soil unit Gf1, described as steep ranges on basic lavas along with dolomites, tuff, banded iron formations, and dolerite dykes, with some narrow valley plains and high-level gently undulating areas of limited extent. Soils are generally shallow and stony and there are large areas without soil cover: chief soils are brown loams (Um6.23) along with significant areas of earthy loams (Um5.51). (Dr2.33) soils occur on lower slopes, with (Uf6.71) and (Ug5.37) on valley floors (CSIRO Australia 2018).

### 3.1.4. Land systems

The land systems of the Pilbara region are classified according to similarities in landform, soil, vegetation, geology and geomorphology, following van Vreeswyk *et al.* (2004). Three land systems (Talga, Rocklea and Macroy) are mapped across the broader WGP area, categorised predominately by hills, ranges and stony plains with spinifex grasslands (Table 4). The application area contains two of these landsystems (Rocklea and Macroy).

Table 4. Land systems intersecting the project area (van Vreeswyk *et al.* 2004)

Land system	Description	Area (ha)
Macroy Land System	Stony plains and occasional tor fields based on granite supporting hard and soft spinifex grasslands.	366.5
Talga Land System	Hills and ridges of greenstone and chert and stony plains supporting hard and soft spinifex grasslands.	16.1
River Land System	Active flood plains, major rivers and banks supporting grassy eucalypt woodlands, tussock grasslands and soft spinifex grasslands.	5.0
Granitic Land System	Rugged granitic hills supporting shrubby hard and soft spinifex grasslands.	1.3
Mine	THIS IS NOT A LAND SYSTEM - Disturbed area, mines, mullock dumps etc	25.2

### 3.1.5. Topography

The topography of the broader WGP area is influenced by the Warrawoona Ridge which provides ~80 metres relief with ground elevation of ~250mAHD on the plains on either side of the ridge to about 330mAHD at the highest point in the immediate vicinity of the proposed mining area. The application area is situated on the plains to the north and west of the Warrawoona Ridge.

### 3.1.6. Groundwater

Groundwater recharge in the area is likely to be significant but episodic, and mostly as a result of summer storms or cyclone events. Recharge will likely be by direct infiltration though exposed outcrop, with secondary infiltration through the base of the local creek systems during runoff events. North of the Warrawoona Range, the regional hydraulic gradient is northward towards the De Grey River. While south of the range, a southward gradient develops towards the Coongan River.

Fractured rock aquifers are the most significant aquifers of the project area, along with smaller alluvial aquifers at the base of the main creek drainages and along the Coongan River, providing sufficiently thick alluvium sequences are developed.

In the broader WGP area, fractured rock aquifers generally develop around structural features such as faults and shears, especially where they intersect notable cross cutting structures. Secondary porosity from weathering of less resistive units can also enhance aquifer development. The fractured rock aquifers can have moderate to high permeability, although storage can be variable depending on the size of individual structures and fracture zones, and the degree of hydraulic connection between them.

The project area has a number of intruded dolerite dykes of various sizes and orientations, including a large northnortheast striking dyke between Klondyke and Copenhagen prospects. This dyke has a discernible air-magnetic signature, with a strike length of over 20 km. The dolerite dykes may have enhanced permeability along their margins in some places. However, the larger dykes (at least) probably form barriers to local groundwater flow.

### 3.1.7. Surface Water

The WGP is located centrally within the Coongan River catchment, which is situated in the larger De Grey River Basin. Although located within the Pilbara Surface Water Area, the creek systems associated with the WGP area do not intersect any proclaimed Surface Water Management Areas or Irrigation Areas.

The WGP straddles the Warrawoona Range, a ridgeline that forms the local catchment divide between the Brockman Hay Cutting Creek/Sandy Creek/Camel Creek system to the south of the ridge and the Brockman Creek in the north (Groundwater Resource Management 2019a).

The Brockman Hay Cutting Creek/Sandy Creek/Camel Creek system reports directly to the Coongan River approximately 20km to the west of the WGP area, while the Brockman Creek empties into the Talga River approximately 35km to the north of the WGP, before also discharging into the Coongan River. The Coongan River feeds the De Grey River, which eventually discharges into the Indian Ocean at Poissonnier Point some 70km northeast of Port Hedland. The application area is located entirely within the Sandy Creek Catchment.

Minor and medium drainage lines and washplains cross the WGP (including the application area) south of the Warrawoona Range in a northeast to southwest direction, including Brockman Hay Cutting Creek and Sandy Creek, both of which report to Camel Creek.

While there is a sparsity of flow gauging data across the region, the Coongan River and both creek systems of the WGP area are typical of the Pilbara in that they are ephemeral and only carry runoff following significant rainfall events.

## 3.2. Biological Environment

### 3.2.1. Biogeographic region

The application area lies within the Pilbara IBRA region, specifically within the Chichester IBRA subregion (PIL01) (Kendrick and McKenzie 2001).

The Chichester subregion accommodates an area of 8,374,728ha in the northern section of the Pilbara Craton. The subregion is described as undulating Archaean granite and basalt plains and basaltic ranges. The plains are known to support a shrub steppe characterised by *Acacia inaequilatera* over *Triodia wiseana* (formerly *Triodia pungens*) hummock grasslands, while *Eucalyptus leucophloia* tree steppes occur on ranges (Kendrick and McKenzie 2001).

### 3.2.2. Vegetation and flora

#### 3.2.2.1. Regional

The Abydos Plain is characterised by four broad associations: Shrub steppe, Dwarf-shrub steppe, Grass plains and the Coastal Complex. Of these, shrub steppe is the only association relevant to the project area. Shrub steppe is the main community of the granite plain, which is dominated by the *Acacia pyrifolia-Triodia epactia* (formerly *T. pungens*) association, with hummock grasses dotted with widely-spaced shrubs. The plain is broken by stony rises and hills with small ranges, with *T. epactia* usually replaced by *T. wiseana*, *T. longiceps* or *T. angusta*, with scattered shrubs. Larger ranges tend to possess mainly *Triodia*, with only a few scattered shrubs and trees. Major creeks and

rivers are wooded with *Eucalyptus camaldulensis* and *Melaleuca argentea* (formerly *M. leucadendron*) (Beard 1975).

The Gorge Ranges consist of tree steppe on the high rocky parts, often with only a sparse occurrence of trees, dominated by *Eucalyptus leucophloia* (formerly *E. brevifolia*) and hummock grasses of *Triodia epactia* and *T. brizoides*. The lower slopes are generally comprised of shrub steppe of *Acacia bivenosa* and *T. epactia*, while the valleys contain *A. pyrifolia* (Beard 1975).

### 3.2.2.2. NVCP Application Area

Two broad vegetation associations are described from the survey area; George Ranges (82; Hummock grasslands with low tree steppe of snappy gum over *Triodia wiseana*) and Abydos Plain (93; Hummock grasslands, shrub steppe; kanji over soft spinifex) (Table 5). This vegetation association is common at the subregional and regional level and widespread through both the Chichester and Hamersley IBRA subregion.

Vegetation types retaining less than 30% of their pre-European extent generally experience accelerated species loss at an ecosystem level (EPA 2000) and are regarded as being ‘vulnerable’, while vegetation types retaining less than 10% of their original extent are regarded as being ‘endangered’ (EPA 2000, Shepherd *et al.* 2002, DER 2014, 2016a). Review of the DBCA State-Wide Vegetation Statistics data (DBCA 2018a) showed that both the Abydos Plain 93 and the George Ranges 82 vegetation system-associations still have 99% of their original extent remaining (DBCA 2018a) and would be considered ‘least concern’ (DER 2014).

Table 5. Vegetation System Associations Intersecting the project area (Government of WA 2018)

System-Association	Structural description	Floristic description	Area (ha)
Abydos Plain 93	Shrub-steppe	Hummock grassland with scattered shrubs or mallee <i>Triodia</i> spp. <i>Acacia</i> spp., <i>Grevillea</i> spp. <i>Eucalyptus</i> spp	404.2
George Ranges 82	Low tree-steppe	Hummock grassland with scattered bloodwoods & snappy gum. <i>Triodia</i> spp., <i>Corymbia dichromophloia</i> , <i>Eucalyptus leucophloia</i> (snappy gum)	9.8

Overall findings from vegetation and flora surveys include:

- Flora
  - A total of 115 discrete vascular flora taxa (including 6 introduced taxa), representing 28 families.
  - One conservation significant (Priority) flora taxa was recorded: *Eragrostis crateriformis* (P3).
  - No Threatened taxa, listed under the EPBC Act or Biodiversity Conservation Act 2016.
  - One Declared Pest recorded (*\*Calotropis procera*) (as listed under Department of Primary Industries and Regional Development 2019), but no taxa recorded were listed as Weeds of National Significance (as listed under Australian Weeds Committee 2019). Including *Calotropis procera*, six introduced taxa were recorded in the survey.
- Vegetation
  - Two vegetation system associations Abydos Plain 93 and George Ranges 82 and four land systems were recorded (Macroy, Talga, River, Granitic and Mine).
  - No listed Threatened Ecological Communities (TECs) listed under the EPBC Act or BC Act.
  - No Priority Ecological Communities (PECs), as listed by the Department of Biodiversity, Conservation and Attractions (DBCA).
  - Nine Vegetation Types (VT) were recorded.
  - One vegetation type (VTC) containing localised areas of potentially groundwater-dependent vegetation.

### 3.2.3. Terrestrial fauna

#### 3.2.3.1. NVCP Application Area

A total of 92 species were recorded during field survey, comprising of 12 mammals, 63 birds, 16 reptiles and 1 frog. Two species are conservation significant (Biologic 2019d):

- Pilbara Leaf-nose Bat (Vulnerable under the EPBC Act and BC Act)
- Common Sandpiper (Listed as migratory under the EPBC Act and BC Act)

No evidence was found of the following conservation significant species, which according to the desktop study, may occur in the survey area:

- Northern quoll
- Night parrot
- Ghost bat
- Pilbara olive python
- Gane's blind snake
- Ctenotus uber johnstonei
- Western pebble-mound mouse
- Peregrine falcon
- Greater bilby
- Northern brushtail possum
- Grey falcon
- Ctenotus nigrilineatus
- Spectacled hare-wallaby
- Brush-tailed mulgara
- Long-tailed dunnart
- Fork-tailed swift
- Sharp-tailed sandpiper
- Common greenshank
- Wood sandpiper
- Oriental plover
- Osprey
- Glossy ibis
- Yellow wagtail

Habitat mapping across the WGP area recorded seven fauna habitat types, comprising:



- Stony Plain (78%)
- Sand Plain (10.1%)
- Major Drainage (2%)
- Hillcrest/ Hillslope (1.9%)
- Medium Drainage – rocky (<1%)
- Medium Drainage – sandy (<1%)
- Minor Drainage (<1%)



- Low Stony Hills (<1%)
- Granite Outcrop (<1%)


Of the 9 broad fauna habitats recorded within the corridor, the Major Drainage habitat and Sand Plain habitat are ranked as high significance for vertebrate fauna due to the potential to provide core habitat for species of conservation significance. The remainder were deemed to be of moderate significance, either due to foraging/dispersal habitats, or habitats known to support priority or migratory species (Table 6).








Table 6. Broad fauna habitats within the NVCP Application area

Habitat	Description	Extent	Photos
<p><b>Low Stony Hills</b></p> <p>Potential Conservation Significance Species</p> <ul style="list-style-type: none"> <li>▪ Ghost bat (foraging/ dispersal)</li> <li>▪ Pilbara leaf-nosed bat (foraging/ dispersal)</li> <li>▪ Northern quoll (foraging/ dispersal)</li> </ul> <p>Area: 0.90 hectares Percentage of survey area: 0.22%</p> <p>Proposed actual disturbance: 0.11 hectares</p> <p><b>Significance: Moderate</b></p>	<p>Low undulating stony hills or rises with <i>Triodia</i> spp. grassland and/or sparse open acacia shrubland on gravelly clay loam substrate, this habitat contains small rocky outcrops, typically not large enough or with enough cracking/crevices to provide shelter for denning species such as Northern quoll.</p>	<p>Low Stony Hills habitat is distributed across the Pilbara region typically as part of stony plain habitat.</p> <p>The low stony hills habitat is not restricted to the survey area and is represented in conservation estate.</p>	
<p><b>Stony Plain</b></p> <p>Potential Conservation Significance Species</p> <ul style="list-style-type: none"> <li>▪ Night parrot (possible foraging/ dispersal)</li> <li>▪ Ghost bat (foraging/ dispersal)</li> <li>▪ Pilbara leaf-nosed bat (foraging/ dispersal)</li> <li>▪ Grey falcon (foraging)</li> <li>▪ Spectacled hare-wallaby (breeding/ shelter, foraging/ dispersal)</li> <li>▪ <i>Ctenotus nigrilineatus</i> (possible habitat)</li> <li>▪ Western pebble-mound mouse (breeding/ shelter, foraging/ dispersal)</li> </ul> <p>Area: 318.90 hectares Percentage of survey area: 77.01%</p> <p>Proposed actual disturbance: 39.80 hectares</p> <p><b>Significance: Moderate</b></p>	<p>Gently undulating stony plain with <i>Triodia</i> hummock grasses and scattered shrubland patches on gritty/gravelly clay loam substrates. This habitat contains small rocky outcrops.</p>	<p>Stony Plain habitat is common and widespread within the survey area and more broadly across the Pilbara region.</p> <p>The stony plain habitat is not restricted to the survey area and is represented in conservation estate.</p>	

Habitat	Description	Extent	Photos
<p><b>Sand Plain</b></p> <p>Potential Conservation Significance Species</p> <ul style="list-style-type: none"> <li>▪ Night parrot (possible foraging/ dispersal)</li> <li>▪ Ghost bat (foraging/ dispersal)</li> <li>▪ Pilbara Leaf-nosed Bat (foraging/ dispersal)</li> <li>▪ Greater bilby (breeding/foraging/ dispersal)</li> <li>▪ The Brush-tailed mulgara ((breeding/foraging/ dispersal)</li> <li>▪ Grey falcon (foraging)</li> <li>▪ Spectacled hare-wallaby (breeding/ shelter, foraging/ dispersal)</li> <li>▪ <i>Ctenotus nigrilineatus</i> (possible habitat)</li> </ul> <p>Area: 41.60 hectares Percentage of survey area: 10.05 %</p> <p>Proposed actual disturbance: 5.19 hectares</p> <p><b>High</b></p>	<p>Sand Plain habitat is variable, occurring in one extensive area in the northern part of the corridor, and as pockets (unmapped) within the Stony Plain habitat. Vegetation comprises low mixed shrubland dominated by Acacia, Grevillea, and Hakea, sometimes with an overstorey of eucalypt woodland or sparsely scattered trees. The understorey is <i>Triodia</i> hummock grassland.</p>	<p>Sand Plain habitat is regionally common throughout the Pilbara region. The sand plain habitat is not restricted to the survey area and is represented in conservation estate.</p>	
<p><b>Major Drainage</b></p> <p>Potential Conservation Significance Species</p> <ul style="list-style-type: none"> <li>▪ Ghost bat (foraging/ dispersal)</li> <li>▪ Pilbara leaf-nosed bat (foraging/ dispersal)</li> <li>▪ Grey falcon (breeding/ nesting, foraging)</li> <li>▪ Pilbara olive python (foraging/dispersal)</li> <li>▪ Northern Brushtail Possum (foraging/ dispersal)</li> <li>▪ Peregrine falcon (foraging/ dispersal)</li> <li>▪ Oriental plover (infrequent visitor)</li> <li>▪ Common sandpiper (confirmed)</li> </ul>	<p>Wide seasonally fed drainage lines characterised by wide non-vegetated channels and sandy banks with fringing riparian vegetation comprising scattered Eucalyptus species over a patchy understory often dominated by Acacia spp. and small ephemerals grasses and herbs. Can contain Melaleuca species in-between major channels.</p> <p>Water can be present in large pools following recent rainfall; however, some drainage lines are seasonally dry and</p>	<p>The tributaries are continuous for some distance outside of the survey area and are representative of major drainage habitat occurring across the Pilbara region. The major drainage habitat is not restricted to the survey area and is represented in conservation estate.</p>	

Habitat	Description	Extent	Photos
<ul style="list-style-type: none"> <li>▪ Sharp-tailed sandpiper (infrequent visitor)</li> <li>▪ Common greenshank (infrequent visitor)</li> <li>▪ Wood sandpiper (infrequent visitor)</li> <li>▪ Osprey (infrequent visitor)</li> <li>▪ Glossy ibis (infrequent visitor)</li> <li>▪ Gane’s blind snake (DBCA Priority 1)</li> </ul> <p>Area: 8.30 hectares Percentage of survey area: 2.00 %</p> <p>Proposed actual disturbance: 1.04 hectares</p> <p><b>Significance: High</b></p>	<p>dependent on large rainfall events. Pools can be groundwater fed.</p> <p>Contains microhabitat such as leaf litter accumulations, large trees, hollows.</p>		
<p><b>Medium Drainage – Rocky</b></p> <p>Potential Conservation Significance Species</p> <ul style="list-style-type: none"> <li>▪ Ghost bat (foraging/ dispersal)</li> <li>▪ Pilbara leaf-nosed bat (foraging/ dispersal)</li> <li>▪ Grey falcon (breeding/ nesting, foraging)</li> <li>▪ Pilbara olive python (foraging/dispersal)</li> <li>▪ Peregrine falcon (foraging/ dispersal)</li> <li>▪ Oriental plover (occasional visitor)</li> <li>▪ Gane’s blind snake (DBCA Priority 1)</li> </ul> <p>Area: 2.60 hectares Percentage of survey area: 0.63%</p> <p>Proposed actual disturbance: 0.32 hectares</p> <p><b>Significance: Moderate</b></p>	<p>Medium Drainage Line - Rocky incised drainage channels lined with large eucalyptus trees typically dissecting the Hillcrest/Hillslope or stony plain habitat of the southern portion of the survey area corresponding to the Warrawoona Range.</p> <p>Contains microhabitat such as leaf litter accumulations, large trees, hollows.</p>	<p>Predominantly a subset of the major drainage habitat: Medium Drainage Lines – Rocky occurs throughout the Pilbara region due to the topography of the region.</p> <p>The medium drainage -rocky habitat is not restricted to the survey area and is represented in conservation estate.</p>	

Habitat	Description	Extent	Photos
<p><b>Medium Drainage – Sandy</b></p> <p>Potential Conservation Significance Species</p> <ul style="list-style-type: none"> <li>▪ Ghost bat (foraging/ dispersal)</li> <li>▪ Pilbara leaf-nosed bat (foraging/ dispersal)</li> <li>▪ Grey falcon (breeding/ nesting, foraging)</li> <li>▪ Pilbara olive python (foraging/dispersal)</li> <li>▪ Peregrine falcon (foraging/ dispersal)</li> <li>▪ Oriental plover (occasional visitor)</li> <li>▪ Gane’s blind snake (DBCA Priority 1)</li> </ul> <p>Area: 1.70 hectares Percentage of survey area: 0.41 %</p> <p>Proposed actual disturbance: 0.21 hectares</p> <p><b>Significance: Moderate</b></p>	<p>Sandy medium drainage lines intersected the survey area in many places throughout the pipeline corridor. The vegetation comprises tall to medium sparse shrubland dominated by <i>Acacia trachycarpa</i> over mixed low shrubs, with an understorey of open to sparse spinifex grassland.</p>	<p>Predominantly a subset of the major drainage habitat: Medium Drainage Lines – Sandy occurs throughout the Pilbara region.</p> <p>The medium drainage – sandy habitat is not restricted to the survey area and is represented in conservation estate.</p>	
<p><b>Minor Drainage</b></p> <p>Potential Conservation Significance Species</p> <ul style="list-style-type: none"> <li>▪ Ghost bat (foraging/ dispersal)</li> <li>▪ Grey falcon (foraging)</li> <li>▪ Pilbara olive python (foraging/dispersal)</li> <li>▪ Peregrine falcon (foraging/ dispersal)</li> </ul> <p>Area: 2.10 hectares Percentage of survey area: 0.51%</p> <p>Proposed actual disturbance: 0.26 hectares</p> <p><b>Significance: Moderate</b></p>	<p>The Minor Drainage represents the narrow drainage channels within the stony plain and sandy plain habitat. Vegetation typically represents that of the surrounding stony/sandy plain or denser patches of mixed shrubs including <i>Acacia</i>.</p> <p>Substrate is generally gravelly with occasional sandy patches.</p>	<p>The Minor Drainage Line habitat is common throughout the Pilbara bioregion particularly within the Chichester and Hamersley subregions where it is associated with the Stony Plain habitats.</p> <p>The minor drainage – sandy habitat is not restricted to the survey area and is represented in conservation estate.</p>	

Habitat	Description	Extent	Photos
<p><b>Hillcrest/Hillslope</b></p> <p>Potential Conservation Significance Species</p> <ul style="list-style-type: none"> <li>▪ Ghost bat (foraging/ dispersal)</li> <li>▪ Pilbara leaf-nosed bat ( foraging/ dispersal)</li> <li>▪ Western pebble-mound mouse (breeding/ shelter, foraging/ dispersal)</li> <li>▪ Long-tailed dunnart (foraging/ dispersal)</li> <li>▪ Potential <i>Ctenotus uber johnstonei</i> habitat</li> </ul> <p>Area : 8.8 hectares Percentage of survey area: 2.13%</p> <p>Proposed actual disturbance: 1.10 hectares</p> <p><b>Significance: Moderate</b></p>	<p>Hillcrest/Hillslope habitat are dominated by varying species of <i>Triodia</i> with scattered Eucalypts. Typically rocky substrate, often with exposed bedrock, and skeletal red soils. This habitat typically does not contain the cracks and cervices of the rocky breakaway habitat.</p>	<p>This habitat corresponds to the slopes of the Warrawoona Range Range that occurs at the southern end of the survey area.</p> <p>This habitat is broadly represented across the Pilbara region in areas of topography typically the slopes and crests of hills that contain gorges and gullies. This habitat is represented in conservation estate</p>	
<p><b>Granite Outcrop</b></p> <p>Potential Conservation Significance Species</p> <ul style="list-style-type: none"> <li>▪ Ghost bat (foraging/ dispersal)</li> <li>▪ <i>Ctenotus nigrilineatus</i> (possible habitat)</li> <li>▪ Northern quoll (foraging/ dispersal)</li> </ul> <p>Survey Area: 3.30 hectares Percentage of survey area: 0.8 %</p> <p>Proposed actual disturbance: 0.41 hectares</p> <p><b>Significance: Moderate</b></p>	<p>Exposed granite outcrops with tors/boulders with sparse vegetation. Granite outcrops of the survey area are predominately small domes with associated small boulders. Not the large granites of the like that occur at Red Rock Indee station, known as high quality Northern quoll habitat (Dunlop 2017) .</p>	<p>This habitat is not common in the Pilbara, however granite tor fields also occur in the Boolaloo Land System van Vreeswyk et al. (2004).</p> <p>This habitat largely falls outside of the survey area as care was taken to avoid these outcrops during project design.</p> <p>This habitat is well represented within the Abydos/Woodstock Reserve (How et al. 1991, How &amp; Cooper 2002).</p>	
<p><b>Disturbed</b></p> <p>Survey Area: 25.90 hectares Percentage of survey area: 6.25 %</p> <p>Proposed actual disturbance: 3.23 hectares</p>	<p>Historical Mining Disturbance</p>	<p>Not a habitat</p>	



## 4. ASSESSMENT AGAINST CLEARING PRINCIPLES

The proposed clearing of 51.67 ha has been assessed against the ten clearing principles, as provided in Schedule 5 of the EP Act. This assessment is presented Table 7.

Table 7. Assessment against the EP Act's Ten Clearing Principles

Principle (a) Native vegetation should not be cleared if it comprises a high level of biological diversity	
<b>Supporting Studies</b>	<ul style="list-style-type: none"> <li>• Woodman (2020)</li> <li>• Rappallo (2021)</li> </ul>
<b>Assessment</b>	<p>The proposed clearing footprint comprises approximately 51.67ha of native vegetation within a wider application envelope of 414.1ha.</p> <p>The basic (reconnaissance) flora survey of the Moolyella pipeline corridor recorded 115 flora taxa from 28 different families. These included 110 native taxa and six introduced taxa (weeds). The most well-represented families were Fabaceae (35 taxa), Poaceae (16 taxa), Malvaceae (7 taxa) and Myrtaceae (6 taxa) (Rappallo 2021).</p> <p>The vegetation of the corridor comprises a variation of spinifex (<i>Triodia</i> spp.) grasslands, mostly on stony or sandy plains, with an overstorey of mixed shrubs and small trees dominated by <i>Acacia</i> species that define each vegetation types. Major, medium, and minor creek lines intersect the plains, with the major and medium creek lines supporting a variety of groundwater dependent flora species ) (Rappallo 2021).</p> <p>The vegetation of the corridor is not highly diverse with a total of 9 vegetation types that are known and can be expected to occur outside of the corridor. The Pilbara bioregion is not known for a high level of biological diversity, in terms of flora and vegetation in comparison to other parts of Western Australia such as the northern sandplains region in the vicinity of Eneabba.</p> <p>The proposal is not at variance with this principle.</p>
<b>Outcome</b>	The proposed clearing is not at variance with this Principle.

Principle (b) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary or the maintenance of, a significant habitat for fauna indigenous to Western Australia	
<b>Supporting Studies</b>	<ul style="list-style-type: none"> <li>• Biologic (2018d) Warrawoona Gold Project. SRE Invertebrate Fauna Survey. Calidus Resources Limited.</li> <li>• Biologic (2018e) Warrawoona Level 1 Fauna Assessment. Report prepared for Calidus Resources Limited. February 2018.</li> <li>• Biologic (2019a) Warrawoona Targeted Bat Assessment - April 2019. Report prepared for Calidus Resources Limited. May 2019.</li> <li>• Biologic (2019b) Warrawoona Gold Project: VHF Bat Foraging Studies. Report prepared for Calidus Resources Limited. March 2019.</li> <li>• Biologic (2019c) Warrawoona Gold Project: Habitat Assessment and Targeted Vertebrate Fauna Survey. Report prepared for Calidus Resources Limited, 22 February 2019.</li> <li>• Biologic (2019d) Warrawoona Gold Project: 2019 Significant Species Survey. June 2019. Prepared for Calidus.</li> <li>• Biologic (2019e) Warrawoona Gold Project: Conservation Significant Bat Species Impact Assessment (Impact assessment Report).</li> <li>• Biologic (2019f) Warrawoona Gold Project. Conservation Significant Vertebrate Fauna Impact Assessment.</li> </ul>
<b>Assessment</b>	<p>The proposed clearing footprint comprises approximately 51.67ha of native vegetation within a wider application envelope of 414.10ha.</p> <p>Fauna habitat loss as a direct result of land clearing is a primary impact clearing the corridor on terrestrial fauna. Clearing for the pipeline will be low impact and restricted to existing pastoral tracks where possible. Nine broad habitat types are represented along the corridor.</p> <p>Of the 9 broad fauna habitats recorded within the corridor, the Major Drainage habitat and Sand Plain habitat are ranked as “High” significance for vertebrate fauna due to the potential to provide core habitat for species of conservation significance. The remainder are of “Moderate” significance, either due to the possibility of foraging/dispersal habitat, or habitats primarily supporting priority or migratory species (Rapallo 2021).</p> <p><b>Sand Plain Habitat</b></p> <p>The Sand Plain habitat was assessed as “High” significance due to the potential for Greater bilby and Brush-tailed mulgara breeding, foraging and dispersal habitat. The Greater bilby is listed as Vulnerable under the <i>Environment Protection and Biodiversity Conservation Act 1999</i> (EPBC Act) and <i>Biodiversity Conservation Act 2016</i> (BC Act). The Brush-tailed mulgara is listed as Priority 4 by the Department of Biodiversity, Conservation and Attractions (DBCA). Both species are rated as “Highly Likely” to occur on the corridor (Rapallo 2021).</p> <p>There are Greater bilby records proximal to the corridor from 2014 in the DBCA threatened species database, however the database does not indicate type of record or source DBCA (2020). No evidence of Greater bilby was recorded during the current survey; nor was the species detected via targeted searches for the Warrawoona Gold Project (Biologic 2019).</p> <p>Greater bilbies are recorded as having low site fidelity and high mobility (Southgate et al. 2007); males regularly move three to five kilometres between burrows on consecutive days; and have been recorded moving up to 15 km in a few weeks (Southgate &amp; Possingham 1995).</p>

Brush-tailed mulgara has been recorded from the Sandy Plain habitat of the Warrawoona Gold Project (Biologic 2019). Mulgara can use multiple burrow systems within a home-range and changing these frequently (Körtner et al. 2008).

Sand Plain habitat provides breeding, shelter, foraging, dispersal habitat for the Spectacled hare-wallaby (DBCA Priority 4) and supporting habitat (dispersal and foraging habitat) for Grey falcon (Vulnerable under the BC Act and EPBC Act), Pilbara leaf-nosed bat, and Ghost bat (both listed as vulnerable under the EPBC Act and BC Act). Sand Plain habitat contains some suitable areas of habitat for the Night parrot listed as Endangered under the BC Act and EPBC Act. Night parrot was not recorded on the corridor via acoustic recorder) (Rapallo 2021).

Local populations of Greater bilby and Brush-tailed mulgara may be temporarily impacted by clearing of any active burrows. Clearing activities will be managed to avoid burrows to minimise impacts to such species. Neither Greater bilby nor Brush-tailed mulgara would not be restricted to the Sand Plain habitat of the corridor.

A total of 41.6 ha of the corridor (10 %) comprises Sand Plain habitat and a substantial amount is known to occur outside the corridor to the south of the Warrawoona Gold Project (Biologic 2019). The habitat type is widespread in the broader landscape, and not restricted to the corridor (Rapallo 2021; Biologic 2019). Fauna occurring in the region are therefore unlikely to be substantially impacted by the proposal, from a regional perspective.

**Major Drainage Habitat**

The Major Drainage habitat provides a range of microhabitats and a stable source of food and water, within vast landscape of relatively resource-poor spinifex plains (How et al. 1991; Rapallo 2021). More specifically, nectivorous avifauna benefit from the flowering plants and hollow-nesting species make use of the large eucalypts that line the banks (Burbidge et al. 2010)). Mammal, reptile and amphibian fauna may also congregate around permanent water pools (How et al. 1991).

Due to the widespread availability of microhabitats, such as leaf litter accumulations, large trees, hollows, and semi-permanent/permanent water sources, the Major Drainage habitat provides foraging and dispersal habitat for Northern quoll, Pilbara leaf-nosed bat, Pilbara olive python, Peregrine falcon, Northern brushtail possum and potentially where there is sufficient moisture: Gane’s blind snake. Grey falcon may utilise the Major Drainage habitat for nesting and foraging (Rapallo 2021).

Until habitat preferences are further defined for Ghost bat it is assumed that the Major Drainage habitat is also utilised in some capacity by Ghost bat (Rapallo 2021).

- Northern quoll is listed as Endangered under the EPBC act and the BC Act
- Pilbara leaf-nosed bat is listed as Vulnerable under the EPBC Act and BC Act
- Ghost bat is listed as Vulnerable under the EPBC Act and BC Act
- Grey falcon is listed as Vulnerable under the BC Act
- Pilbara olive python is listed as Vulnerable under the EPBC Act and BC Act
- Peregrine Falcon is listed as Other Specially Protected Fauna under the BC Act
- Northern Brushtail Possum is listed as Vulnerable under the BC Act
- Gane’s blind snake (DBCA Priority 1)

Migratory bird species can use drainage systems as conduits for movement throughout an otherwise arid landscape (Storr 1984, Bamford et al. 2008).

Migratory species assessed as “Possible infrequent visitors” on the corridor include:

- Oriental plover
- Common sandpiper
- Sharp-tailed sandpiper



- Common greenshank
- Wood sandpiper
- Osprey
- Glossy ibis

Local populations of Northern quoll, Pilbara leaf-nosed bat, Pilbara olive python, Peregrine falcon, Northern brushtail possum, Gane’s blind snake and Grey Falcon are not anticipated to be impacted by the clearing of a narrow corridor of Major Drainage habitat beyond temporary displacement and direct short-term impact from machinery because this habitat does not contain critical or preferred breeding habitat for the majority of these species. Northern quoll, Pilbara olive python and Peregrine falcon breeding habitat is located within the Rocky breakaway habitat of the Warrawoona Gold Project and will not be impacted by the proposal. The Rocky breakaway habitat is extensive and predominately intact with only 0.8 ha of this habitat approved for clearance within the Warrawoona Gold Project (EPBC 2019/8584).

Both Gane’s blind snake and the Northern Brushtail Possum have a patchy distribution and are infrequently recorded (Rapallo 2021).

The Pilbara leaf-nosed bat will potentially forage over most habitats within the corridor with Major Drainage containing most significant foraging habitats due to proximity of pools, however it is noted that the Pilbara leaf-nosed bat was also recorded foraging proximal to the artificial water bodies that occur on the corridor (Rapallo 2021). Pilbara leaf-nosed bat breeding habitat is located within the old workings proximal to the Warrawoona Gold project and will not be impacted by the proposal.

Ghost bat breeding habitat is located within the old workings proximal to the Warrawoona Gold project and will not be impacted by the proposal. Ghost bat will potentially forage over most habitats of the corridor (Rapallo 2021).

The Grey falcon uses Major Drainage habitats for breeding; however, it is noted that this habitat is not restricted, and the species has not been recorded nesting on the corridor to date.

A total of 8.3 ha of the corridor (2%) comprises of Major Drainage habitat. The habitat type is widespread in the broader landscape, and the affected areas are contiguous with surrounding occurrences of Major Drainage habitat (Rapallo 2021). Fauna occurring within this habitat type are therefore unlikely to be substantially impacted by the proposal.

Minor Drainage, Medium Drainage – rocky and Medium Drainage – sandy habitats provides potential dispersal and foraging habitat for Pilbara olive python, Ghost bat, Pilbara Leaf-nosed bat, Peregrine falcon, Grey Falcon, Oriental plover (Migratory BC/EPBC Act) and where there is sufficient moisture Gane’s blind snake (Rapallo 2021).

Hillcrest/Hillslope provides supporting habitat (dispersal and foraging habitat) for Ghost bat, Pilbara Leaf-nosed bat and Long-tailed dunnart (DBCA Priority 4) and breeding, shelter, foraging, dispersal habitat for the Western Pebble-mound mouse (DBCA Priority 4). Hillcrest/ Hillslope contains potential habitat for *Ctenotus uber johnstonei* (DBCA Priority 2) (Rapallo 2021).

Low Stony Hills and Granite Outcrop provides potential dispersal and foraging habitat for Ghost bat, Pilbara Leaf-nosed bat, Northern quoll (Rapallo 2021). Granite Outcrop provides potential *Ctenotus nigrilineatus* habitat (Rapallo 2021).

Stony Plain, the dominant habitat within the corridor (78%) provides breeding, shelter, foraging, dispersal habitat for the priority listed Western Pebble-mound mouse and Spectacled hare-wallaby and supporting habitat (dispersal and foraging habitat) for Grey falcon, Pilbara leaf-nosed bat, and Ghost bat. Stony Plain provides potential *Ctenotus nigrilineatus* habitat (Rapallo 2021). Stony Plain contains some suitable areas of habitat for the Night parrot listed as Endangered under the BC Act and EPBC Act. Night parrot was not recorded on the corridor via acoustic recorder) (Rapallo 2021).

	<p>Given the habitats are represented outside of the corridor, throughout the region and in conservation estate and primarily represent foraging and dispersal habitat of listed threatened species rather than breeding habitat of listed threatened species of high site fidelity, with management, clearing within the corridor is unlikely to be at variance to this clearing principal.</p> <p>Management will include clearing protocols as per Warrawoona Gold Project Environmental Procedures and preclearance surveys (Greater bilby and Brush-tailed mulgara).</p>
<b>Outcome</b>	The proposed clearing is unlikely to be at variance with this Principle.

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

<b>Supporting Studies</b>	<ul style="list-style-type: none"> <li>• Woodman Environmental (2019a) Detailed Flora and Vegetation Survey (formally Level 2). Appendix 7-1</li> <li>• Woodman Environmental (2019b) Memo of recommendations for referral of Warrawoona Gold Project, assessment against Clearing Principles. Woodman Environmental (2019b), Appendix 7-2.</li> </ul>
<b>Assessment</b>	<p>No threatened flora, listed under the EPBC Act or BC Act, have been recorded from the corridor (Rapallo 2021). None of the threatened flora species listed for the Pilbara are expected to occur within the corridor, due to a lack of suitable habitat and/or a distribution that does not overlap with the corridor.</p> <p><i>Eragrostis crateriformis</i> (DBCA Priority 3) was recorded from one location within the corridor from stony plain habitat (Rapallo 2021) and occurs throughout the Warrawoona Gold Project, recorded from minor drainage lines and sheet flow areas of red sandy clay (Woodman 2020). This ephemeral grass occurs over a range of approximately 1,370 km in Western Australia, from near Onslow in the west to near Balgo Hills in the Tanami Desert in the east. It also occurs in the Northern Territory. There are 51 records of this taxon in Western Australia, representing approximately 30 populations. Three of these populations occur in the DBCA managed Millstream-Chichester National Park and DBCA managed Ex Meentheena Station (Woodman 2020, ALA 2021, Western Australian Herbarium 2021, DBCA 2020b). <i>Eragrostis crateriformis</i> is not restricted to the habitats of the corridor and given this taxon is found regularly within the drainage of the region it is highly likely that additional searching along the drainage that bisects the corridor would locate many more plants. Removal of individual plants will not alter the local or regional conservation status of this species should the pipeline infrastructure be unable to avoid individuals.</p> <p>Although not recorded on the corridor, three additional species were assessed as “Highly Likely” to occur on the corridor. <i>Heliotropium murinum</i> (DBCA Priority 3), <i>Euphorbia clementii</i> (DBCA Priority 3), <i>Ptilotus mollis</i> (DBCA Priority 3) (Rapallo 2021).</p> <p><i>Heliotropium murinum</i> (DBCA Priority 3), grows on red sand, plains, or brown light clay or sand over ironstone. <i>Heliotropium murinum</i> and occurs within the Warrawoona Gold Project and has been recorded from other nearby localities (Woodman 2020, Rapallo 2021). The species occurs over a range of approximately 150 km from Woodstock Reserve in the west to DBCA managed Ex Meentheena Station in the east. There are 17 location records of this taxon in Western Australia representing approximately 12 populations (including the records from the Warrawoona Gold Project). One population occurs in the DBCA-managed Ex Meentheena Station (Woodman 2020, ALA 2021, Western Australian Herbarium 2021, DBCA 2020b). <i>Heliotropium murinum</i> is locally common with 890 plants recorded from 160 point locations within the Warrawoona Gold Project (Woodman 2020). <i>Heliotropium murinum</i> is not restricted to the habitats of the corridor, and removal of individual plants will not alter the local or regional conservation status of this species should the pipeline infrastructure be unable to avoid individuals.</p>

<p><i>Euphorbia clementii</i> (DBCA Priority 3), grows on gravelly hillsides, stony grounds, and along drainage lines on red, orange sandy loams, or stony areas. The species occurs within the Warrawoona Gold Project and has been recorded from other nearby localities (Woodman 2020, Rapallo 2021). This taxon is endemic to Western Australia with the main range of its distribution extending over 190 km from Wodgina in the west to northeast of Marble Bar. There are 35 location records of <i>Euphorbia clementii</i> in Western Australia representing approximately 18 populations, none of which occur in DBCA-managed tenure (Woodman 2020, ALA 2021, Western Australian Herbarium 2021, DBCA 2020b).</p> <p><i>Euphorbia clementii</i> was recorded from a long unburnt stony undulating plain of red-brown sandy clay loam on the Warrawoona Gold Project. (Woodman 2020) found this habitat to be atypical for the species as this taxon is typically a fire-responder (and relatively short-lived) but may germinate in response to physical disturbance. Woodman (2020) hypothesised that the record on the Warrawoona Gold Project may have been transported, given the nearby historical disturbance evident in aerial photography and long unburnt nature of the vegetation. The taxon was not observed in more recently burnt areas of typical habitat (sandy or stony plains) (Woodman 2020). <i>Euphorbia clementii</i> was not recorded on the recently burnt areas or disturbed areas of the corridor where if present it would have been readily identifiable as it typically occurs in large numbers (Woodman 2020).</p> <p><i>Euphorbia clementii</i> is not restricted to the habitats of the corridor, and removal of individual plants will not alter the local or regional conservation status of this species should the pipeline infrastructure be unable to avoid individuals.</p> <p><i>Ptilotus mollis</i> (DBCA Priority 4) grows on stony hills and screes. The species occurs within the Warrawoona Gold Project on rocky hill tops and slopes of the main range (consisting of granite, chert and mafic schist) or smaller outcroppings of mafic schist immediately adjacent to the main range (to the south) and has been recorded from other nearby localities (Woodman 2020, Rapallo 2021). <i>Ptilotus mollis</i> is endemic to Western Australia occurring over a range of approximately 640 km from Cane River Conservation Park in the west (65 km south-west of Pannawonica) to near Karlamilyi National Park in the east (270 km south-east of Marble Bar). There are 39 location records of this taxon in Western Australia, representing approximately 28 populations (including the records from the Warrawoona Gold Project). Three of these populations occur within DBCA conservation estate, Cane River Conservation Park and Karijini National Park (Woodman 2020, ALA 2021, Western Australian Herbarium 2021, DBCA 2020b). <i>Ptilotus mollis</i> is locally common (2534 plants have been recorded from 350 locations within the Warrawoona Gold Project) (Woodman 2020), and removal of individual plants will not alter the local or regional conservation status of this species should the pipeline infrastructure be unable to avoid individuals.</p> <p>Four species were assessed as “Likely” to occur on the survey area <i>Josephinia</i> sp. Woodstock (A.A. Mitchell PRP 989) (DBCA Priority 1), <i>Bulbostylis burbidgeae</i> (DBCA Priority 4), <i>Heliotropium muticum</i> (DBCA Priority 3) and <i>Gomphrena leptophylla</i> (DBCA Priority 3) (Rapallo 2021).</p> <p><i>Josephinia</i> sp. Woodstock (DBCA Priority 1) grows on sheet flow or drainage lines, on red sandy (granitic) plains. This taxon is known from seven records across four localities (Ashburton, Chichester, Fortescue and Hamersley IBRA sub-regions) and is not currently known from any DBCA-managed conservation reserves (Woodman 2020, ALA 2021, Western Australian Herbarium 2021, DBCA 2020b). The species has been recorded from the Warrawoona Gold Project from a loamy minor drainage line and despite a comprehensive targeted survey of all potential habitat on the Warrawoona Gold Project no additional locations have been recorded and the original plant recorded in 2019 could not be relocated despite intensive grid searching of the known location at 5 m intervals (Woodman 2020). <i>Josephinia</i> sp. Woodstock, although rarely recorded is not restricted to the habitats of the corridor, and removal of individual plants would not alter the local or regional conservation status of this species should the pipeline infrastructure be unable to avoid individuals.</p> <p><i>Bulbostylis burbidgeae</i> (DBCA Priority 4) grows in granitic soils and has been recorded from granitic outcrops and cliff bases and could occur within the granite outcrops on the corridor.</p>
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	<p><i>Bulbostylis burbidgeae</i> is endemic to Western Australia occurring over a range of approximately 28409.58 square kilometres from South Hedland south to the Nanutarra/Fortescue, east to Nullagine and north to the DeGray River within the Chichester, Fortescue and Roebourne IBRA subregions. <i>Bulbostylis burbidgeae</i> is not currently known from any DBCA-managed conservation reserves (ALA 2021, Western Australian Herbarium 2021, DBCA 2020b). Field observations from Mt Webber indicate that this taxon only occurs in shady areas on massive granite outcrops (Woodman 2012) and the granite outcrop habitats of the corridor are too small to cast significant shade (Rapallo 2021).</p> <p><i>Bulbostylis burbidgeae</i> is not restricted to the habitats of the corridor, and removal of individual plants would not alter the local or regional conservation status of this species should the pipeline infrastructure be unable to avoid individuals.</p> <p><i>Heliotropium muticum</i> (DBCA - Priority 3) grows on flat terrain, low in the landscape, flood plains and sand plains. Soil types where this species has been recorded included (very gritty) skeletal red brown granitic soil, clay loams, and sand. The species is endemic to the Pilbara and occurs between Port Hedland/Wickham south to Coonarrie Creek and west to Marble Bar (ALA 2021, Western Australian Herbarium 2021, DBCA 2020b). <i>Heliotropium muticum</i> growth is triggered by fire with an estimated population of approximately 1,300 to 2,500 individuals at Pilgangoora (MMWC 2016) and 20 individuals located at North Star (Ecologia 2012). <i>Heliotropium muticum</i> is not restricted to the habitats of the corridor, and removal of individual plants would not alter the local or regional conservation status of this species should the pipeline infrastructure be unable to avoid individuals.</p> <p><i>Gomphrena leptophylla</i> (DBCA Priority 3) occurs on sand to sandy to clay-loam, granite or quartzite, on open flats, sandy creek beds, edges of salt marshes and pans, and on stony hillsides, with records in the Chichester, Fitzroy Trough, Roebourne, South Kimberley Interzone Ibra subregion extending into the Northern Territory and Queensland. (ALA 2021, Western Australian Herbarium 2021, DBCA 2020b). <i>Gomphrena leptophylla</i> is not restricted to the habitats of the corridor, and removal of individual plants would not alter the local or regional conservation status of this species should the pipeline infrastructure be unable to avoid individuals.</p> <p>No flora listed as threatened flora, under the EPBC Act or BC Act will be impacted by clearing for the corridor. Based on habitat, and local records, clearing within the corridor does have the potential to impact several priority taxa however none of these species are recognised as threatened, nor are restricted to the local area or the region. Given the narrow clearing parcel required for a pipeline and that much of the clearing involves upgrading existing tracks rather than the establishment of new tracks, clearing activities will not result in the complete loss of these taxa from the local area, and will not impact regional populations.</p>
<b>Outcome</b>	The proposed clearing is not at variance with this Principle.

<b>Principle (d) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a threatened ecological community</b>	
<b>Supporting Studies</b>	<ul style="list-style-type: none"> <li>• Woodman Environmental (2019a) Detailed Flora and Vegetation Survey (formally Level 2). Appendix 7-1</li> <li>• Woodman Environmental (2019b) Memo of recommendations for referral of Warrawoona Gold Project, assessment against Clearing Principles. Woodman Environmental (2019b), Appendix 7-2.</li> </ul>

<p><b>Assessment</b></p>	<p>Search results of DBCA Threatened and Priority Ecological Community (TEC/PEC) database search (DBCA 2020b) indicates that no TECs are known to occur within or near the corridor.</p> <p>Rapallo (2021) found no known locations of listed significant vegetation, as listed by the AWE (EPBC Act) or otherwise listed by the DBCA, occurring within 40 km of the corridor (DBCA 2020a); AWE 2020). Only two TECs are known from the <i>Pilbara</i> Region (TEC 46 -Themeda Grasslands and TEC 78 - Ethel Gorge Aquifer Stygobiont Community DBCA 2018c). Both TECs are associated with the Hamersley Range area, therefore it is highly unlikely that either of these TECs would occur within the corridor.</p> <p>A review of the published TEC and PEC listings for Western Australia (DBCA 2020a); DBCA 2018c) against the descriptions of the vegetation types in (Rapallo 2021) identified no vegetation types in the corridor representing listed TECs or PECs as listed by DBCA or the AWE.</p>
<p><b>Outcome</b></p>	<p>The proposed clearing is not at variance with this Principle.</p>

**Principle (e) Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared**

<p><b>Supporting Studies</b></p>	<ul style="list-style-type: none"> <li>• Woodman Environmental (2019a) Detailed Flora and Vegetation Survey (formally Level 2). Appendix 7-1</li> <li>• Woodman Environmental (2019b) Memo of recommendations for referral of Warrawoona Gold Project, assessment against Clearing Principles. Woodman Environmental (2019b), Appendix 7-2.</li> </ul>
<p><b>Assessment</b></p>	<p>Review of the DBCA State-Wide Vegetation Statistics data (DBCA 2018a) showed that both the Abydos Plain 93 and the George Ranges 82 vegetation system-associations still have 99% of their pre-European extent remaining (DBCA 2018d) and would be considered 'least concern' (DER 2014).</p> <p>The corridor is located outside of the 'agricultural area' (Intensive Land Use zone) where remnant vegetation has been extensively cleared (DBCA 2018d). The corridor is not located within a significant remnant of native vegetation in an area which has been extensively cleared.</p>
<p><b>Outcome</b></p>	<p>The proposed clearing is not at variance with this Principle.</p>

Principle (f) Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland	
<b>Supporting Studies</b>	<ul style="list-style-type: none"> <li>• Woodman Environmental (2019a) Detailed Flora and Vegetation Survey (formally Level 2). Appendix 7-1</li> <li>• Woodman Environmental (2019b) Memo of recommendations for referral of Warrawoona Gold Project, assessment against Clearing Principles. Woodman Environmental (2019b), Appendix 7-2.</li> <li>• Groundwater Resource Management (2019a) Hydro-Meteorological and Surface Water Management Study. Warrawoona Gold Project. Pre-Feasibility Study. Prepared for Calidus Resources Ltd.</li> <li>• Groundwater Resource Management (2019b) Warrawoona Gold Project Pre-Feasibility Hydrogeological Investigations Report. Prepared for Calidus Resources Limited.</li> </ul>
<b>Assessment</b>	<p>The corridor crosses Brockman and Chinaman Creeks five times, all tributaries of the Talga River. The pipeline corridor design will pass flows across the roadway by means of floodways, culverts or a combination of both to reduce risk of crossing flooding and minimise the time the corridor will be out of commission during a flood event. The presence of these floodways / culverts will ensure that there are minimal impacts to the upstream and downstream flow regimes of these drainage lines.</p> <p>If channel capacities are exceeded, short-term ponding may occur over the corridor with potential scour and road degradation. During a large rainfall event, the background mobilisation of natural sediments in the catchments is expected to be significant, and any increase in sediment loads from the erosion of the corridor would likely be minor in comparison.</p> <p>With management clearing within the corridor is unlikely to alter the hydrological and ecological values of the Brockman and Chinaman Creeks tributaries and ultimately the Talga River.</p>
<b>Outcome</b>	The proposed clearing is unlikely to be at variance with this Principle.

Principle (g) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation	
<b>Supporting Studies</b>	<ul style="list-style-type: none"> <li>• Mine Earth (2019) Warrawoona Gold Project: Soils and landform assessment.</li> <li>• Groundwater Resource Management (2019a) Hydro-Meteorological and Surface Water Management Study. Warrawoona Gold Project. Pre-Feasibility Study. Prepared for Calidus Resources Ltd.</li> </ul>

<b>Assessment</b>	<p>Because the topography of the corridor is generally flat for much of its length and given much of the involves upgrade to existing tracks, significant land degradation is unlikely to occur. The Macroy, Talga, and Granitic land systems are not particularly prone to degradation or erosion. The River land system is susceptibility to erosion is high or very high if vegetative cover is removed (Van Vreeswyk et al. 2004). This is apparent from the disturbance observed in the Major Drainage habitats of the corridor from cattle grazing. it is considered that this impact can be managed through appropriate engineering controls and progressive rehabilitation, and appreciable land degradation from clearing for a pipeline is unlikely to occur if such measures are undertaken.</p> <p>There is potential for clearing to result in the establishment and or spread of weeds. Given the extent to which weeds have established in the Pilbara, especially along drainage lines, existing weeds within the corridor and the current pastoral land use, eradication of existing weeds within the corridor is not a feasible option. Effort will be focussed on preventing the establishment of previously unrecorded weeds and reducing the spread of existing weeds.</p>
<b>Outcome</b>	The proposed clearing is unlikely to be at variance with this Principle.

**Principle (h) Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area**

<b>Assessment</b>	The corridor is located on Eginbah Pastoral lease and unallocated crown land. No conservation areas are located in the immediate vicinity of the corridor.
<b>Outcome</b>	The proposed clearing is not at variance with this Principle.

**Principle (i) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water**

<b>Supporting Studies</b>	<ul style="list-style-type: none"> <li>• Woodman Environmental (2019a) Detailed Flora and Vegetation Survey (formally Level 2). Appendix 7-1</li> <li>• Woodman Environmental (2019b) Memo of recommendations for referral of Warrawoona Gold Project, assessment against Clearing Principles. Woodman Environmental (2019b), Appendix 7-2.</li> <li>• Groundwater Resource Management (2019a) Hydro-Meteorological and Surface Water Management Study. Warrawoona Gold Project. Pre-Feasibility Study. Prepared for Calidus Resources Ltd.</li> <li>• Groundwater Resource Management (2019b) Warrawoona Gold Project Pre-Feasibility Hydrogeological Investigations Report. Prepared for Calidus Resources Limited.</li> </ul>
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<b>Assessment</b>	<p>There are pools adjacent to the corridor all impacted by cattle grazing. Provided that clearing within creek lines is managed and minimised via the Warrawoona Gold Project Environmental Procedures, clearing of vegetation for a pipeline will not impact the quality of surface or underground water greater than the impacts currently experienced from cattle grazing.</p> <p>There is a low potential for minor impacts to the quality of surface water as a result of sedimentation or the release of hydrocarbons during pipeline construction. However, the likelihood of this occurring and the significance of this impact can be managed utilising the controls and management measures in place via the Warrawoona Gold Project Environmental Procedures.</p>
<b>Outcome</b>	The proposed clearing is not at variance with this Principle.

<b>Principle (j) Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence of flooding</b>	
<b>Supporting Studies</b>	<ul style="list-style-type: none"> <li>• Woodman Environmental (2019a) Detailed Flora and Vegetation Survey (formally Level 2).</li> <li>• Groundwater Resource Management (2019a) Hydro-Meteorological and Surface Water Management Study. Warrawoona Gold Project. Pre-Feasibility Study. Prepared for Calidus Resources Ltd.</li> <li>• Groundwater Resource Management (2019b) Warrawoona Gold Project Pre-Feasibility Hydrogeological Investigations Report. Prepared for Calidus Resources Limited.</li> </ul>
<b>Assessment</b>	The Brockman and Chinaman Creeks flow intermittently following periods of intense rainfall. Clearing within the corridor would not be expected to cause or increase the frequency or intensity of flooding.
<b>Outcome</b>	The proposed clearing is not at variance with this Principle.

## 5. RISK ASSESSMENT

### 5.1. Approach

A risk assessment of the application area has been undertaken of the potential environmental impacts within the application area. The risk assessment approach is based on guidance developed by the Department of Environment Regulation's (DER) *Risk Assessments Part V Division 3 EP Act* (DER 2017), which uses a consequence and likelihood rating system to determine the most appropriate risk rating for each impact. Details of the risk assessment approach are discussed below.

#### 5.1.1. Consequence

Consequence refers to an environmental outcome or impact arising from a risk event occurring. An assessment of consequence will indicate the seriousness of a risk event, which may be expressed in terms of environmental implications (Table 8).

Table 8. Consequence Risk Criteria

Consequence levels	Potential consequences/impacts
Severe	<ul style="list-style-type: none"> <li>on-site impacts: catastrophic</li> <li>off-site impacts local scale: high level or above</li> <li>off-site impacts wider scale: mid-level or above</li> <li>Mid to long term or permanent impact to an area of high conservation value or special significance</li> <li>Specific Consequence Criteria (for environment) are significantly exceeded</li> </ul>
Major	<ul style="list-style-type: none"> <li>on-site impacts: high level</li> <li>off-site impacts local scale: mid-level</li> <li>off-site impacts wider scale: low level</li> <li>Short term impact to an area of high conservation value or special significance<sup>^</sup></li> <li>Specific Consequence Criteria (for environment) are exceeded</li> </ul>
Moderate	<ul style="list-style-type: none"> <li>on-site impacts: mid-level</li> <li>off-site impacts local scale: low level</li> <li>off-site impacts wider scale: minimal</li> <li>Specific Consequence Criteria (for environment) are at risk of not being met</li> </ul>
Minor	<ul style="list-style-type: none"> <li>on-site impacts: low level</li> <li>off-site impacts local scale: minimal</li> <li>off-site impacts wider scale: not detectable</li> <li>Specific Consequence Criteria (for environment) likely to be met</li> </ul>
Slight	<ul style="list-style-type: none"> <li>on-site impact: minimal</li> <li>Specific Consequence Criteria (for environment) met</li> </ul>

Source: DER (2017)

### 5.1.2. Likelihood

Likelihood refers to the probability of an environmental risk event occurring. Risks that have a higher likelihood (i.e. frequent occurrences) have a greater chance of an environmental impact occurring (Table 9).

Table 9. Likelihood rankings

Likelihood levels	Frequency of risk events
Almost certain	The risk event is expected to occur in most circumstances
Likely	The risk event will probably occur in most circumstances
Possible	The risk event could occur at some time
Unlikely	The risk event will probably not occur in most circumstances
Rare	The risk event may only occur in exceptional circumstances

Source: DER (2017)

### 5.1.3. Risk rating determination

The risk rating is determined for a particular risk by combining the consequence level with the likelihood level (Table 10). The results of the risk evaluation process are summarised in a risk matrix table, noting that the main feature is to divide the matrix table into four ratings of risk classifications are:

- Extreme risks: Unacceptable. Risk event will not be tolerated. DWER may refuse application
- High risks: May be acceptable. Subject to multiple regulatory controls. Risk event may be tolerated and may be subject to multiple regulatory controls. This may include both outcome-based and management conditions.
- Medium risk: Acceptable, generally subject to regulatory controls. Risk event is tolerable and is likely to be subject to some regulatory controls. A preference for outcome-based conditions where practical and appropriate will be applied.
- Low risk: Acceptable, generally not controlled. Risk event is acceptable and will generally not be subject to regulatory controls.

Table 10. Risk rating matrix

		Consequence				
		Slight	Minor	Moderate	Major	Severe
Likelihood	Almost certain	Medium	High	High	Extreme	Extreme
	Likely	Medium	Medium	High	High	Extreme
	Possible	Low	Medium	Medium	High	Extreme
	Unlikely	Low	Medium	Medium	Medium	High

	Rare	Low	Low	Medium	Medium	High
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Source: DER (2017)

## 5.2. Potential Impacts

The potential environmental impacts are based on the preliminary environmental factors assigned to the broader Warrawoona Gold Project as determined by the EPA (Decision to Assess the Proposal, 23 December 2019, EPA Assessment Reference No. 2229). The Four key environmental factors, as identified by the EPA in their referral determination are:

- Flora and Vegetation
- Terrestrial Fauna
- Inland Waters; and
- Subterranean Fauna

This section provides an impact assessment of this NVCP application for each of these key preliminary factors. The potential direct and indirect impacts for each of these key preliminary factors is summarised in Table 11.

Table 11. Potential impacts

Impact type	Potential Impact	Description/ causing factor
<b>Terrestrial Fauna</b>		
Direct	Habitat loss	Direct loss of fauna habitat due to land clearing
Indirect	Habitat fragmentation	Habitat fragmentation from the establishment of infrastructure such as roads and utility corridors can restrict animal movements.
	Death or injury to individuals	Death or injury to individuals as a result of interactions with vehicles, infrastructure, machinery, and the workforce.
	Reduced habitat quality	Habitat modification and reduced habitat quality resulting from an increase in weeds may degrade the condition and resilience of local vegetation.
	Increased predation and competition	Increased predation and competition from introduced species as a result of new road corridors, and generation of food/water resources.
	Altered behaviour	Altered behaviour of native populations and/or individuals may occur as a result of dust emissions, artificial light, or water storage facilities
	Altered fire regimes	Altered fire regimes (e.g., increased frequency, intensity, extent) through uncontrolled or unintentional fires as a result of increased human activity in the area, has the potential to modify, degrade or remove fauna habitat or individuals.
<b>Flora and vegetation</b>		

Direct impacts	Loss of native flora.	Direct loss of conservation significant native flora.
	Vegetation removal	Direct loss of conservation significant vegetation or ecological communities
Indirect impacts	Downstream disturbance	Downstream disturbance/impact to wetlands and/or watercourses
	Reduction in remnant extent	Reduction in overall remnant vegetation extent
	Land degradation	Land degradation and reduction in environmental value of the local area
<b>Inland waters</b>		
Indirect	Loss of catchment area	Loss of catchment area
	Altered water flow	Altered surface water flow downstream
	Contamination	Groundwater and surface water contamination
<b>Subterranean Fauna</b>		
Indirect	Contamination	Groundwater and surface water contamination

### 5.3. Risk assessment and rating

Overall, the risk assessment process identified 16 potential impacts, 11 rated as Medium and five rated as Low (Table 12). No high or extreme risks were identified. These risks are all considered acceptable, with some level of regulatory control depending on the potential impact.

Table 12. Risk assessment and rating

Ref	Potential Impact	Assessment, mitigation, and comments	Consequence	Likelihood	Risk rating
<b>Terrestrial Fauna</b>					
1	Direct loss of habitat for conservation significant fauna species	<p>Approximately 5.19 ha of high significance Sandplain habitat will be disturbed. Sandplain habitat is known to support Brush-tailed Mulgara, and potentially Night Parrot and Greater Bilby (not confirmed from site).</p> <p>Approximately 1.04 ha of high significance Major drainage habitat will be disturbed. Major drainage is known to support foraging activities of the Ghost bat, Pilbara leaf nosed bat and Pilbara olive python.</p> <p>Approximately 33.83 ha of moderate significance habitat will be disturbed, including:</p> <ul style="list-style-type: none"> <li>Stony Plain - potential habitat for the Spectacled Hare-Wallaby and Western Pebble-mound Mouse and some suitable areas of potential habitat for the Night Parrot (31.89ha).</li> <li>Hillcrest/hillslope – potential foraging area for the Ghost bat, Pilbara leaf nosed bat and Western Pebble-mound mouse (1.10ha)</li> </ul> <p>Existing pastoral tracks will be used, where available, thus minimising new disturbance.</p>	Minor	Likely	Medium
2	Habitat fragmentation from the establishment of infrastructure such as roads and utility corridors can restrict animal movements.	<p>The pipeline and associated road plans to establish an infrastructure corridor of approximately 40 km. The majority of which is within moderate significance habitat type (87.94%).</p> <p>Most species assessed are known to cross roads and corridors to access habitat.</p> <p>Road corridor does not intersect or lie between core habitat and so movement between habitats on either side of the corridor may be limited.</p> <p>Vast majority of the pipeline and road will be placed along existing pastoral tracks.</p>	Minor	Possible	Medium

3	Death or injury to individuals as a result of interactions with vehicles, infrastructure, machinery and the workforce.	<p>The construction activities will occur during daylight hours and vehicle movement at night will be limited.</p> <p>Many of the species assessed are known to be comfortable crossing roads and corridors. Some species are more susceptible (i.e. Pilbara Olive Python is known to lay still in response to vehicle vibration) than others (i.e. small rodents).</p>	Moderate	Possible	Medium
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Ref	Potential Impact	Assessment, mitigation and comments	Consequence	Likelihood	Risk rating
		<p>Individual deaths can affect some very small local populations (i.e. Bilby – although not confirmed from local surveys it may potentially occur), however other species have high fecundity and boom-bust life modes and can easily recover from individual deaths (i.e. Western Pebble-mound Mouse).</p> <p>The road corridor does not intersect (or lie between) core habitat for conservation significant species and so movement between habitats and via road crossings may be limited.</p> <p>Speed restrictions and hours of operation will apply. Site personnel will be made aware of this issue through inductions and fauna management procedures.</p>			Medium
4	Habitat modification and reduced habitat quality resulting from an increase in weeds may degrade the condition and resilience of local vegetation.	<p>Cleared areas will not be left undeveloped for long, rather, areas will be developed (road or camp construction) soon after clearing.</p> <p>No introduced taxa listed as Weeds of National Significance (as listed under AWC 2019), one Declared Pest (<i>*Calotropis procera</i>) (as listed under DPIRD 2019) and five introduced taxa.</p> <p>Hygiene management and weed control procedures will be implemented</p>	Minor	Unlikely	Medium
5	Increased predation and competition from introduced species as a result of new road corridors, and generation of food/water resources.	<p>Feral predators have already been recorded on site, in part due to existing (historic) mining tracks and disturbance workings across the local area.</p> <p>Camp waste hygiene practices will be implemented and site personnel will be made aware of feral animals and be required to avoid and report any interactions via inductions and fauna management procedures.</p> <p>Feral animal control measures will be implemented opportunistically.</p>	Moderate	Possible	Medium

6	Altered behaviour of native populations and/or individuals may occur as a result of dust emissions, artificial light or water/waste storage facilities	<p>Some native animals are known to reside or frequent mine camps and infrastructure if resources (i.e. water, waste food, shelter etc) are available to them.</p> <p>Dust impacts will be limited as small clearing areas will be developed immediately and dust management procedures will be implemented.</p> <p>Light design will consider light impacts towards the Warrawoona Range (for potential light impacts on bats).</p> <p>Activities will not occur during night hours so prolonged and intense lighting will not be required.</p>	Minor	Possible	Medium
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Ref	Potential Impact	Assessment, mitigation and comments	Consequence	Likelihood	Risk rating
		Site personnel will be made aware of animal interaction issues via fauna management procedures and inductions.			
7	Altered fire regimes through uncontrolled or unintentional fires as a result of increased human activity.	<p>Fire is a regular occurrence in the Pilbara, predominantly as a result planned controlled burning activities or unplanned events such as lightning storms.</p> <p>Site personnel will be inducted in fire management procedures to prevent fires from starting within the application area and to control and contain unplanned and unintentional fires in and around the application area to avoid fire spread.</p>	Moderate	Unlikely	Medium
<b>Vegetation and Flora</b>					
8	Direct loss of conservation significant native flora.	<p>No Threatened flora, listed under the EPBC Act or BC Act, will be impacted in the application area</p> <p><i>Eragrostis crateriformis</i> (DBC Priority 3) was recorded from one location within the corridor from stony plain habitat (Rapallo 2021) and occurs throughout the Warrawoona Gold Project, recorded from minor drainage lines and sheet flow areas of red sandy clay (Woodman 2020). Removal of one location will not alter the conservation status of this species.</p>	Minor	Likely	Medium



9	Direct loss of conservation significant vegetation or ecological communities	<p>The proposed clearing footprint comprises approximately 51.67 ha of native vegetation.</p> <p>No State or Commonwealth listed Threatened Ecological Communities (TECs) occur within the proposed area.</p> <p>No DBCA listed priority Ecological Communities (PECs) were inferred by Rapallo (2021).</p> <p>Five vegetation types occur within the applications area, all of which are widespread throughout the Pilbara region.</p>	Minor	Likely	Medium
10	Downstream disturbance/impact	<p>There are no Nationally Important Wetlands or RAMSAR wetlands located within the application area, with the closest National Important Wetland, the De Grey River, located approximately 70km to the north of the application area (DoEE 2018).</p>	Moderate	Rare	Low

Ref	Potential Impact	Assessment, mitigation and comments	Consequence	Likelihood	Risk rating
	to wetlands and/or watercourses	<p>There are no permanent pools in the vicinity for the proposed development.</p> <p>There are some minor ephemeral outwash plains and drainage lines within the application area.</p>			
11	Reduction in overall remnant vegetation extent	<p>Disturbance will occur over a very small footprint (~51.67ha).</p> <p>The proposed clearing footprint occurs within a large contiguous of remnant vegetation.</p> <p>This NVCP application is represented by two vegetation associations (Abydos Plain 93 and George Ranges 82) (Table 5), both of which occur over very large areas of the Pilbara (432,038ha and 316,855 respectively) and have been subject to very limited clearing (less than 1 %) since European settlement.</p>	Moderate	Unlikely	Medium

12	Land degradation and reduction in environmental value of the local area	<p>Cleared areas will not be left undeveloped for long, rather, areas will be developed (road or camp construction) soon after clearing.</p> <p>Dust management and topsoil stockpile management procedures will be implemented.</p> <p>Infrastructure will be engineered to manage surface water flows and consider and implement water erosion measures in all surface water design.</p> <p>Botanic surveys found no introduced taxa listed as Weeds of National Significance (as listed under AWC 2019), one Declared Pest (<i>Calotropis procera</i>) (as listed under DPIRD 2019) and five introduced taxa.</p> <p>Hygiene management and weed control procedures will be implemented</p>	Minor	Unlikely	Medium
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**Inland Waters**

13	Loss of catchment area	<p>The proposed development is located within the Brockman Creek Upper Catchment (area of 396.2 km<sup>2</sup>), which in turn is located within the broader Coongan River Catchment (7,080km<sup>2</sup>).</p> <p>Based on soil, habitat and vegetation mapping within the application area, approximately 0.4ha of the application area is represented by either minor or medium drainage lines or outwash plains, within the 7,080km<sup>2</sup> Coongan River Catchment.</p> <p>The total area of disturbance (approximately 51.67ha) represents 0.13% of the local Brockman Creek Upper Catchment and 0.007% of the total Coongan River Catchment area.</p>	Slight	Possible	Low
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Ref	Potential Impact	Assessment, mitigation and comments	Consequence	Likelihood	Risk rating
14	Altered surface water flow downstream	<p>The proposed development crosses over several outwash plains and minor drainage lines. The pipeline will be buried in these locations so as not to inhibit surface water flows.</p> <p>The proposed development is located within the Brockman Creek Upper Catchment (area of 396.2 km<sup>2</sup>), which in turn is located within the broader Coongan River Catchment (7,080km<sup>2</sup>).</p> <p>The total area of disturbance (approximately 51.67ha) represents 0.13% of the local Brockman Creek Upper Catchment and 0.007% of the total Coongan River Catchment area.</p> <p>Tropical cyclones in the Pilbara occur relatively frequently and are therefore considered in the design of infrastructure and surface water management measures throughout all developments in the region.</p>	Slight	Unlikely	Low

15	Groundwater and surface water contamination	Best practice Hydrocarbon management and handling procedures will be implemented.	Slight	Unlikely	Low
<b>Subterranean Fauna</b>					
16	Groundwater and surface water contamination	Best practice Hydrocarbon management and handling procedures will be implemented.	Slight	Unlikely	Low

## 6. ENVIRONMENTAL MANAGEMENT

### 6.1. Management Approach

Calidus has developed a number of procedures to help manage and mitigate potential impacts from the broader WGP. Procedures most relevant to managing impacts resulting from this NVCP application are summarised in Table 13 and key actions from these procedures is further provided in the following section (Section 6.2, Key Management Actions).

Table 13. Key environmental management documentation relevant to terrestrial fauna

Environmental Management Document	Calidus Reference
<b>Environmental Management</b>	
Environmental Management Standard	CRL-ENV-STA-001-19
<b>Fauna management</b>	
Significant Species Management Plan	CRL-ENV-PLN-006-19
Fauna Management Procedure	CRL-ENV-PRO-007-19
Introduced Fauna Control Procedure	CRL-ENV-PRO-009-19
Ground Disturbance Permit Procedure	CRL-ENV-PRO-002-19
<b>Water Management</b>	
Surface Water Monitoring Procedure	CRL-ENV-PRO-020-19
Groundwater Monitoring Procedure	CRL-ENV-PRO-021-19

### 6.2. Key Management Actions

#### 6.2.1. Avoid harm to individuals through fauna protection measures

- Include fauna protection specifications in all construction related contracts and sub-contracts, including no barbed wire fencing at the project area and measures to prevent accidental entrapment of fauna such as the Northern Quoll
- Induct workforce on fauna identification and encounter (including physical interaction, littering, feeding, approaching and unexpected encounters) and educate the mine site personnel about the fauna of conservation significance within the project area.
- During construction, any trenches that remain open overnight must follow trench management procedures, including a provision for ramps to assist trapped fauna and to relocate trapped fauna unable to escape (using trained fauna handlers).

#### 6.2.2. Adaptive monitoring and management measures

- Implement the Significant Species Management Plan (CRL-ENV-PLN-006-19), which contains specific management and monitoring targets for fauna of conservation significance, to be reviewed on a regular basis. Key monitoring components of the Significant Species Management Plan include:

- Significant bats. Bat monitoring will include: 1) prior to project implementation, ongoing surveys at significant roosts; 2) prior to project implementation, bat activity at the existing Copenhagen mine pit lake across all seasons; 3) during operations, monitoring bat activity at impact and non-impact (control) sites, including the mining exclusion zone; 4) during operations, activity levels near night infrastructure (i.e. plant site), as well as bat activity during key project development milestones (e.g. blasting for the first time, blasting at significantly closer locations, first outflow of TSF or when pooling starts etc).
- Other conservation significant species (Northern Quoll, Pilbara Olive Python, Bilby). Monitoring will include pre-clearance surveys for key species using approved DBCA methodology, targeted surveys of suitable habitat adjacent the mine areas and monitor population changes over time.
- Monitor groundwater levels and quality and adjust modelling accordingly.

### **6.2.3. Measures to reduce impacts from habitat removal, fragmentation, and modification**

- Implement Ground Disturbance Permitting Procedure (CRL-ENV-PRO-002-19) to ensure disturbance remains within authorised boundaries.
- Prevent unauthorised access to habitats of conservation significance, including the mining exclusion zone.
- Develop and implement rehabilitation and mine closure principles and procedures that include aims to rehabilitate self-sustaining fauna habitat.
- Maintain natural drainage flows where practicable and prevent ponding of water.

### **6.2.4. Measures to reduce impacts from light and general operational noise/vibration**

- During both construction and operation stages, design artificial lighting to illuminate work areas and limit illumination of the surrounding landscape, such as water sources and substantial rocky outcrops. Directing lights inwards towards work activities will minimise lighting effects on fauna in adjacent areas.
- Implement best available technology to minimise noise emissions from mining operations.
- Reduce traffic and equipment usage at night to minimise noise disruption.
- Mine and infrastructure planning has considered the location and position of the accommodation village, to minimise artificial lighting of the bat roost entrances.

### **6.2.5. Measures to reduce impacts from vehicle strike**

- Investigate strategies to reduce impacts on fauna from all construction traffic, especially for nocturnal species or those prone to vehicle collisions, including speed limits, signage, fences or barriers.
- Prevent unauthorised off-track driving.
- Report and record any incident that results in the injury or death of a fauna species from vehicle strike.

### **6.2.6. Measures to reduce impacts from introduced species**

- Conduct opportunistic monitoring and control of feral animals and implement measures to reduce the abundance of feral species in the project area
- Employ housekeeping measures such as covering up landfill and bin management.
- Implement quarantine and hygiene controls to prevent the inadvertent introduction of Cane Toads and other introduced species (including weeds).

### **6.2.7. Measures to reduce impacts from dust**

- Prepare and implement dust management procedures to reduce the effects of dust on nearby vegetation and fauna habitats, including management of vehicle speed on unsealed roads, dust suppression measures (spray trucks) and proximity of habitats to blasting and excavation.
- Implement standard dust suppression measures across the WGP area during construction and operation

### 6.2.8. Measures to reduce impacts from changed fire regimes

- Prepare and implement best practice fire control strategies to manage unplanned fires, including educating and training staff on equipment and procedures.
- Control and manage weeds as they contribute to an increased fuel load and fire risk.

## 7. CONCLUSION

Baseline studies since 2016 have contributed significantly to the scientific understanding of environmental significance of the broader WGP and allowed Calidus to design the project in a way that identifies, prevents and minimises adverse environmental impacts.

The wider investigations of the WGP have relied on the technical skills and experience of over 25 specialised consultants and covered a range of environmental factors and aspects relevant to the project, including terrestrial and subterranean fauna; flora and vegetation; air quality (dust); noise; vibration/blasting; geotechnical and geochemical analysis of soils and waste; hydrogeology and hydrology; and ethnographic and archaeological investigations.

The results of these investigations, consultations and risk assessments have all been taken into account in developing the project, including the proposal presented in this document.

As part of an adaptive management approach, Calidus will continue to work closely with technical experts across a range of environmental factors (i.e. bat and other fauna specialists, hydrologists, botanists) to better understand the issues and to refine/adapt management measures accordingly.

An assessment of the impacts of this NVCP application against the ten clearing principles has determined that the clearing is not at variance or is unlikely to be at variance with these principles.

## 8. REFERENCES

- Armstrong, K. (2001) The distribution and roost habitat of the Orange Leaf -nosed Bat, *Rhinonicteris aurantius*, in the Pilbara region of Western Australia. *Wildlife Research* **28**, 95–104.
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## Flora and Vertebrate Fauna Assessment of the Moolyella Pipeline Corridor

Prepared for: Calidus Resources Limited

Date: 14 May 2021

Rapallo Environmental is a Western Australian consultancy with a strong reputation for technical excellence, client-focus and innovation. We build long-term alliances through outstanding delivery on a range of services to the resource sector, government and associated industries.



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Report No. J020702  
Flora and Vertebrate Fauna Assessment of the Moolyella Pipeline Corridor  
Prepared for Calidus Resources  
14 May 2021

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## Executive Summary

Calidus Resources Limited (Calidus) commissioned Rapallo Environmental (Rapallo) to conduct a combined flora and fauna assessment for the Moolyella Pipeline corridor associated with the Warrawoona Gold Project.

The survey area for the project, covers approximately 413 hectares (ha) and, traverses approximately 37 kilometres (km) beginning at the Warrawoona Gold Project and terminating at the Moolyella Borefield located approximately 20 km north east of Marble Bar within the Pilbara region of Western Australia.

The objective of the survey was to provide a baseline assessment that identifies conservation significant vertebrate fauna species, conservation significant flora species and vegetation types that may potentially be impacted by clearing for a pipeline corridor linking the Moolyella borefield to the Warrawoona Gold Project.

### Flora desktop results

A review of all available literature and database relevant to the survey area was conducted to compile a list of conservation significant flora species with the potential to occur with the Moolyella pipeline corridor. A total of 14 survey reports were reviewed and four databases searched. The literature review and database searches identified a total of 46 taxa of conservation significant flora that could potentially occur on the survey area (one Threatened taxon, 16 Priority 1 taxa, three Priority 2 taxa, 21 Priority 3 taxa and five Priority 4 taxa).

These flora taxa were ranked between highly likely and unlikely to occur based on habitat specificity and the occurrence of records proximal to the survey area.

Four species were assessed to be “Highly Likely” to occur on the survey area.

- *Eragrostis crateriformis* (DBCA Priority 3)
- *Heliotropium murinum* (DBCA Priority 3)
- *Euphorbia clementii* (DBCA Priority 3)
- *Ptilotus mollis* (DBCA Priority 3)

Four species were assessed to be “Likely” to occur on the survey area.

- *Josephinia* sp. Woodstock (A.A. Mitchell PRP 989) (DBCA Priority 1)
- *Bulbostylis burbridgeae* (DBCA Priority 4)
- *Heliotropium muticum* (DBCA Priority 3)
- *Gomphrena leptophylla* (DBCA Priority 3)

Thirty-eight species were assessed to be “Possible to Unlikely” to occur on the survey area.

Threatened flora was considered unlikely to occur on the survey area.

### Flora survey results

The survey recorded 115 flora taxa from 28 different families. These included 110 native taxa and six introduced taxa (weeds). The most well-represented families were Fabaceae (35 taxa), Poaceae (16 taxa), Malvaceae (7 taxa) and Myrtaceae (6 taxa). The greater majority (79%) of flora taxa recorded were perennials, with annuals making up only 12%, while the life cycle of the remaining taxa was undefined.

Nine vegetation types were recorded in the survey area, none of which represent a threatened ecological community or priority ecological community (TEC-PEC).

No threatened flora species were recorded, however one priority flora species, *Eragrostis crateriformis* (DBCA Priority 3) was recorded from a single location in the northern part of the survey area, within vegetation type A. It is considered highly likely to occur elsewhere in the survey area, especially on stony plain and around creek lines.

Six flora groundwater dependent taxa were recorded during the survey. These were the obligate phreatophytes *Eucalyptus camaldulensis* and *Melaleuca argentea* recorded primarily from vegetation type C (Major Drainage habitat). The facultative phreatophytes *Acacia ampliceps* (and a potential hybrid *Acacia ampliceps* x *sclerosperma*), *Atalaya hemiglaucula*, *Eucalyptus victrix*, and *Melaleuca glomerata* were recorded from vegetation type C (Major Drainage), vegetation type D (Medium Drainage – rocky), vegetation type E (Medium Drainage – sandy), and vegetation type A (Stony Plain).

Six introduced flora (weed) species were recorded within the survey area, none of which represent a Weed of National Significance or a Declared Pest. Weeds were most abundant within drainage landforms. \**Cenchrus ciliaris* (buffel grass) was the most abundant and widespread weed species recorded.

#### **Broad vegetation types recorded in the survey area**

The vegetation of the survey area comprised a variation of spinifex (*Triodia* spp.) grasslands, mostly on stony or sandy plains, with an overstorey of mixed shrubs and small trees dominated by different *Acacia* species that defined each vegetation types. Major, medium, and minor creek lines intersected the plains, with the major and medium creek lines supporting a variety of groundwater dependent flora species.

Nine broad vegetation types were recorded during the survey. The most extensive was vegetation type A - *Acacia inaequilatera* over *Triodia epactia* and *T. wiseana* on stony plain, which covered 318.9 ha or 77.0% of the survey area. It fell primarily in the Macroy land system, with a small section in the Talga land system. Vegetation type B – *Acacia stellaticeps* over *Triodia epactia* and *T. longiceps* on sand plain was the next most dominant vegetation type, covering 41.6 ha (10.0%) of the survey area. A significant part of the survey area, covering 25.9 ha (6.3%) was disturbed by mining and other activities.

Condition of the vegetation units (and habitats) ranged from 'Excellent' to 'Poor', with the majority of the survey area rated as 'Very Good'. Vegetation condition decline was often correlated with evidence of cattle grazing – especially so within the major and medium drainage habitats and proximal to station bores at Moolyella. The majority of the survey area was long unburnt with the exception of the granite outcrops.

The broad vegetation types of the survey area were assessed for the potential to support the eight conservation significant flora taxa identified in the desktop as likely to highly likely to occur in the survey area. Flowering period was also taken into account to assess the possibility for the survey team to have recorded these taxa in the field. The assessment indicated that all the broad vegetation types in the survey area have potential to support one or more conservation significant flora taxa. However, only one taxon (*Eragrostis crateriformis*) was recorded during the survey. Six of the eight taxa were small annual or short-lived perennial herbs or grasses. Although the survey overlapped with the flowering time of four of the eight taxa (Table 12), the dry conditions during the survey means that the possibility of these taxa occurring in the survey area cannot be discounted. The survey was not a targeted survey as per EPA (2016a), however the narrow corridor did focus the survey maximizing the likelihood of recording conservation significant species provided they were extant/identifiable at the time of survey.

## **Fauna desktop results**

A review of all available literature and database relevant to the survey area was conducted to compile a list of vertebrate fauna species with the potential to occur within the survey area. A total of 12 reports were reviewed and four databases searched.

The literature review and database searches identified a total of 329 vertebrate fauna species which have the potential to occur within the survey area. This comprises 37 native and 10 introduced mammal species, 162 bird species, 106 reptile species, 10 amphibian species and four fish species. Not all species are likely to occur in the survey area due to the large search extent of the desktop assessment. Additionally, many species tend to be patchily distributed even where appropriate habitats are present, and many species of birds can occur as regular migrants, occasional visitors or vagrants.

A total of 32 species of conservation significance were identified in the literature review and database searches as potentially occurring within the survey area, including nine mammals, 19 birds and four reptiles. This comprised eight species listed as Threatened (five mammals, two birds and one reptile), one species listed as Other Specially Protected under the *Biodiversity Conservation Act* 2016 (BC Act) and seven species listed as Priority by the DBCA (four mammals and three reptiles). Nineteen bird species are listed as Migratory (all birds) under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) and/or BC Act.

Excluding migratory birds, of the species of conservation significance identified as potentially occurring within the survey area, one species were “Confirmed” (Pilbara leaf-nosed bat), five species assessed as “Highly Likely”, five species as “Likely” and the remainder were listed as “Possible” (four species) or “Unlikely” (one species) due to lack of suitable habitat and/or based on species distribution and lack of contemporary records.

Migratory birds were assessed as “Possible (infrequent visitor)” (seven species) to “Unlikely” to occur (8 species), dependent on the species distribution and contemporary records primarily due to the presence of habitat within the major and medium drainage lines and the dams within the historical mining areas. One migratory bird was confirmed on the survey area (Common sandpiper). Of the Migratory birds, the Australian painted-snipe is also listed Endangered (EPBC and BC Act) and the Curlew sandpiper is listed Critically Endangered (EPBC and BC Act). Both species were assessed as “Unlikely” to occur based on habitat and species distribution.

## **Vertebrate fauna species recorded during the survey**

The survey recorded 92 vertebrate fauna species from the survey area. These comprised 63 birds, 12 mammals, 16 reptiles, and one species of frog. Most fauna records came from opportunistic sightings while traversing the survey area, while additional records of mammals and reptiles were recorded on the cameras. The majority of mammal species recorded were bats (seven species) which were all recorded from SM4 ultrasonic recorders.

Two conservation significant species were recorded during the survey. These were the Pilbara leaf-nosed bat (Vulnerable under the BCA and EPBC Act) and the common sandpiper (Migratory BCA and EPBC Act). The Pilbara leaf-nosed bat was picked up as a foraging visitor on one of the SM4 ultrasonic recorders. Since the survey area does not support any caves, the species would not be a resident within the survey area. The common sandpiper is listed Migratory under both the BCA and EPBC Act. It was recorded opportunistically at one of the artificial dams in the disturbed areas (vegetation type X). This species can move large distances in response to availability of water bodies and would not be restricted to the survey area.

## **Fauna habitats recorded in the survey area**

Stony Plain was the dominant broad fauna habitat within the survey area, covering approximately 318.9 hectares (78%), followed by Sand Plain: 41.6 hectares (10.1%), Major Drainage: 8.3 hectares (2%), Hillcrest /Hillslope: 7.7 hectares (1.9%). The remaining four broad fauna habitats each covered less than 1 percent of the survey area : Medium drainage – Rocky (2.4 hectares), Medium drainage – Sandy (1.7 hectares), Low Stony Hills (0.9 hectares) and Granite Outcrop (3.3 hectares).

Of the 9 broad fauna habitats recorded within the corridor, the Major Drainage habitat and Sand Plain habitat were assessed as high significance for vertebrate fauna due to the potential to provide core habitat for species of conservation significance. The remainder were deemed to be of moderate significance, either due to foraging/dispersal habitats, or habitats known to support priority or migratory species.

### **Sand Plain Habitat**

Sand Plain habitat was ranked as High significance due to the potential for Greater bilby and Brush-tailed mulgara breeding, foraging and dispersal habitat. The Greater bilby is listed as Vulnerable under the EPBC Act and BC Act . The Brush-tailed mulgara is listed as Priority 4 by DBCA. Both species are rated as “Highly Likely” to occur on the survey area.

There are Greater bilby records proximal to the corridor from 2014 in the DBCA threatened species database. No evidence of Greater bilby was recorded during the current survey; nor was the species detected via targeted searches for the Warrawoona Gold Project (Biologic 2019a).

Greater bilbies are recorded as having low site fidelity and high mobility (Southgate et al. 2007); males regularly move three to five kilometres between burrows on consecutive days; and have been recorded moving up to 15 km in a few weeks (Southgate & Possingham 1995).

Brush-tailed mulgara has been recorded from the Sandy Plain habitat of the Warrawoona Gold Project (Biologic 2019a). Mulgara can use multiple burrow systems within a home-range and changing these frequently (Körtner et al. 2008).

Sand Plain habitat provides breeding, shelter, foraging, dispersal habitat for the Spectacled hare-wallaby (DBCA Priority 4) and supporting habitat (dispersal and foraging habitat) for Grey falcon (Vulnerable under the BC Act and EPBC Act), Pilbara leaf-nosed bat, and Ghost bat (both listed as vulnerable under the EPBC Act and BC Act). Sand Plain habitat contains some suitable areas of habitat for the Night parrot listed as Endangered under the BC Act and EPBC Act. Night parrot was not recorded on the corridor via acoustic recorder).

A total of 41.6 ha of the corridor (10 %) comprises Sand Plain habitat and a substantial amount is known to occur outside the corridor to the south of the Warrawoona Gold Project. The habitat type is widespread in the broader landscape, and not restricted to the corridor (Biologic 2019a). Fauna occurring on the Sand Plain Habitat are therefore unlikely to be substantially impacted by clearing for a pipeline, from a regional perspective.

Local populations of Greater bilby and Brush-tailed mulgara may be temporarily impacted by clearing of any active burrows. Clearing activities should be managed to avoid burrows to minimise impacts to such species. Neither Greater bilby , Brush-tailed mulgara or species known to use the Sand Plain habitat would not be restricted to the Sand Plain habitat of the survey area.

### **Major Drainage Habitat**

The Major Drainage habitat provides a range of microhabitats and a stable source of food and water, within vast landscape of relatively resource-poor spinifex plains (How et al. 1991). More specifically, nectivorous avifauna benefit from the flowering plants and hollow-nesting species make use of the large eucalypts that line the banks (Burbidge et al. 2010)). Mammal, reptile and amphibian fauna may also congregate around permanent water pools (How et al. 1991).

Due to the widespread availability of microhabitats, such as leaf litter accumulations, large trees, hollows, and semi-permanent/permanent water sources, the Major Drainage habitat provides foraging and dispersal habitat for Northern quoll, Pilbara leaf-nosed bat, Pilbara olive python and Peregrine Falcon and Northern Brushtail Possum and where there is sufficient moisture Gane's blind snake. Grey falcon may utilise the Major Drainage habitat for nesting and foraging.

Until habitat preferences are further defined for Ghost bat it is assumed that the Major Drainage habitat is also utilised in some capacity by Ghost bat.

Local populations of Northern quoll, Pilbara leaf-nosed bat, Pilbara olive python, Peregrine falcon, Northern Brushtail Possum, Gane's blind snake and migratory birds are not anticipated to be impacted by the clearing of a narrow corridor of Major Drainage habitat beyond temporary displacement and direct short-term impact from machinery because this habitat does not contain critical or preferred breeding habitat for the majority of these species. Northern quoll, Pilbara olive python and Peregrine Falcon breeding habitat is located within the Rocky breakaway habitat of the Warrawoona Gold Project and will not be impacted by the proposal. The Rocky breakaway habitat is extensive and predominately intact (only 0.8 ha of this habitat has been approved for clearance within the Warrawoona Gold Project).

Both Gane's blind snake and the Northern Brushtail Possum have a patchy distribution and are infrequently recorded. The migratory birds are all infrequent visitors to the area.

The Pilbara leaf-nosed bat will potentially forage over most habitats within the corridor with Major Drainage containing most significant foraging habitats due to proximity of pools, however it is noted that the Pilbara leaf-nosed bat was also recorded foraging at the artificial water bodies that occur on the corridor. Ghost bat will potentially forage over most habitats of the corridor.

Grey Falcon does use the Major Drainage habitats for breeding, however it is noted that this habitat is not restricted and the species has not been recorded nesting on the corridor.

A total of 8.3 ha of the corridor (2%) comprises of Major Drainage habitat. The habitat type is widespread in the broader landscape, and the affected areas are contiguous with surrounding occurrences of Major Drainage habitat. Fauna occurring within this habitat type are therefore unlikely to be substantially impacted by clearing for a pipeline, from a regional perspective.

Stony Plain, the dominant habitat within the corridor (78%) provides breeding, shelter, foraging, dispersal habitat for the priority listed Western Pebble-mound mouse and Spectacled hare-wallaby and supporting habitat (dispersal and foraging habitat) for Grey falcon, Pilbara leaf-nosed bat, and Ghost bat. Stony Plain provides potential *Ctenotus nigrilineatus* habitat. Stony Plain habitat contains some suitable areas of habitat for the Night parrot listed as Endangered under the BC Act and EPBC Act. Night parrot was not recorded on the corridor via acoustic recorder.

Minor Drainage, Medium Drainage – rocky and Medium Drainage – sandy habitats provides potential dispersal and foraging habitat for Pilbara olive python, Ghost bat, Pilbara Leaf-nosed bat, Peregrine falcon, Grey Falcon, Oriental plover and where there is sufficient moisture, Gane's blind snake. As these habitats are primarily dispersal and foraging habitat for Conservation Significant species, fauna

occurring within this habitat type are unlikely to be substantially impacted by clearing for a pipeline, from a regional perspective.

Hillcrest/ Hillslope, provides supporting habitat (dispersal and foraging habitat) for Ghost bat, Pilbara Leaf-nosed bat and Long-tailed dunnart (DBCA Priority 4) and breeding, shelter, foraging, dispersal habitat for the Western Pebble-mound mouse (DBCA Priority 4). Hillcrest/ Hillslope contains potential habitat for *Ctenotus uber johnstonei* (DBCA Priority 2). This habitat is primarily dispersal and foraging habitat for listed threatened species, fauna occurring within this habitat type are unlikely to be substantially impacted by clearing for a pipeline, from a regional perspective.

Low Stony Hills and Granite Outcrop provides potential dispersal and foraging habitat for Ghost bat, Pilbara Leaf-nosed bat, Northern quoll. Granite Outcrop provides potential *Ctenotus nigrilineatus* habitat. These habitat are primarily dispersal and foraging habitat for listed threatened species, fauna occurring within this habitat type and are unlikely to be substantially impacted by clearing for a pipeline, from a regional perspective.

Given the habitats are represented outside of the survey area, throughout the region and in conservation estate and primarily represent foraging and dispersal habitat of listed threatened species rather than breeding habitat, with management (clearing protocols and preclearance surveys), clearing within the survey area is unlikely to impact local populations beyond temporary displacement.

Note Pilbara leaf-nosed bat and Ghost bat breeding habitat is located within the old workings proximal to the Warrawoona Gold project and breeding habitat will not be impacted by clearing in pipeline corridor. No additional roosts were located during the survey.



# 1 Introduction

## 1.1 Project overview

Calidus Resources Limited (Calidus) commissioned Rapallo Environmental (Rapallo) to conduct a combined flora and fauna assessment for the Moolyella Pipeline corridor associated with the Warrawoona Gold Project.

The Moolyella borefield is located around 30 kilometres (km) to the north of the Warrawoona Gold Project on the Talga River floodplain, and the Narri borefield is located around 8 km north of the Warrawoona Gold Project within the upper catchment of Brockman Creek. The Moolyella and Narri borefields will connect to the Warrawoona Gold Project via the Moolyella pipeline corridor. The proposed pipeline corridor is approximately 37 km in length and 100 meters (m) wide. The pipeline corridor will hereafter be referred to as the survey area (Figure 1).

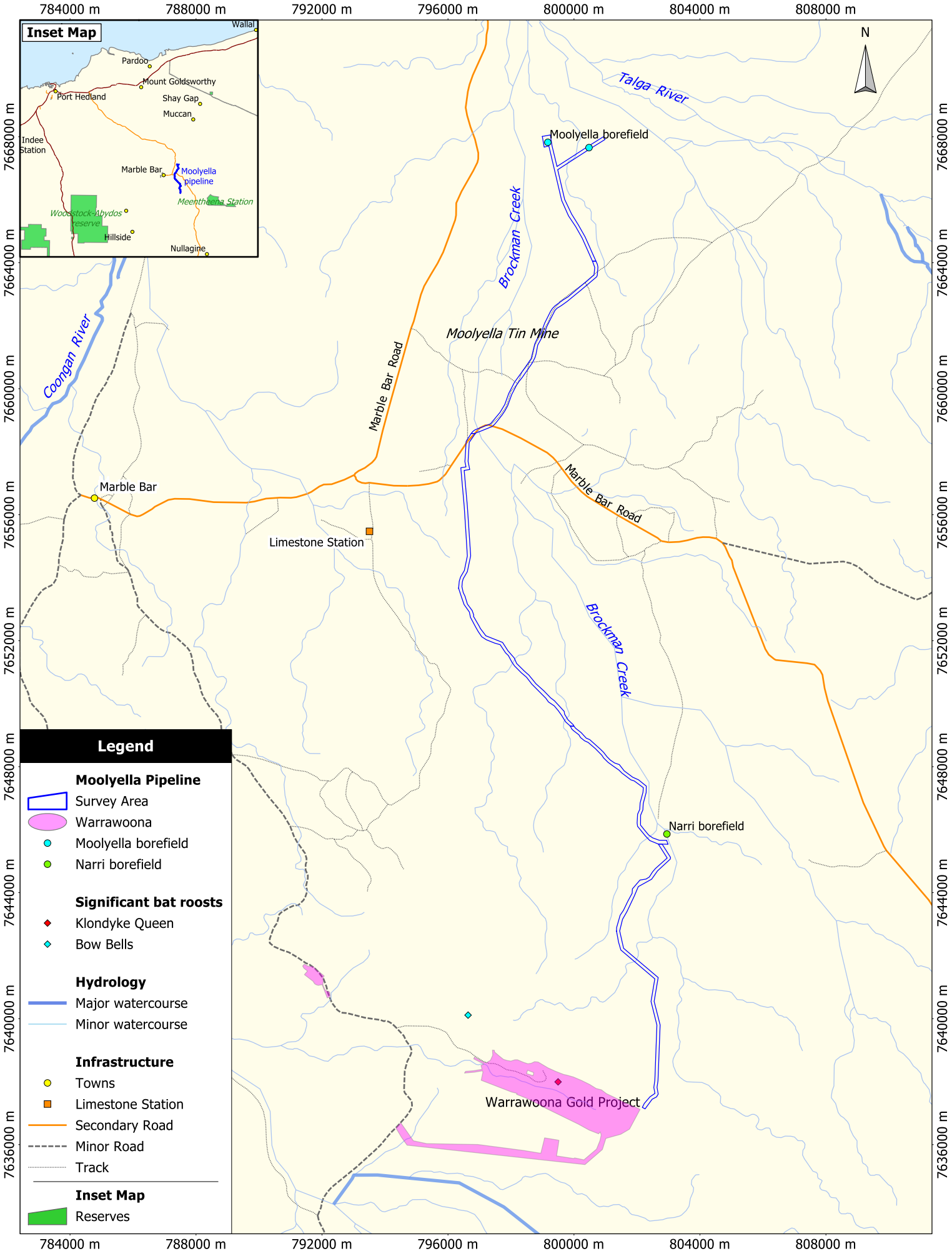
## 1.2 Scope and objectives

The objectives of the reconnaissance flora and vegetation survey were to:

- Complete a desktop study to document the regional flora and vegetation and to identify conservation significant flora and ecological communities that may occur in the survey area.
- Conduct a reconnaissance field survey of the proposed corridor to map broad-scale vegetation communities and describe the floristic diversity of the survey area, verify desktop information and determine if the habitats of the survey area contain conservation significant flora and vegetation.

The objectives of the basic vertebrate fauna survey were to:

- Complete a desktop study to understand the regional fauna assemblage and habitats.
- Conduct a basic fauna survey of the proposed corridor to identify and map broad-scale fauna habitats, verify desktop information and determine if conservation significant vertebrate habitats occur within the survey area.

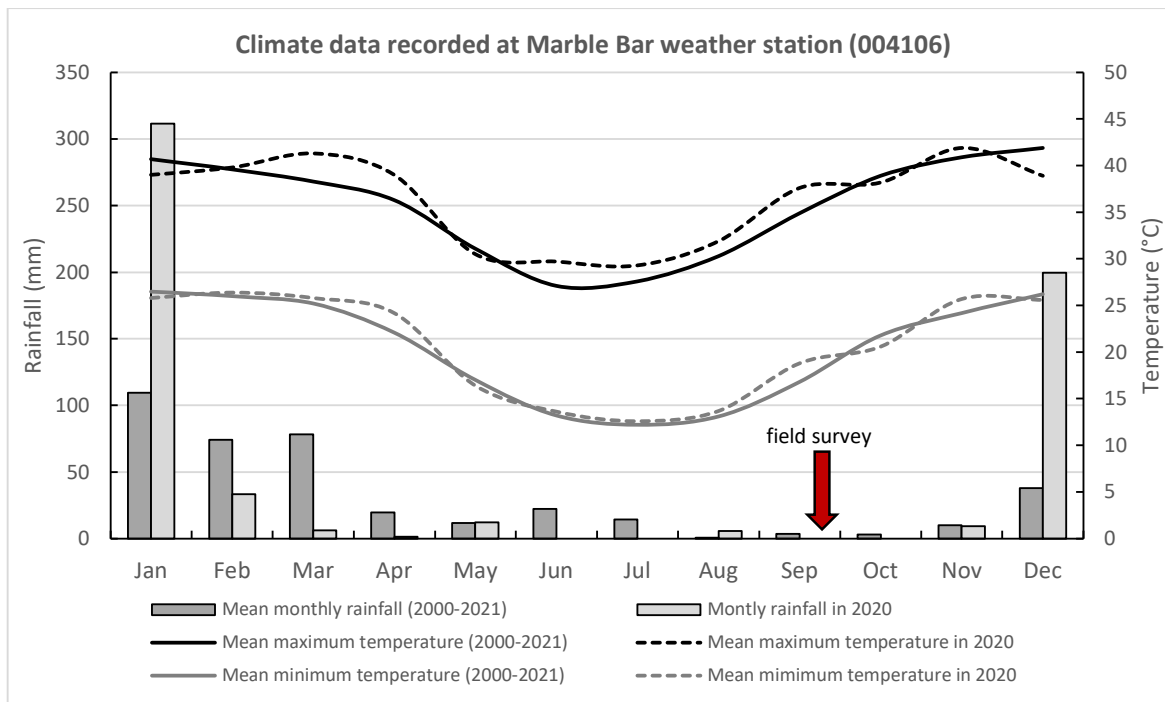


## 2 Regional context

### 2.1 Climate and weather

The Pilbara bioregion has a semi-desert to tropical climate, with rainfall occurring sporadically throughout the year, mostly during summer (Thackway & Cresswell 1995). Summer rainfall is usually the result of tropical storms in the north or tropical cyclones that impact upon the coast and move inland. Winter rainfall is generally lighter and is the result of cold fronts moving north easterly across the state (Leighton 2004). The average annual rainfall ranges from 200-350 mm, although there are significant fluctuations between years (BoM, 2021), with up to 1,200 mm falling in some locations in some years (McKenzie et al. 2009).

Long-term climatic data is not available for the Warrawoona Gold Project; however, long term climatic data is available from the Bureau of Meteorology (BoM) weather station at Marble Bar, proximal to the survey area and the Warrawoona Gold Project (BoM 2021) (Figure 2).



**Figure 2 Climate Graph**

Rainfall over the three months preceding the survey was low, in line with average rainfall for this period. Daily maximum temperatures during the survey ranged from 40.8 °C to 38.3 °C. Daily minimum temperatures ranged from 16.1 °C to 20.1 °C at night. These temperatures were higher than average for September, as also reflected in Figure 2 which shows that the mean monthly temperature for September 2020 was about 3 degrees higher than the long-term average.

## 2.2 Biogeography

### 2.2.1 IBRA bioregions

The bioregions of Australia are described in the Interim Biogeographic Regionalisation for Australia (IBRA) (Thackway & Cresswell 1995). Bioregions are large, geographically distinct areas of land with common characteristics such as geology, landform patterns, climate, ecological features and plant and animal communities. The latest version, IBRA7, classifies Australia's landscapes into 89 large geographically distinct bioregions and 419 subregions (DoE 2012).

The survey area is located within the Pilbara bioregion (Figure 1), as defined by the Interim Biogeographic Regionalisation of Australia (IBRA). The Pilbara bioregion is characterised by vast coastal plains and inland mountain ranges with cliffs and deep gorges (Thackway & Cresswell 1995). Vegetation is predominantly mulga low woodlands or snappy gum over bunch and hummock grasses (Bastin 2008).

The survey area is located within the Chichester (PIL 1) IBRA subregion, comprised of undulating archaean granite and basalt plains with areas of basaltic ranges (Kendrick & Mckenzie 2001). The plains support a shrub steppe characterised by *Acacia inaequilatera* over *Triodia wiseana* hummock grasslands, while *Eucalyptus leucophloia* tree steppes occur through the ranges (Kendrick & Mckenzie 2001).

### 2.2.2 Land System

The land systems of the Pilbara region are classified according to similarities in landform, soil, vegetation, geology and geomorphology, following van Vreeswyk et al. (2004). Four land systems occur on the survey area, as listed in Table 1 below and displayed in Figure 3. A fifth category labelled Mine also intersects the Moolyella pipeline route. This is not a land system, but encompasses disturbed areas where the original vegetation and/or land forms are no longer present.

**Table 1 Land Systems of the survey area**

Land system	Description	Area (ha)
Macroy Land System	Stony plains and occasional tor fields based on granite supporting hard and soft spinifex grasslands.	366.5
Talga Land System	Hills and ridges of greenstone and chert and stony plains supporting hard and soft spinifex grasslands.	16.1
River Land System	Active flood plains, major rivers and banks supporting grassy eucalypt woodlands, tussock grasslands and soft spinifex grasslands.	5.0
Granitic Land System	Rugged granitic hills supporting shrubby hard and soft spinifex grasslands.	1.3
Mine	THIS IS NOT A LAND SYSTEM - Disturbed area, mines, mullock dumps etc	25.2

The dominant land system within the Moolyella pipeline survey area is the Macroy land system, characterised by stony plains supporting spinifex. The southern end of the survey area falls into the Talga land system, which also underlies the Warrawoona Gold Project. The Talga land system is characterised by hills and ridges. The survey area traverses the River Land System at one location and skims the edge of the Granitic land system in several places (Figure 3).

### **2.2.3 Geology**

The survey area is situated within the Eastern Pilbara Domain of the Archean Pilbara Craton within the Abydos Plains and Hills Zone, north of the Warrawoona Klondyke deposit. The area is dominated by granite-greenstone terrain and subdivided into two major stratigraphic units, the Warrawoona Group and the George Creek Group (Mine Earth 2019).

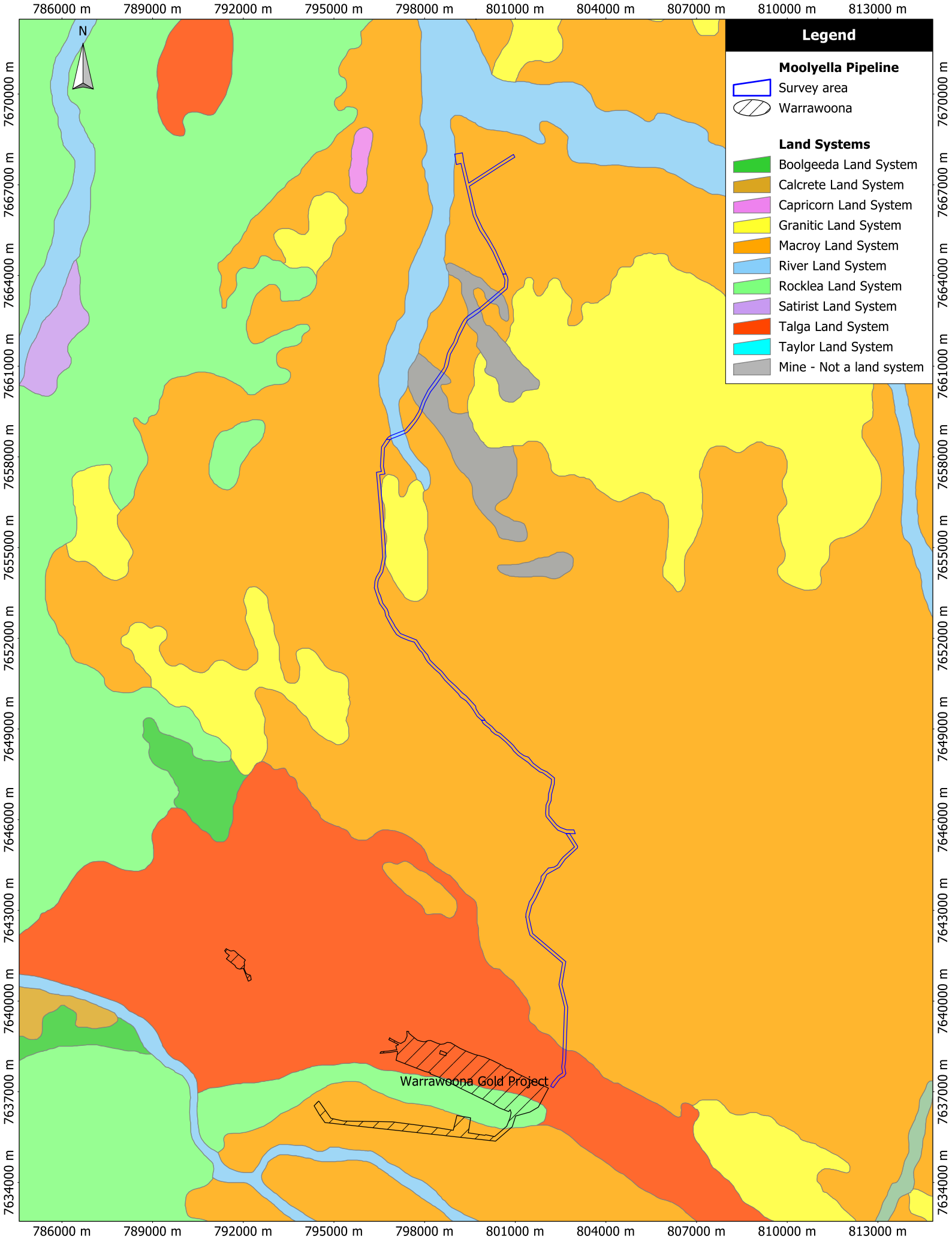
### **2.2.4 Soils**

The majority of the survey area falls within the soil unit Fa12 described as gently undulating plain with frequent low granite tors and coalescing pediplains. Chief soils are earthy loams (Um5.51), and coarse sands (Uc5.21) overlying granite. There are considerable areas of red earths (Gn2.12), which may assume dominance in some places; some hard red soils (Dr2) together with coarse (Uc1) soils along creek lines; and minor areas of calcareous loams (Um1) associated with calcrete (kunkar) (CSIRO Australia 2018)..

Soils at the southern end of the survey area are influenced by the Warrawoona Group as per soil unit Gf1, described as steep ranges on basic lavas along with dolomites, tuff, banded iron formations, and dolerite dykes, with some narrow valley plains and high-level gently undulating areas of limited extent. Soils are generally shallow and stony and there are large areas without soil cover: chief soils are brown loams (Um6.23) along with significant areas of earthy loams (Um5.51). (Dr2.33) soils occur on lower slopes, with (Uf6.71) and (Ug5.37) on valley floors (CSIRO Australia 2018).

### **2.2.5 Hydrology**

The Warrawoona Range which intersects the survey area is a major feature that impacts hydrology within the local surrounds, forming a local and regional surface water divide (Groundwater Resource Management 2019a). The northwest striking Warrawoona Range forms a local surface water and groundwater divide. Runoff from the range proceeds to the Brockman Creek catchment to the north, which discharges to the Talga River or alternatively to the Camel Creek catchment, which discharges to the Coongan River in a southerly direction (Groundwater Resource Management 2019b). The flowlines proximal to the survey area are tributaries of the Talga River.



## 2.3 Regional vegetation

### 2.3.1 Botanical district

The Moolyella pipeline survey area is situated in the Pilbara Botanical District in the Eremaean Botanical Province of Western Australia (Beard 1975).

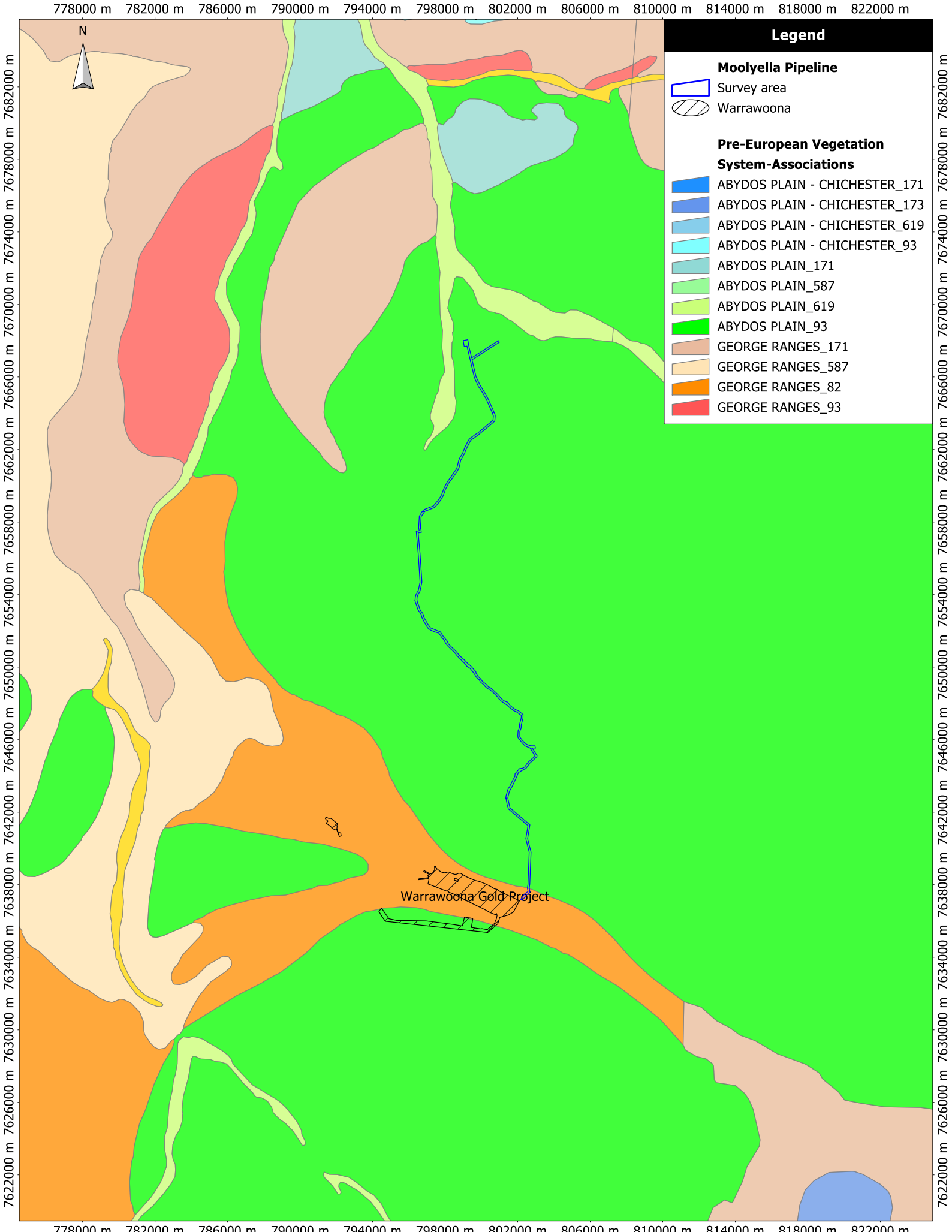
### 2.3.2 Vegetation system association

Digital maps (spatial data) of pre-European vegetation communities, based on state-wide mapping by J.S. Beard at 1:250,000 scale, are published by the Department of Primary Industries and Regional Development (DPIRD) (Beard 2018). The survey area is situated within association 93 of the Abydos Plain vegetation system, and association 82 of the George Ranges system (Table 2, Figure 4).

Two broad vegetation associations are described from the survey area; George Ranges (82; Hummock grasslands with low tree steppe of snappy gum over *Triodia wiseana*) and Abydos Plain (93; Hummock grasslands, shrub steppe; kanji over soft spinifex). This vegetation association is common at the subregional and regional level and widespread through both the Chichester and Hamersley IBRA subregion (Shepherd et al. 2002).

**Table 2** Pre-European vegetation within the survey area

System-Association	Structural description	Floristic description	Area (ha)
Abydos Plain 93	Shrub-steppe	Hummock grassland with scattered shrubs or mallee <i>Triodia</i> spp. <i>Acacia</i> spp., <i>Grevillea</i> spp. <i>Eucalyptus</i> spp	404.2
George Ranges 82	Low tree-steppe	Hummock grassland with scattered bloodwoods & snappy gum. <i>Triodia</i> spp., <i>Corymbia dichromophloia</i> , <i>Eucalyptus leucophloia</i> (snappy gum)	9.8





### 3 Methods

#### 3.1 Desktop study

##### 3.1.1 Flora desktop study

The flora desktop study comprised a search of paid and free databases, and a review of available literature relevant to the survey area. The desktop review served to compile a list of conservation significant flora taxa and vegetation communities with the potential to occur within the survey area. The conservation significant taxa identified in the desktop were then reviewed for likelihood of occurrence within the survey area, based on the likelihood categories outlined in Table 3 below. Database search parameters are outlined in Table 4 and the literature review is summarised in Table 5.

**Table 3 Likelihood assessment criteria**

Likelihood	Criteria
Highly likely	The taxon has been recorded previously within the survey area, or there are (recent) previous records within 5 km of the survey area, and suitable habitat is present in the survey area.
Likely	Suitable habitat is present in the survey area and there are previous (recent) records within 5-10 km of the survey area.
Possible	The habitat specificity of the taxon is not well defined and/or the survey area contains suitable habitat and nearest records are within 10-50 km of the survey area.
Unlikely	The habitat specificity of the taxon is well defined from previous records and the survey area does not contain suitable habitat for the taxon.

**Table 4 Flora database search parameters**

Source of information	Search area
DBCA (2020a) Threatened and Priority Flora Database	100 km radius surrounding the pipeline corridor
DBCA (2020b) Threatened and Priority Ecological Communities (TEC-PEC) database	50 km radius surrounding the pipeline corridor
DBCA (2020c) NatureMap online database	40 km radius around three point locations along the pipeline corridor
Department of Agriculture Water and the Environment (AWE) (2020) Protected Matters search tool	50 km radius around three point locations along the pipeline corridor

**Table 5 Summary of available regional flora surveys**

Survey report	Survey type and level	Distance from Warrawoona Gold Project*
Woodman (2020a) Warrawoona Gold Project Groundwater Dependent Vegetation Assessment	Groundwater Dependent Vegetation Assessment	Addresses portions of the survey area: Narri and Moolyella
Woodman (2019) Warrawoona Gold Project Flora and Vegetation Survey.	Targeted and Level 2	Warrawoona
Woodman (2020b) Warrawoona Gold Project. Detailed Flora and Vegetation Assessment	Targeted and Level 2	Warrawoona

Survey report	Survey type and level	Distance from Warrawoona Gold Project*
Mattiske (2007) Flora and Vegetation and Assessment of Groundwater Dependent Ecosystems in the Panorama Project survey area.	Summary of Trudgen et al. (2002), Trudgen (2006, 2007) Level 2 and Targeted	60 km west north-west
Woodman (2012a) Abydos Direct Shipping Ore Project – Flora and Vegetation Studies	Level 2	70 km west north-west
Woodman (2012b) Abydos East Project Camp and Haul Road Corridor – Flora and Vegetation Studies	Level 1	70 km west north-west
Woodman (2013a) Mt Webber DSO Project – Flora and Vegetation Assessment	Level 2	50 km south- west
Woodman (2013b) McPhee Creek Project – Flora and Vegetation Assessment	Level 2	
Woodman (2013c) McPhee Creek Iron Ore Project – Conservation Significant Flora Assessment.	Targeted	30 km south- east
Woodman (2014a) McPhee Creek Iron Ore Project – Riparian Vegetation Mapping (Discharge Options 1, 2 and 3).	Level 2	30 km south- east
Woodman (2014b) McPhee Creek Rail Project (Eastern Corridor Yandeyarra to Mt Webber and McPhee Creek) – Flora and Vegetation Assessment	Level 2	30 km south
Woodman (2014c) McPhee Creek Rail Spur Project – Flora and Vegetation Assessment.	Level 2	50 km south- west
Woodman (2016) Corunna Downs Project, Level 2 Flora and Vegetation Assessment	Level 2	25 km south- west
GHD (2017) Coongan Gorge Realignment Environmental Impact Assessment and Environmental Management Plan	Level 2	60 km north-west (M030 Pit) and 45 km north (Coongan Gorge) of Warrawoona Gold Project
* The survey area originates from the Warrawoona Gold Project Area, north for approximately 24 km		

### 3.1.2 Fauna desktop study

The fauna desktop study comprised a search of paid and free databases and a review of available literature relevant to the survey area. The fauna desktop served to place the fauna assemblage of the survey area in a regional context and to compile a list of vertebrate fauna species with the potential to occur within the survey area. This list was then filtered for conservation significant fauna species and likelihood to occur within the survey area was assessed using the fauna decision matrix located in Appendix I.

Four fauna databases were searched (Table 6), two to obtain information on all species previously recorded (NatureMap and Birdlife Birdata), one to identify species of conservation significance previously recorded in the region (DBCAs threatened and priority fauna database) and one to identify EPBC listed species of conservation significance known or likely to occur within the region (Protected matters database). Fauna Database search parameters are outlined in Table 6 and the literature review is summarised in Table 7.

**Table 6 Fauna Database search parameters**

Source of information	Search area
DBCA (2020d) Threatened and Priority Fauna Database (TPFA)	20 km radius surrounding the pipeline corridor
DBCA (2020c) NatureMap online database	40 km radius around three point locations along the pipeline
DAWE (2020) Protected Matters search tool	50 km radius around three point locations along the pipeline
Birdlife Australia (2020) Birdata database	50 km radius around the pipeline corridor

**Table 7 Summary of available regional fauna surveys**

Survey report	Survey Type	Distance from Warrawoona Gold Project*
MWH (2016) Corunna Downs Iron Ore Project Terrestrial Vertebrate Fauna Survey	Level 2	25 km to the south west
Ecologia (2010) Giralia Resources NL Mount Webber Iron Ore Project Vertebrate Fauna Assessment	Level 2	80 km to the south west
Biota (2007) Panorama Project Mine Site and Haul Road Corridor Targeted Fauna Survey	Level1 – Plains Access Road and Level 2 - Valley Access Road	76km to the north west
Bamford (2001) Panorama Project Area Baseline Fauna Study	Level 2	76 km to the north west
Bamford (2009a) Fauna Assessment of the BC Iron Nullagine Iron Ore Project	Level 2	77 km to the south
Bamford (2009b) Fauna Assessment of the Abydos DSO Project	Level 2	80km to the north west
How <i>et al.</i> (1991) Ecological Survey of Abydos-Woodstock Reserve, Pilbara Region, Western Australia	Multiple years scientific survey	102 km to the south west
Ecologia (2012a) North Star Project North Star Project Level 2 Terrestrial Vertebrate Fauna Assessment	Level 2	100 km to the north west
Biologic (2020) McPhee Creek Consolidated Terrestrial Fauna Report McPhee Creek Project	Summary of vertebrate fauna surveys (two x level 2 surveys 7 x targeted survey)	36 km to the south west
Biologic (2019b) Warrawoona Gold Project Level 1 Vertebrate Fauna Survey, and Desktop SRE and Subterranean Assessment	Level 1	Warrawoona Gold Project
Biologic (2019c) Warrawoona Gold Project: Habitat Assessment and Targeted Vertebrate Fauna Survey.	Level 1 and Targeted	Warrawoona Gold Project
Biologic (2018) Warrawoona Targeted Bat Assessment September 2017	Targeted – including assessment of underground workings within the Warrawoona Gold Project in terms of providing roosting habitat for Pilbara Leaf-nosed Bat and Ghost Bat	Warrawoona Gold Project
* The survey area originates from the Warrawoona Gold Project Area, north for approximately 24 km		

## 3.2 Field Survey

A combined basic vertebrate fauna survey and reconnaissance flora survey was completed by a team of two botanists and two zoologists. The field survey was completed between 25 September and 2 October 2020. The survey area was accessed by four-wheel drive vehicle using existing tracks, and surveyed on foot.

The survey was carried out in a manner consistent with the following documents developed by the Western Australian Environmental Protection Authority (EPA):

- Environmental Protection Authority (EPA) *Technical Guidance - Terrestrial vertebrate fauna surveys for environmental impact assessment* (EPA 2020)
- Environmental Protection Authority (EPA) *Technical Guidance Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016a)

### 3.2.1 Reconnaissance flora survey

A total of 61 non-permanent relevés were surveyed either within or directly adjacent to (within 500 m) of the pipeline corridor (Figure 5). The relevés were located in all vegetation types discernible through aerial photography interpretation, in combination with on-ground inspection.

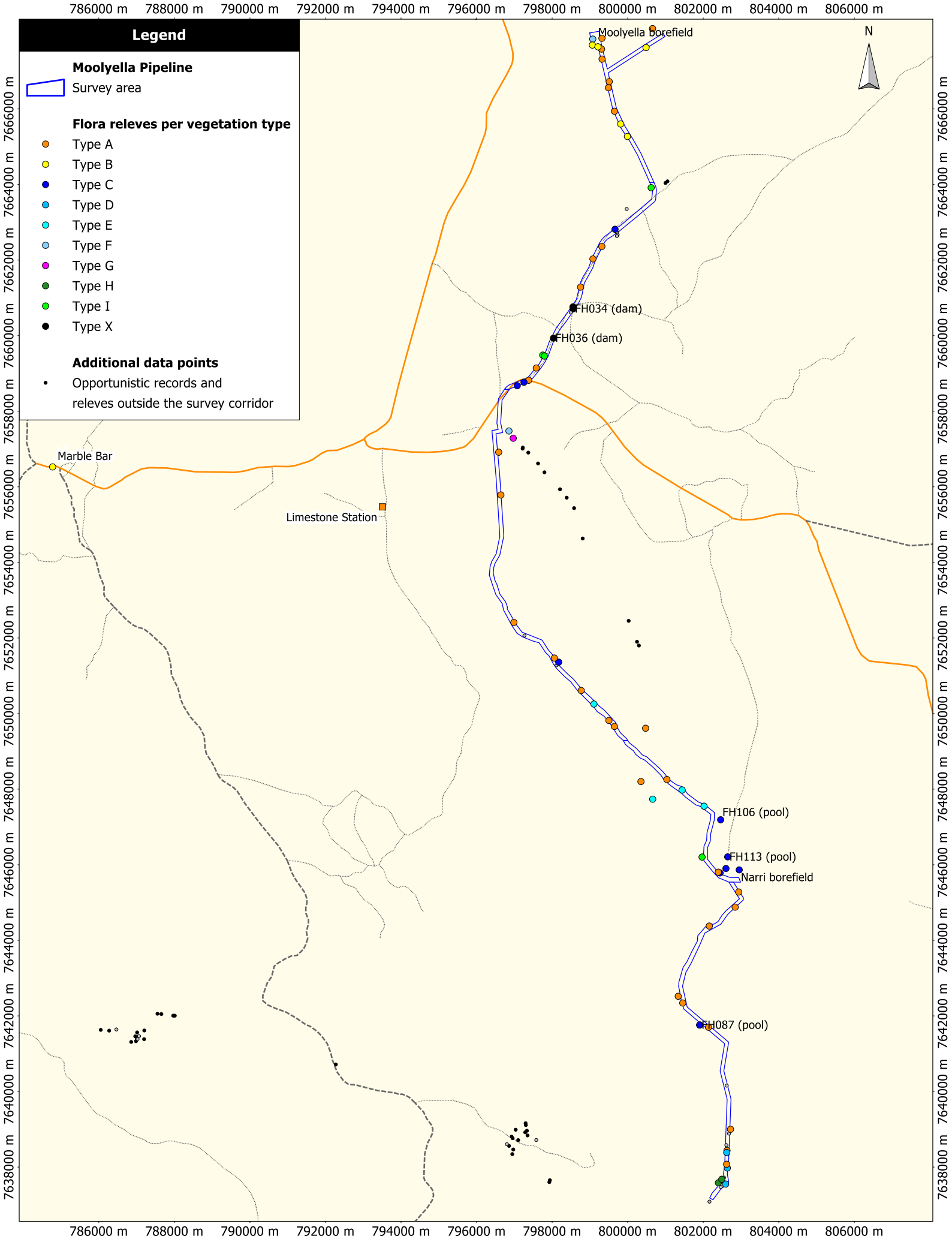
The following information was recorded at each relevé:

- Site name, date, photographs, central GPS coordinate
- Topography;
- Soils (type and colour);
- Condition (vegetation condition scale)
- Disturbance factors in the area (including time since fire); and
- Vascular plant species – including height and approximate foliage cover.

Additional flora taxa were recorded opportunistically in the survey area via a search around the general vicinity of each relevé, and during traverses on foot between relevés. This included searches for conservation significant species as identified prior to the field survey. Vegetation condition was described at each relevé using the vegetation condition scale presented in EPA (2016a).

Following the survey, the broad vegetation types of the survey area were manually classified based on landform, floristic composition, and vegetation structure. Vegetation boundaries were mapped in the field using aerial photographs, relevé classification, mapping points and notes taken at opportunistic flora sites.

Additional flora and vegetation data was available from thirteen relevés surveyed outside the final survey area. Data from these relevés, which formed part of earlier versions of the pipeline corridor, was used to inform vegetation classification, but the data is not included in the species lists or further discussed in this report. These additional sites are also mapped in Figure 5.



### **3.2.2 Basic fauna survey**

The broad fauna habitats of the survey area were mapped and described with the aim of identifying habitats that may support species of conservation significance. Habitat data was recorded at 69-point locations throughout the survey area.

Additional fauna records and habitat data was recorded opportunistically in the survey area via a search around the general vicinity of habitat sites, and during traverses on foot between sites.

Information recorded at fauna habitat sites included:

- Site name, date, photographs, central GPS coordinate
- Landform, slope, and aspect
- Notes on soil and rock cover
- Leaf litter cover and depth, presence of coarse woody debris and dead trees
- Broad description of habitat

Preliminary habitat boundaries were mapped in the field while traversing the survey area by drawing vegetation boundary shapefiles on an aerial photograph loaded onto an Apple iPad Pro using the ArcGIS collector app.

Following the survey, broad fauna habitats were manually classified using field data aligned with land system mapping, surface geology and topography data, and final boundaries were drawn using GIS.

Fauna habitats were assessed for the likelihood that they may support fauna of conservation significance. All major fauna habitats present within the survey area were scored for significance (High, Moderate or Low) according to the criteria in Appendix II.

Active searching (foraging) was conducted at opportunistic foraging sites throughout the survey area. Foraging included turning rocks, logs, peeling bark, raking leaf litter, and searching under vegetation. All vertebrate fauna captured during foraging was identified in the field and released on site.

Opportunistic records and mapping points were collected throughout the survey area. Opportunistic records included direct sightings and calls, as well as secondary signs of presence such as tracks, scats, diggings, burrows, mounds, feathers, bones, sloughed reptile skins. All records were accompanied by a GPS waypoint and/or fauna habitat notes, in order to link species records to fauna habitats. Fauna survey effort is presented in Figure 6.

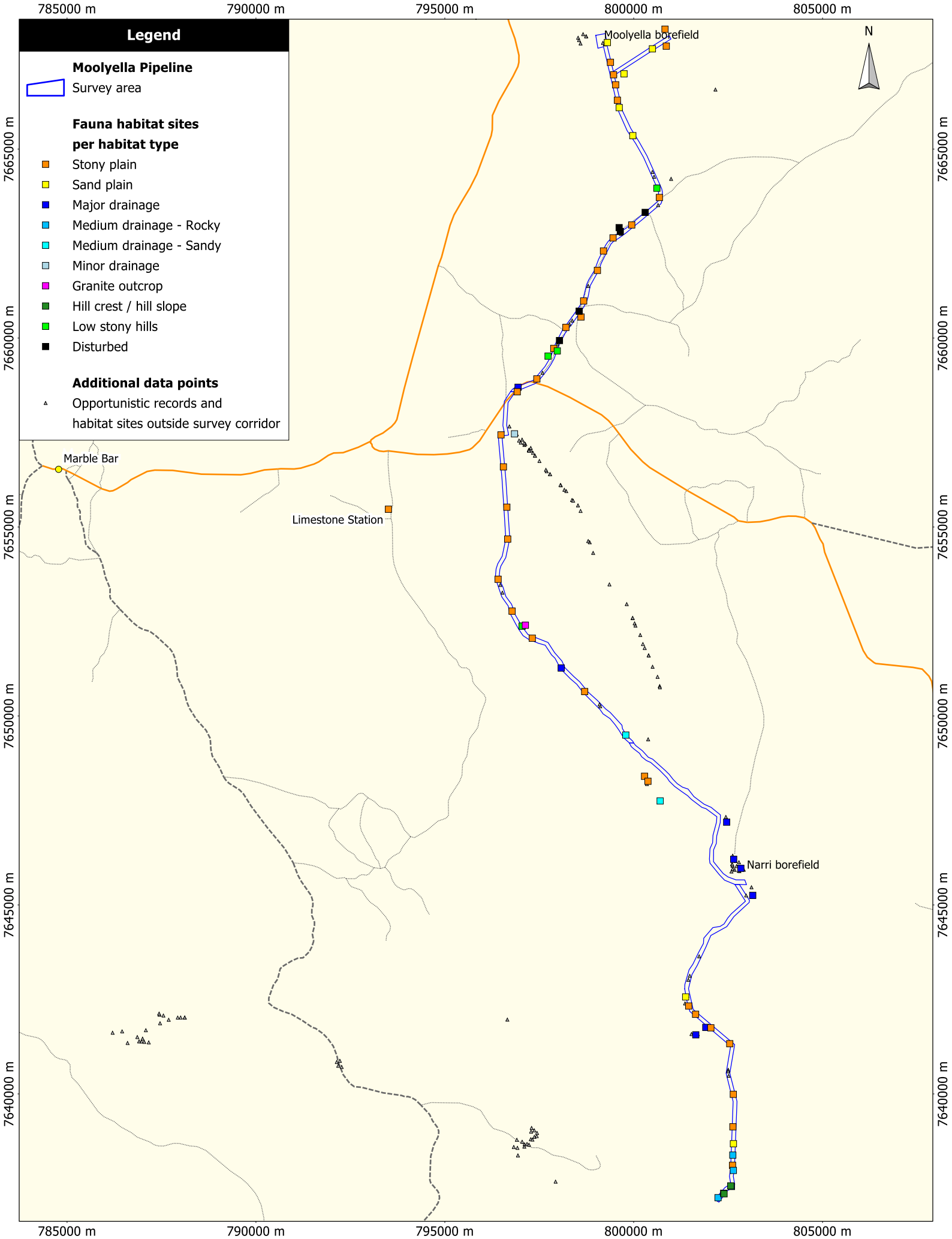
Twenty one Swift Enduro cameras were deployed across the survey area. Cameras were operational for a minimum of four days (Appendix X). Each camera was baited with peanut butter and oats.

Microbats were surveyed using two SM4 ultrasonic recorders with a third SM4 ultrasonic recorder used to survey for Night parrot. The ultrasonic recorders were deployed at each site between 1 and 2 nights to maximise spread across the survey area.

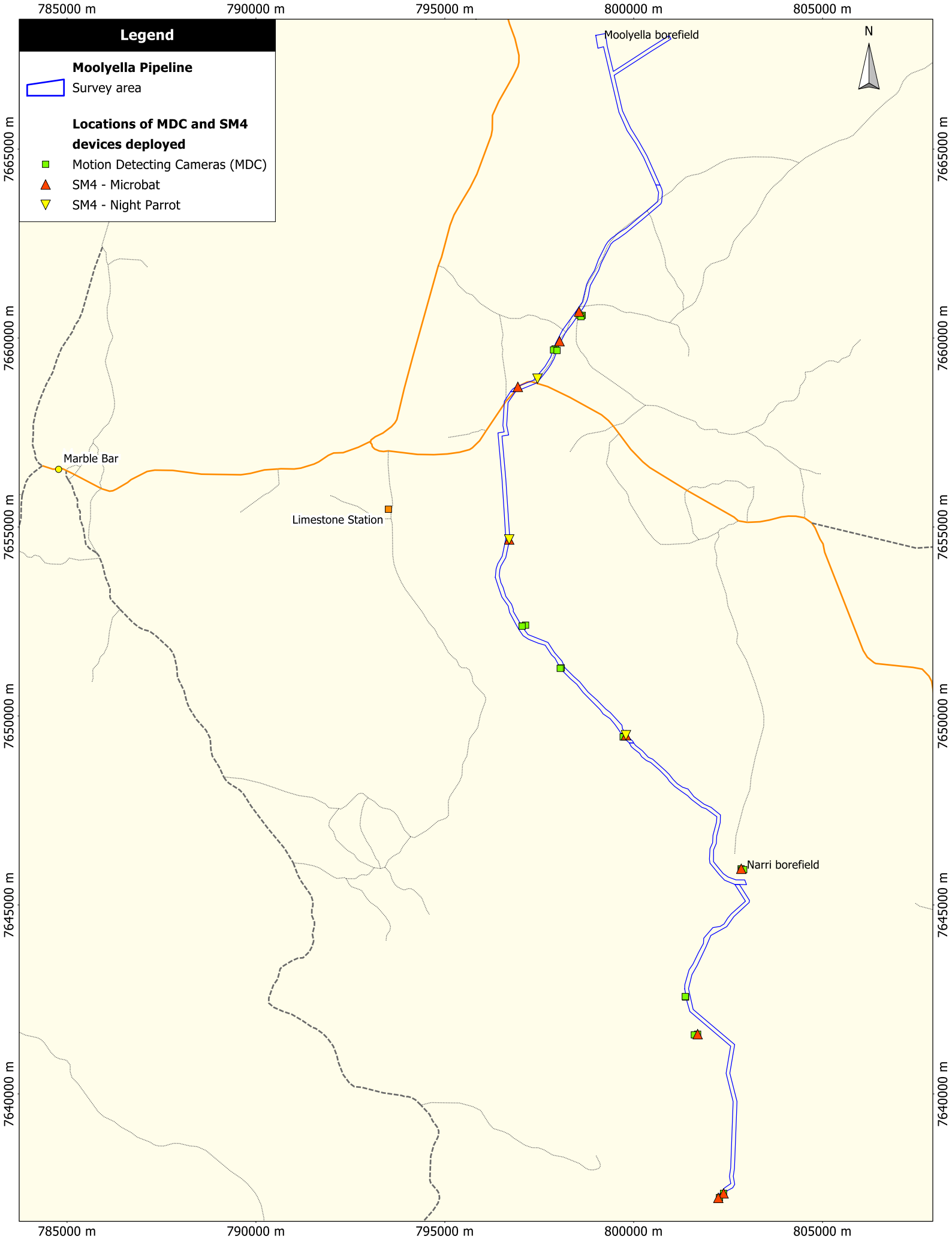
Three sites were surveyed for Night parrot and nine sites were surveyed for microbats. The bat survey consisted of completing a total of fifteen overnight ultrasonic bat sound recordings, beginning at twilight. A total of five acoustic survey nights were completed at three sites for Night Parrot. The recordings were “continuous” made using ultrasonic SM4BAT-FS and acoustic SM4A SongMeter (both by Wildlife Acoustics Inc., USA) detectors. The audio settings used followed the manufacturer’s recommendations contained in the user manuals (Bat Call, WA 2021).

Recordings were sent to Bat Call for analysis and identification. For the ultrasonic recordings, call analysis details are provided in Table 2 of (Bat Call, WA 2021) as recommended by Australasian Bat Society (Australasian Bat Society 2006). Reference data for the species identified are available in (Bullen & McKenzie 2002, McKenzie & Bullen 2003, 2009). For the acoustic recordings, Bat Call reviewed recordings both manually and using an automatic scan technique for Night parrot calls. Candidate calls were compared Bat Call's confirmed reference calls from two Western Australian arid zone locations.

Location , habitat data and survey effort corresponding to SM4 and cameras are located in Appendix X.







### 3.3 Personnel and licensing

The personnel involved in the field survey, data entry and analysis, and the preparation of this report are listed in Table 8. The field survey was conducted under Fauna Taking (Biological Assessment) Licence BA27000314 issued under Regulation 17 of the *Biodiversity Conservation Regulations 2018* and the flora sampling was conducted under Flora Taking (Biological Assessment) Licences pursuant to Regulation 62 of the *Biodiversity Conservation Regulations 2018*. As part of the license conditions, a list of flora and fauna species recorded in the survey will be forwarded to the DBCA.

**Table 8 Personnel**

Name	Position	Survey	Analysis	Reporting
Kate George	Principal Environmental Scientist			•
Marieke Weerheim	Senior Environmental Scientist		•	•
Jeremy Ringma	Senior Zoologist	•		•
Jon-Paul Emery	Zoologist		•	•
Emily Hoffmann	Zoologist	•		
Daniel Marsh	Senior Botanist	•	•	
Cielito Marbus	Botanist	•		
Molly George	Ecologist		•	
Ryan Craig	Botanist		•	•

### 3.4 Nomenclature and conservation listing

In this report, names for birds follow the Birdlife Australia (2019) Working List of Australian Birds (version 3, August 2019), names for mammals, reptiles, and amphibians follow the Western Australian Museum (WAM 2020) Checklist of Terrestrial Vertebrate Fauna (November 2020). Names for fish species follow the Fishes of Australia website (Bray & Gomon 2021).

Distribution maps and recent records of vertebrate fauna species were verified using the Atlas of Living Australia (ALA 2021), and Birddata online databases, the Species Profile and Threats Database (SPRAT) (AWE 2021), Van Dyck and Strahan (2008), Johnstone and Storr (1998, 2004), Wilson and Swan (2017), Cogger (2018), and other relevant publications as cited within this report.

Flora taxonomy and nomenclature follows FloraBase (Western Australian Herbarium 1998). FloraBase was also accessed to verify conservation codes, distribution records, habitat requirements, and flowering times. Conservation codes cited in this report are as per Appendix III. Note that the conservation codes on FloraBase are the most up to date, whereas the DBCA Threatened (Declared Rare) and Priority Flora List (DBCA 2018b) was last updated on 5 December 2018.

## 4 Results and Discussion

### 4.1 Flora desktop results

#### 4.1.1 Conservation significant flora

The flora desktop review identified 566 flora taxa from 67 families recorded from within 100 km of the survey area. The list included 46 conservation significant taxa from 22 families, and 28 introduced taxa (weeds) from 15 families. Conservation significant taxon counts are summarised in .

**Table 9 Summary statistics of flora taxa identified in the desktop**

Taxonomic level	All taxa	Conservation significant	EN	P1	P2	P3	P4	Weeds
Families	67	22	1	10	3	13	5	15
Taxa	566	46	1	16	3	21	5	28

The list of significant flora taxa that are known from within or in the vicinity of the survey area is presented in Table 10. This list has been compiled from the results of database searches and the results of regional surveys as outlined in section 3.1. The 46 conservation significant flora taxa identified in the desktop included one Threatened taxon, 16 Priority 1 taxa, three Priority 2 taxa, 1 Priority 3 taxa and five Priority 4 taxa. Of those one (*Eragrostis crateriformis* – P3) was recorded during the survey (section 4.2.2).

A likelihood assessment was completed as per Table 3 in section 3.1.1 to estimate the potential of occurrence within the survey area for each of the conservation significant taxa. The full likelihood assessment table is provided in Appendix V. Descriptions of the taxa considered highly likely or likely to occur in the survey area are provided below in Table 10.

**Table 10 Conservation significant flora taxa recorded in the desktop**

Scientific Name	Status	Total records	Flowering period	Likelihood
<i>Acacia aphanoclada</i>	P1	41	August to October	Possible
<i>Acacia cyperophylla</i> var. <i>omearana</i>	P1	19	March, April, August, October	Possible
<i>Acacia fecunda</i>	P1	10	April, May, August, October	Unlikely
<i>Acacia leeuweniana</i>	P1	19	No info	Unlikely
<i>Acacia levata</i>	P3	17	May and October	Possible
<i>Acacia</i> sp. <i>Marble Bar</i> (J.G. & M.H. Simmons 3499)	P1	1	September	Possible
<i>Acacia</i> sp. <i>Nullagine</i> (B.R. Maslin 4955)	P1	2	No info	Possible
<i>Atriplex spinulosa</i>	P1	15	No info	Unlikely
<i>Bulbostylis burbridgeae</i>	P4	12	March, June to August	Likely
<i>Cochlospermum macnamarae</i>	P1	10	No info	Possible
<i>Corchorus</i> sp. <i>Yarrie</i> (J. Bull & D. Roberts CAL 01.05)	P1	6	May, June	Possible

Scientific Name	Status	Total records	Flowering period	Likelihood
<i>Croton aridus</i>	P3	1	August	Unlikely
<i>Cucumis</i> sp. Barrow Island (D.W. Goodall 1264)	P2	1	May	Unlikely
<i>Dolichocarpa</i> sp. Hamersley Station (A.A. Mitchell PRP 1479) <sup>2</sup>	P3	1	No info	Unlikely
<i>Eragrostis crateriformis</i>	P3	23	May or July	<b>Highly likely</b>
<i>Eremophila maculata</i> subsp. <i>filifolia</i>	P1	3	July	Possible
<i>Eucalyptus rowleyi</i>	P3	7	June to July	Unlikely
<i>Euphorbia clementii</i>	P3	17	April	<b>Highly likely</b>
<i>Euphorbia inappendiculata</i> var. <i>inappendiculata</i>	P2	3	May	Unlikely
<i>Fimbristylis sieberiana</i>	P3	1	May to June	Unlikely
<i>Fimbristylis</i> sp. Shay Gap (K.R. Newbey 10293)	P1	3	June to July	Possible
<i>Gomphrena leptophylla</i>	P3	6	March to September	<b>Likely</b>
<i>Goodenia nuda</i>	P4	2	April to August	Possible
<i>Gymnanthera cunninghamii</i>	P3	8	January to December	Unlikely
<i>Heliotropium murinum</i>	P3	12	May or September	<b>Highly likely</b>
<i>Heliotropium muticum</i>	P3	28	April to June, September	<b>Likely</b>
<i>Heliotropium parviantrum</i>	P1	1	February to June	Unlikely
<i>Indigofera ammobia</i>	P3	2	No info	Possible
<i>Indigofera ixocarpa</i>	P2	4	March, May	Unlikely
<i>Josephinia</i> sp. Woodstock (A.A. Mitchell PRP 989)	P1	1	No info	<b>Likely</b>
<i>Lepidium catapycnon</i>	P4	2	February to June	Unlikely
<i>Nicotiana umbratica</i>	P3	15	April to June	Possible
<i>Phyllanthus hebecarpus</i>	P3	3	No info	Unlikely
<i>Ptilotus mollis</i>	P4	28	May or September	<b>Highly likely</b>
<i>Ptilotus wilsonii</i>	P1	2	October	Unlikely
<i>Quoya zonalis</i> K.A.Sheph. & Hislop <sup>1</sup>	EN	84	June-September	Unlikely
<i>Rhynchosia bungarensis</i>	P4	2	May, July, November	Unlikely
<i>Rostellularia adscendens</i> var. <i>latifolia</i>	P3	11	April to May	Unlikely
<i>Rothia indica</i> subsp. <i>australis</i>	P3	8	April to August	Possible
<i>Schoenus coultasii</i> <sup>3</sup>	P1	4	No info	Unlikely
<i>Solanum</i> sp. Mosquito Creek (A.A. Mitchell et al. AAM 10795)	P1	9	March, June, October	Possible

Scientific Name	Status	Total records	Flowering period	Likelihood
<i>Stylidium weeliwoilli</i>	P3	4	August to September	Unlikely
<i>Swainsona thompsoniana</i>	P3	1	April, June, August	Possible
<i>Themeda</i> sp. Hamersley Station (M.E. Trudgen 11431)	P3	1	August	Possible
<i>Triodia basitricha</i>	P3	4	May	Possible
<i>Triodia chichesterensis</i>	P3	1	May	Unlikely

Footnotes:

1 = Name change from *Pityrodia* sp. Marble Bar

2 = Name change from *Oldenlandia* sp. Hamersley Station

3 = Name change from *Schoenus* sp. Marble Bar

*Bulbostylis burbidgeae* (DBCA Priority 4) grows in granitic soils and has been recorded from granitic outcrops and cliff bases and could occur within the small granite outcrops of the survey area. *Bulbostylis burbidgeae* is endemic to Western Australia occurring over a range of approximately 28,000 square kilometres from South Hedland south to the Nanutarra/Fortescue, east to Nullagine and north to the DeGray River within the Chichester, Fortescue and Roebourne IBRA subregions (ALA 2021, Western Australian Herbarium 2021, DBCA 2020b). Field observations from Mt Webber indicate that this taxon only occurs in shady areas on massive granite outcrops (Woodman 2012) and the granite outcrop habitats of the corridor are too small to cast significant shade (Rapallo 2021), nevertheless, conservatively, the species is rated as “Likely” based on habitat and proximity.

*Eragrostis crateriformis* (DBCA - Priority 3) is an annual, grass-like or herb. It flowers May or July growing on creek banks, depressions, clay pans, and red-brown clay loams (Western Australian Herbarium 1998). The species has been recorded by Woodman (2020b) from multiple locations within the Warrawoona Gold Project and in association with other projects reviewed for the desktop. The species was confirmed during the survey (this report) from a single location in the northern part of the pipeline corridor, within vegetation type A. It is considered “Highly Likely” to occur elsewhere in the survey area and the local region, especially on stony plain and around creek lines where additional searching along the drainage that bisects the corridor would likely locate more plants.

*Euphorbia clementii* (DBCA - Priority 3) is an erect herb, 0.6 m high. It flowers in April, growing on gravelly hillsides, stony grounds, and along drainage lines on red, orange sandy loams, or stony areas (Western Australian Herbarium 1998). It was recorded from the Warrawoona Project Area by Woodman (2020) and from other surveys reviewed for the desktop. It is considered “Highly Likely” to occur within the survey area, with suitable habitat in nearly all of the vegetation communities present. *Euphorbia clementii* was recorded from a long unburnt stony undulating plain of red-brown sandy clay loam on the Warrawoona Gold Project. (Woodman (2020b) found this habitat to be atypical for the species as this taxon is typically a fire-responder (and relatively short-lived) but may germinate in response to physical disturbance. Woodman (2020b) hypothesised that the plant on the Warrawoona Gold Project may have been transported, given the nearby historical disturbance evident in aerial photography and long unburnt nature of the vegetation. The taxon was not observed in more recently burnt areas of typical habitat (sandy or stony plains) (Woodman 2020b). *Euphorbia clementii* was not recorded on the burnt or disturbed areas of the survey area where if present it would have been readily identifiable as it typically the species occurs in large numbers (Woodman 2020b).

*Gomphrena leptophylla* (P3) is a prostrate or erect to spreading annual, herb to 0.15 m high. It flowers March to September and grows on open flats, sandy creek beds, edges of salt pans and salt marshes, and

on stony hill sides. Recorded growing on sand, sand, sandy to clayey loam, granite, quartzite (Western Australian Herbarium 1998). The DBCA database has an old record within 2.5 km east of the survey area. It was also recorded by Woodman (2012c) from the Mount Webber DSO project 50 km away, and from NatureMap searches within 40 km of the survey area. The species is considered “Likely” to occur” in the survey area.

*Heliotropium murinum* (DBCA Priority 3), grows on red sand, plains, or brown light clay or sand over ironstone. *Heliotropium murinum* and occurs within the Warrawoona Gold Project and has been recorded from other nearby localities identified in the desktop. The species occurs over a range of approximately 150 km from Woodstock Reserve in the west to DBCA managed Ex Meentheena Station in the east. There are 17 location records of this taxon in Western Australia representing approximately 12 populations (including the records from the Warrawoona Gold Project (Western Australian Herbarium 1998, Woodman Environmental 2020b, ALA 2021), DBCA 2020b). *Heliotropium murinum* is locally common with 890 plants recorded from 160 point locations within the Warrawoona Gold Project (Woodman 2020b). It is considered “Highly Likely” to occur in the survey area, on the sandy and rocky plains areas that make up the majority of the survey area.

*Heliotropium muticum* (DBCA - Priority 3) grows on flat terrain, low in the landscape, flood plains and sand plains. Soil types where this species has been recorded included (very gritty) skeletal red brown granitic soil, clay loams, and sand. The species is endemic to the Pilbara and occurs between Port Hedland/Wickham south to Coonarrie Creek and west to Marble Bar (Western Australian Herbarium 1998, Woodman Environmental 2020b, Atlas of Living Australia 2021), DBCA 2020b). *Heliotropium muticum* growth is triggered by fire with an estimated population of approximately 1,300 to 2,500 individuals at Pilgangoora (MMWC 2016) and 20 individuals located at North Star (Ecologia 2012). The nearest DBCA record for this species is 7 km east of the survey area. It is considered “Likely” to occur in the survey area.

*Josephinia* sp. Woodstock (DBCA Priority 1) grows on sheet flow or drainage lines, on red sandy (granitic) plains. This taxon is known from seven records across four localities (Ashburton, Chichester, Fortescue and Hamersley IBRA sub-regions) and is not currently known from any DBCA-managed conservation reserves (ALA 2021), DBCA 2020b). The species has been recorded from the Warrawoona Gold Project from a loamy minor drainage line and despite a comprehensive targeted survey of all potential habitat on the Warrawoona Gold Project, no additional locations were recorded and the original plant recorded in 2019 has not been relocated despite intensive grid searching of the known location at 5 metre intervals (Woodman 2020b). The taxon is considered “Likely” to occur on the survey area within the many drainage lines that cross the pipeline corridor.

*Ptilotus mollis* (DBCA Priority 4) grows on stony hills and screes. The species occurs within the Warrawoona Gold Project on rocky hill tops and slopes of the main range (consisting of granite, chert and mafic schist) or smaller outcroppings of mafic schist immediately adjacent to the main range (to the south) and has been recorded from other nearby localities identified in the desktop. *Ptilotus mollis* is endemic to Western Australia occurring over a range of approximately 640 km from Cane River Conservation Park in the west (65 km south-west of Pannawonica) to near Karlamilyi National Park in the east (270 km south-east of Marble Bar). There are 39 location records of this taxon in Western Australia, representing approximately 28 populations (including the records from the Warrawoona Gold Project). Three of these populations occur within DBCA conservation estate, Cane River Conservation Park and Karijini National Park (ALA 2021), DBCA 2020b). *Ptilotus mollis* is locally common (2534 plants have been recorded from 350 locations within the Warrawoona Gold Project) (Woodman 2020b). *Ptilotus mollis* was recorded during this survey from areas outside of the survey area, proximal to the Warrawoona Range

and is considered “Highly Likely” to occur within the survey area, especially in the stony and rocky hill tops and slopes proximal to the Warrawoona Gold Project where the corridor commences in the south.

#### 4.1.2 Introduced flora (weeds)

The Biosecurity and Agriculture Management Act 2007 (BAM Act) categorises the weeds of Western Australia into four main classifications:

- Declared Pests (under Section 22 of the Act);
- Permitted (under Section 11 of the Act);
- Prohibited (under Section 12 of the Act); and
- Permitted requiring a permit (Section 73, BAM Regulations 2013).

Under the BAM Act all declared plant pests are placed in one of three categories:

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

Fifteen introduced taxa have been identified by DBCA as ‘Priority Alerts’ for the Pilbara region, including *\*Azadirachta indica*, *\*Calotropis procera*, *\*Chloris gayana*, *\*Clitoria ternatea*, *\*Cryptostegia grandiflora*, *\*Cylindropuntia spp.*, *\*Euphorbia tirucalli*, *\*Jatropha gossypifolia*, *\*Lantana camara*, *\*Moringa oleifera*, *\*Ricinus communis*, *\*Schinus molle var. areira*, *\*Vachellia nilotica*, *\*Washingtonia robusta* and *\*Xanthium strumarium* (DPaW 2014). *Calotropis procera*\* was recorded in the desktop and from the survey area (section 4.2.3).

Twenty-eight introduced flora taxa have been recorded from the vicinity of the survey area, as presented in below. The status of each of these weeds was assessed against the Western Australian Organism List (WAOL) as available from the Department of Agriculture and Food (DAFWA) website (DAFWA 2018). Most weeds recorded in the desktop were listed as Permitted – s11, and two were listed as Declared Pest – s22(2). Weeds recorded from the survey area are further discussed in section 4.2.3.

**Table 11 Weeds recorded in the desktop study**

Family	Scientific Name	WAOL status	Total records
Aizoaceae	<i>*Trianthema portulacastrum</i>	Permitted - s11	2
Amaranthaceae	<i>*Aerva javanica</i> <sup>R</sup>	Permitted - s11	13
Amaranthaceae	<i>*Amaranthus viridis</i>	Permitted - s11	1
Apocynaceae	<i>*Calotropis procera</i> <sup>R</sup>	Declared Pest - s22(2) (Exempt)	3
Asphodelaceae	<i>*Aloe vera var. officinalis</i>	Permitted - s11	3
Asteraceae	<i>*Bidens bipinnata</i>	Permitted - s11	2
Asteraceae	<i>*Flaveria trinervia</i>	Permitted - s11	11



Family	Scientific Name	WAOL status	Total records
Asteraceae	* <i>Sonchus oleraceus</i>	Permitted - s11	3
Cucurbitaceae	* <i>Citrullus colocynthis</i>	Permitted - s11	2
Cucurbitaceae	* <i>Citrullus lanatus</i>	Permitted - s11	3
Euphorbiaceae	* <i>Ricinus communis</i>	Permitted - s11	1
Fabaceae	* <i>Parkinsonia aculeata</i>	Declared Pest - s22(2) (C3 Exempt)	1
Fabaceae	* <i>Vachellia farnesiana</i>	Permitted - s11	11
Malvaceae	* <i>Malvastrum americanum</i>	Permitted - s11	10
Papaveraceae	* <i>Argemone ochroleuca</i> <sup>R</sup>	Permitted - s11	10
Passifloraceae	* <i>Passiflora foetida</i> var. <i>hispida</i>	Permitted - s11	1
Poaceae	* <i>Cenchrus ciliaris</i> <sup>R</sup>	Permitted - s11	18
Poaceae	* <i>Cenchrus setiger</i>	Permitted - s11	6
Poaceae	* <i>Chloris barbata</i> <sup>R</sup>	Permitted - s11	3
Poaceae	* <i>Chloris virgata</i>	Permitted - s11	2
Poaceae	* <i>Cynodon dactylon</i> <sup>R</sup>	Permitted - s11	5
Poaceae	* <i>Digitaria ciliaris</i>	Permitted - s11	1
Poaceae	* <i>Echinochloa colona</i>	Permitted - s11	4
Poaceae	* <i>Eragrostis minor</i>	Permitted - s11	1
Poaceae	* <i>Setaria verticillata</i>	Permitted - s11	7
Portulacaceae	* <i>Portulaca pilosa</i>	Permitted - s11	1
Solanaceae	* <i>Solanum nigrum</i>	Permitted - s11	3
Zygophyllaceae	* <i>Tribulus terrestris</i>	Permitted - s11	3

Footnotes: R = Recorded during the Moolyella Pipeline Corridor Survey.

#### 4.1.3 Threatened Ecological Communities and Environmentally Sensitive Areas

The search of the DBCA TEC and PEC database found no known occurrences of listed significant vegetation types within the survey area or within a 50 km radius of the survey area (DBCA 2020b).

The search of the Commonwealth Protected Matters database with regard to MNES listed under the EPBC Act did not return any TECs as likely or known to occur within the search area (AWE 2020).

A search of the Ramsar Database and Nationally Important Wetlands Database using the Protected Matters Search Tool's Interactive Map did not return occurrences within or proximal to the survey area. The closest significant wetland or riparian vegetation is the De Grey River, a Nationally Important Wetland, located approximately 70 km to the north of the survey area (AWE 2020).

## 4.2 Flora and vegetation survey results

### 4.2.1 Flora taxa recorded during the survey

The survey recorded 115 flora taxa from 28 different families, as presented in Appendix XI. These included 109 native taxa and six introduced taxa (section 4.2.3). One conservation significant taxon was recorded

during the survey (section 4.2.2). The most well-represented families were Fabaceae (35 taxa), Poaceae (16 taxa), Malvaceae (7 taxa) and Myrtaceae (6 taxa). Of the 115 flora taxa recorded, 14 taxa (12%) were annuals, 4 (4%) were annual or short-lived perennial, 91 (79%) were perennials. Six taxa did not have any life cycle information available. The full list of taxa is presented in Appendix XI, with relevé data presented in Appendix XIV.

#### 4.2.2 Conservation significant flora

One conservation significant flora taxon was recorded during the survey. This was the grass *Eragrostis crateriformis* (P3) which was recorded from a single location in the northern part of the survey corridor, within vegetation type A. Vegetation types recorded during the survey are discussed in section 4.2.4. No flora taxa listed as Threatened were recorded from the survey area.

The desktop identified eight conservation significant flora taxa that were considered likely or highly likely to occur in the survey area, based on proximity of records and 4.1.1. The broad vegetation types of the survey area (described in 4.2.4 below) were assessed for potential to support these eight conservation significant flora taxa. Flowering period, growth form, and life cycle (annual or perennial) were also taken into account to assess the possibility for the survey team to have recorded these taxa in the field. The results are summarised in the Table 12 below.

**Table 12 Potential for the broad vegetation types to support the conservation significant taxa identified as likely or highly likely to occur in the survey area**

Taxon	Growth form and life cycle	Flowering period	Broad vegetation types											
			A	B	C	D	E	F	G	H	I	X		
<i>Bulbostylis burbidgeae</i> (P4)	Annual sedge to 0.25 m	March, June to August							Y	p				
<i>Eragrostis crateriformis</i> (P3)	Annual grass to 0.4 m	May or July	Y	p	Y	Y	p							
<i>Euphorbia clementii</i> (P3)	Herb to 0.6 m	April	Y		Y	Y	Y	p		Y	Y			
<i>Gomphrena leptophylla</i> (P3)	Annual herb to 0.15 m	March to September	p	p	p	p	Y		Y	Y				
<i>Heliotropium murinum</i> (P3)	Short-lived perennial herb to 0.4 m	May or September	p	Y										
<i>Heliotropium muticum</i> (P3)	Perennial herb to 0.3 m high	April to June, September	Y	Y					Y					
<i>Josephinia sp. Woodstock</i> (P1)	Shrub to 0.4 m	No info			Y	Y	Y							
<i>Ptilotus mollis</i> (P4)	Shrub to 5 m	May or September										Y		

Footnotes: Y = Suitable habitat; p = potentially suitable habitat.

The assessment indicated that all the broad vegetation types in the survey area have potential to support one or more conservation significant flora taxa. However, only one taxon (*Eragrostis crateriformis*) was recorded during the survey. Six of the eight taxa were small annual or short-lived perennial herbs or grasses. Although the survey overlapped with the flowering time of four of the eight taxa (Table 12), the dry conditions in the months prior to the survey that the possibility of these taxa occurring in the survey area cannot be discounted. The survey was not a targeted survey as per EPA (2016a), however the narrow

corridor did focus effort, maximizing the likelihood of recording conservation significant species provided they were extant at the time of survey.

Flora species, subspecies, varieties, hybrids and ecotypes may be considered significant for reasons other than listing as a Threatened or Priority Flora taxa. This may include, but is not limited to, range extensions, keystone species, relic status, local endemism and anomalous features (EPA 2004). Based on these features, no taxa recorded from the survey area during the current survey are considered to be flora of “other” significance.

#### 4.2.3 Introduced flora taxa (weeds)

Six taxa of introduced flora (weeds) were recorded during the survey, these are listed in Table 13 below. The majority of weeds were recorded in vegetation type C which occurred along the major drainage lines within the survey area, as further described in section 4.2.4, while the disturbed areas (type X) also supported three weed species. The most frequently recorded weed was *\*Cenchrus ciliaris* (buffel grass) which was recorded from fifteen locations across the survey area from five different vegetation types.

**Table 13 Weeds recorded during the survey**

Scientific Name	WAOL status	A	C	D	E	H	X	Total
<i>*Aerva javanica</i>	Permitted - s11					1		1
<i>*Argemone ochroleuca subsp. ochroleuca</i>	Permitted - s11		1					1
<i>*Calotropis procera</i>	Declared Pest - s22(2) (Exempt)		6				3	9
<i>*Cenchrus ciliaris</i>	Permitted - s11	5	5	1	4		1	15
<i>*Chloris barbata</i>	Permitted - s11		2					2
<i>*Cynodon dactylon</i>	Permitted – s11						2	2

**\*Calotropis procera** – The survey recorded one Declared Pest, *\*Calotropis procera* (rubber bush) which is listed as a Declared Pest – s22(2) and a Pilbara region priority alert weed (DPaW 2014). Declared pests must satisfy any applicable import requirements when imported, and may be subject to an import permit if they are potential carriers of high-risk organisms. They may also be subject to control and keeping requirements once within Western Australia (DAFWA 2018). *\*Calotropis procera* was recorded from nine location in the survey area, six of which were in vegetation type C (major drainage lines habitat) and three in disturbed areas. *\*Calotropis procera* is a shrub or tree 1-4 meters tall. It grows often in sandy and clayey soils and flowers from January to December, producing cream/white and purple flowers (Western Australian Herbarium 1998). This taxon is easy to recognise in the field even when not in flower because of its relatively large size and distinct foliage. Targeted surveys would likely record more instances of this species in the survey area.

#### 4.2.4 Broad vegetation types recorded in the survey area

The vegetation of the survey area comprises a variation of spinifex (*Triodia* spp.) grasslands, mostly on stony or sandy plains, with an overstorey of mixed shrubs and small trees dominated by different Acacia species that defined each vegetation type. Major, medium, and minor creek lines bisect the plains, with the major and medium creek lines supporting a variety of groundwater dependent flora species.

Nine broad vegetation types were mapped in the survey area, as summarised in Table 14. The most extensive was vegetation type A - *Acacia inaequilatera* over *Triodia epactia* and *T. wiseana* on stony plain, covering 318.9 ha or 77.0% of the survey area. Vegetation type B – *Acacia stellaticeps* over *Triodia epactia* and *T. longiceps* on sand plain was the next most dominant vegetation type, covering 41.6 ha (10.0%) of the survey area. A significant part of the survey area, covering 25.9 ha (6.3%) was disturbed by mining and other activities. The broad vegetation types of the survey area are described in Table 15, and are mapped in Figure 8, Figure 9 and Figure 10.

**Table 14 Summary of broad vegetation types and corresponding fauna habitats**

Code	Broad vegetation type	Fauna habitat	Area (ha)
A	<i>Acacia inaequilatera</i> over <i>Triodia epactia</i> and <i>T. wiseana</i> on stony plain	Stony plain	318.9
B	<i>Acacia stellaticeps</i> over <i>Triodia epactia</i> and <i>T. longiceps</i> on sand plain	Sand plain	41.6
C	<i>Eucalyptus camaldulensis</i> and <i>Melaleuca argentea</i> over <i>Acacia trachycarpa</i> and <i>Triodia longiceps</i> on major drainage	Major drainage	8.3
D	<i>Corymbia hamersleyana</i> over <i>Acacia eriopoda</i> and <i>Triodia wiseana</i> on rocky medium drainage	Medium drainage - Rocky	2.6
E	<i>Acacia trachycarpa</i> over <i>Triodia longiceps</i> and <i>Cyperus vaginatus</i> on sandy medium drainage	Medium drainage - Sandy	1.7
F	Mixed <i>Acacia</i> shrubland over <i>Triodia</i> species on minor drainage	Minor drainage	2.1
G	<i>Acacia eriopoda</i> over <i>Triodia</i> species surrounding granite outcrops	Granite outcrop	3.3
H	<i>Indigofera monophylla</i> and other mixed shrubs over <i>Triodia wiseana</i> on hill crests and slopes	Hill crest / hill slope	8.8
I	<i>Senna glutinosa</i> and <i>Acacia orthocarpa</i> over <i>Triodia epactia</i> on low stony hills	Low stony hills	0.9
X	Disturbed areas with variety of vegetation	Disturbed	25.9

#### 4.2.5 Conservation significant vegetation

There are no known locations of listed significant vegetation, as listed by AWE (EPBC Act) or otherwise listed by the DBCA, occurring within 50 km of the survey area (see section 4.1.1) (DBCA 2020b; AWE 2020). A review of the published TEC and PEC listings for Western Australia (DBCA 2018c; DBCA 2021) against the descriptions of the vegetation types in Table 15 identified no vegetation types in the survey area representing listed TECs or PECs. .

Vegetation may be of significance for reasons other than a listing as a TEC or a PEC. This may include, although is not limited to, scarcity, combination of species, role as a refuge, restricted distribution and vegetation extent being below a threshold level (EPA 2004). No vegetation considered to provide refugia for flora taxa (for example, vegetation associated with gorges or seepage areas), or otherwise providing an important function required to maintain ecological integrity of a significant ecosystem (as defined by EPA 2016a) was recorded in the survey area.

Vegetation that is not a Threatened or Priority Ecological Community may still be considered significant if it has a restricted distribution, or has experienced a degree of historical impact from threatening processes (EPA 2016b). Vegetation types retaining less than 30% of their pre-European extent generally experience accelerated species loss at an ecosystem level (EPA 2000) and are regarded as being

'vulnerable', while vegetation types retaining less than 10% of their original extent are regarded as being 'endangered' (EPA 2000, 2016b, Shepherd *et al.* 2002, DER 2014). Review of the DBCA State-Wide Vegetation Statistics data (DBCA 2018a) showed that both the Abydos Plain 93 and the George Ranges 82 vegetation system-associations still have 99% of their original extent remaining (DBCA 2018a) and would be considered 'least concern' (DER 2014).

Local significance can be determined where a vegetation association is confined to a specialised habitat or landform that is not common in the local area or where vegetation types support conservation significant species.

Two vegetation types mapped in the survey area were considered locally significant on the basis of supporting the priority 3 species *Eragrostis crateriformis* (vegetation type A) and the priority four species *Ptilotus mollis* (vegetation type H).

Vegetation types C,D, and E containing groundwater dependent taxa associated with drainage habitats were considered locally significant as was the granite outcrop (G) and low stony hills vegetation type (I), due to small size of the vegetation types (Table 15) within the survey area,

#### **4.2.6 Watercourses and Groundwater Dependent Vegetation**

Six flora groundwater dependent taxa were recorded during the survey. These were the obligate phreatophytes *Eucalyptus camaldulensis* and *Melaleuca argentea* recorded from primarily the vegetation type C (Major Drainage habitat), and the facultative phreatophytes *Acacia ampliceps* (and a potential hybrid *Acacia ampliceps* x *sclerosperma*), *Atalaya hemiglauc*, *Eucalyptus victrix*, and *Melaleuca glomerata* were recorded from vegetation type C (Major Drainage), D (Medium Drainage – rocky), and E (Medium Drainage – sandy), and A (Stony Plain).



Groundwater Dependent Vegetation (GVD) proximal to the Narri and Mooyella borefields have been assessed by (Woodman 2020a) where a GDV classification system categorises the vegetation to Level 1 (presence of *Melaleuca argentea*), Level 2 (presence of *E. camaldulensis* subsp *refulgens*, without *M. argentea*) and Level 3 (presence of only *A. hemiglauc* and/or *E. victrix*) where level 1 represents the most sensitive obligate phreatophytic vegetation, and Level 3, presumed facultative phreatophytic vegetation.

The drainage proximal to Moolyella Borefield was classified as Level 1 Groundwater Dependent Vegetation where *M. argentea* trees were present throughout the majority of the riparian zones. *Melaleuca argentea* stands were common in flowlines and scattered individual trees were recorded along the banks (Woodman 2020a).

Where *Eucalyptus camaldulensis* subsp. *refulgens*, was dominant or co dominant on banks and scattered within the riverbed, and where it occurred without *M. argentea* the vegetation was classified as Level 2 Groundwater Dependent Vegetation.

At Narri Borefield the *Eucalyptus camaldulensis* subsp. *refulgens* dominated flowlines represents Level 2 Groundwater Dependent Vegetation (Woodman 2020a).

**Table 15 Broad vegetation types of the survey area**



Type	Vegetation description	Photo
A	<p><b><i>Acacia inaequilatera</i> over <i>Triodia epactia</i> and <i>T. wiseana</i> on stony plain</b></p> <p><u>Description:</u> Low woodland to medium shrubland of <i>Acacia inaequilatera</i> with <i>Grevillea pyramidalis</i>, <i>Grevillea wickhamii</i>, and <i>Acacia bivenosa</i>; over mixed shrubs including <i>Corchorus parviflorus</i>; over <i>Triodia epactia</i> and/or <i>T. wiseana</i> hummock grassland occasionally dominated by <i>Triodia longiceps</i>. Occasional emergent <i>Corymbia hamersleyana</i> isolated low trees.</p> <p><u>Extent and landform:</u> The dominant vegetation type within the pipeline corridor, covering 318.9 ha (77.0%) of the survey area. It is synonymous with the Stony Plain fauna habitat. Vegetation type A falls primarily within the Macroy land system with a minor section in the Talga Land System. It occurs on flat to lightly undulating terrain. Soils range from brown loam to orange-brown clay-loam and orange sand. Rock cover is generally high, average of 30% up to 80-100% at some relevés.</p> <p><u>Vegetation condition:</u> Very good to Excellent (rarely Poor or Good)</p> <p><u>Disturbances:</u> Tracks and feral animals (cattle) and some historic or (rarely) recent fire.</p> <p><u>Conservation significant flora:</u> <i>Eragrostis crateriformis</i> (P3)</p> <p><u>GDV indicator species:</u> <i>Atalaya hemiglauca</i><sup>F</sup></p> <p><u>Weeds:</u> *<i>Cenchrus ciliaris</i></p> <p><u>Significance:</u> Local, Very Low</p>	
B	<p><b><i>Acacia stellaticeps</i> over <i>Triodia epactia</i> and <i>T. longiceps</i> on sand plain</b></p> <p><u>Description:</u> Low mixed shrubland dominated by <i>Acacia stellaticeps</i>, over <i>Triodia epactia</i> and/or <i>T. longiceps</i> hummock grassland, sometimes with emergent <i>Acacia</i> spp., <i>Grevillea</i> spp. and <i>Hakea lorea</i> tall shrubs to low trees.</p> <p><u>Extent and landform:</u> The second most dominant vegetation type, covering 41.6 ha (10.0%) of the survey area. It occurs in extensive areas in the northern part of the corridor, and as pockets (unmapped) within vegetation type A. It falls in the Macroy land system, primarily on flat terrain. Soils are orange to orange-brown with zero to minimal (10%).</p> <p><u>Vegetation condition:</u> Good to Excellent (rarely poor)</p> <p><u>Disturbances:</u> Tracks, feral animals (cattle)</p> <p><u>Conservation significant flora:</u> None</p> <p><u>GDV indicator species:</u> <i>Atalaya hemiglauca</i><sup>F</sup></p> <p><u>Weeds:</u> None</p> <p><u>Significance:</u> Nil, Negligible</p>	





Type	Vegetation description	Photo
C	<p><b><i>Eucalyptus camaldulensis</i> and <i>Melaleuca argentea</i> over <i>Acacia trachycarpa</i> and <i>Triodia longiceps</i> on major drainage</b></p> <p><u>Description:</u> <i>Eucalyptus camaldulensis</i> and <i>Melaleuca argentea</i> open woodland with occasional <i>E. victrix</i> or <i>M. glomerata</i>; over mixed tall to medium shrubland dominated by <i>Acacia trachycarpa</i> and *<i>Calotropis procera</i>; over mixed medium to low shrubs; over <i>Triodia longiceps</i> sparse hummock grassland; over <i>Cyperus vaginatus</i> sedges and *<i>Cenchrus ciliaris</i> and/or *<i>Chloris barbata</i> grasses.</p> <p><u>Extent and landform:</u> This vegetation type occurs on the medium drainage lines intersecting the survey area and is synonymous with the Major Drainage fauna habitat. It falls in the Macroy and River Land Systems, covering 8.3 hectares (2.0% of the survey area). Soils are primarily brown to orange sand with zero to minimal (10%) rock cover.</p> <p><u>Vegetation condition:</u> Good to very good</p> <p><u>Disturbances:</u> Feral animals and weeds</p> <p><u>Conservation significant flora:</u> None</p> <p><u>GDV indicator species:</u> <i>Eucalyptus camaldulensis</i><sup>o</sup>, <i>Eucalyptus. victrix</i><sup>f</sup>, <i>Melaleuca argentea</i><sup>o</sup>, <i>Melaleuca glomerata</i><sup>f</sup>, <i>Acacia ampliceps</i><sup>f</sup>, <i>Atalaya hemiglauca</i><sup>f</sup></p> <p><u>Weeds:</u> *<i>Argemone mexicana</i>, *<i>Calotropis procera</i>, *<i>Cenchrus ciliaris</i>, *<i>Chloris barbata</i></p> <p><u>Significance:</u> Local, Low</p>	




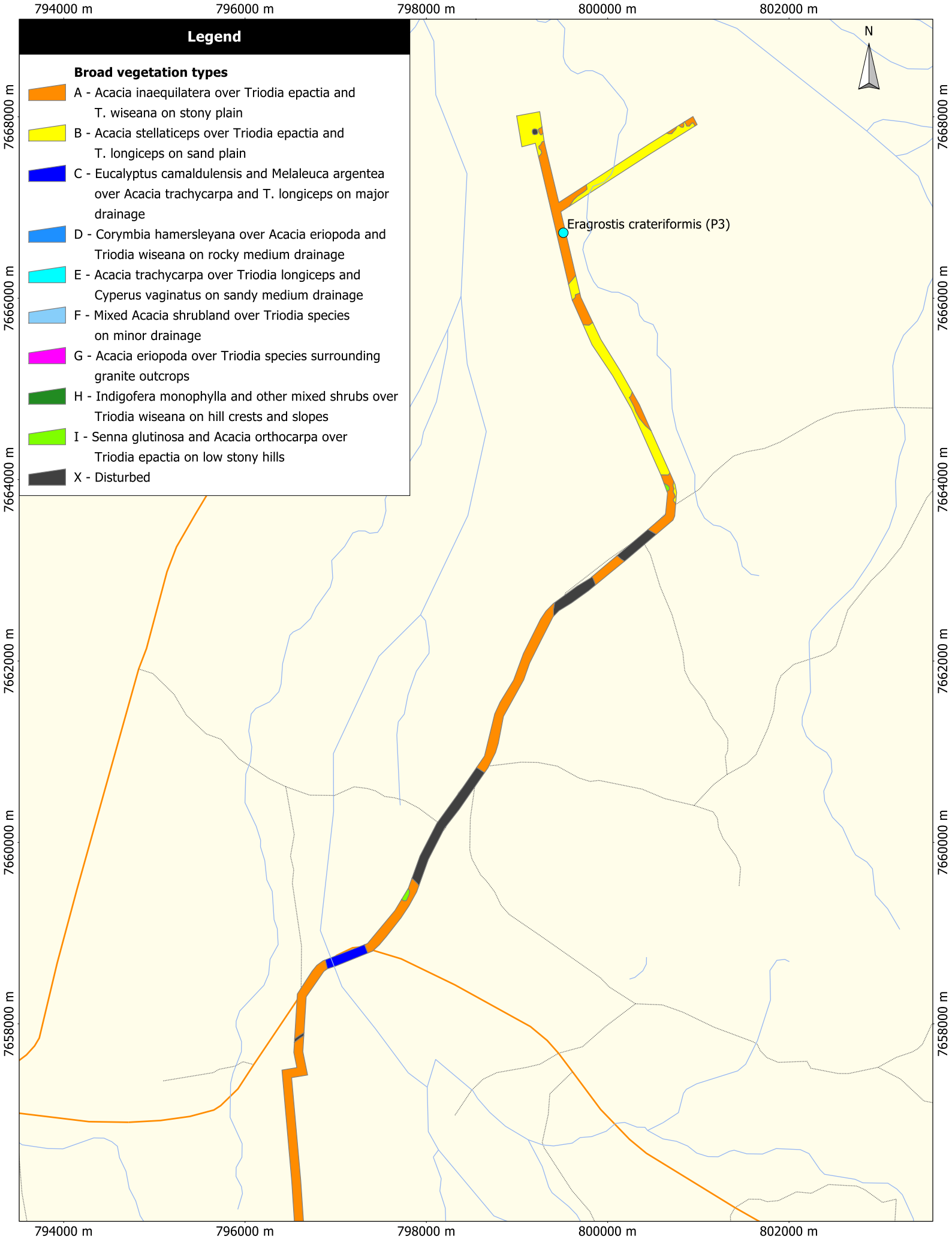
Type	Vegetation description	Photo
D	<p><b><i>Corymbia hamersleyana</i> over <i>Acacia eriopoda</i> and <i>Triodia wiseana</i> on rocky medium drainage</b></p> <p><u>Description:</u> Mixed open woodland dominated by <i>Corymbia hamersleyana</i>, with <i>Eucalyptus victrix</i>, <i>E. camaldulensis</i>, <i>C. ferritcola</i> and <i>Atalaya hemiglauca</i>; over mixed open to sparse medium shrubland dominated by <i>Acacia eriopoda</i> with <i>Petalostylis labicheoides</i>, <i>A. pyrifolia</i>, <i>Cymbopogon ambiguus</i> and <i>Grevillea pyramidalis</i>; over <i>Triodia wiseana</i> sparse hummock grassland.</p> <p><u>Extent and landform:</u> Southernmost part of the survey area, synonymous with Medium Drainage - Rocky fauna habitat. It falls within the Talga Land System, covering 2.6 ha (0.6%) of the survey area. Vegetation type B continues on into the Warrawoona project area where it matches VT3 mapped by Woodman (2020). Soils are stony with high (70%) rock cover.</p> <p><u>Vegetation condition:</u> Excellent</p> <p><u>Disturbances:</u> Some litter</p> <p><u>Conservation significant flora:</u> None</p> <p><u>GDV indicator species:</u> <i>Eucalyptus camaldulensis</i><sup>O</sup>, <i>Eucalyptus. victrix</i><sup>F</sup>, <i>Atalaya hemiglauca</i><sup>F</sup></p> <p><u>Weeds:</u> *<i>Cenchrus ciliaris</i></p> <p><u>Significance:</u> Local, Low</p>	
E	<p><b><i>Acacia trachycarpa</i> over <i>Triodia longiceps</i> and <i>Cyperus vaginatus</i> on sandy medium drainage</b></p> <p><u>Description:</u> Tall to medium mixed sparse shrubland dominated by <i>Acacia trachycarpa</i>; over mixed low shrubs; over <i>Triodia longiceps</i> open to sparse hummock grassland; over <i>Cyperus vaginatus</i> sparse to isolated sedges and *<i>Cenchrus ciliaris</i> grasses.</p> <p><u>Extent and landform:</u> Occurs on sandy medium drainage lines intersecting the survey area. Synonymous with Medium Drainage – Sandy fauna habitat. It falls primarily in the Macroy Land System with a small extent in the Talga Land System. Vegetation type E covers 1.7 ha (0.4%) of the survey area. Soils are brown or orange sand, with zero to minimal (10%) rock cover.</p> <p><u>Vegetation condition:</u> Poor to Excellent</p> <p><u>Disturbances:</u> Feral animals</p> <p><u>Conservation significant flora:</u> None</p> <p><u>GDV indicator species:</u> <i>Acacia ampliceps</i><sup>F</sup>, <i>Acacia ampliceps x sclerosperma</i><sup>F</sup></p> <p><u>Weeds:</u> *<i>Cenchrus ciliaris</i></p> <p><u>Significance:</u> Local, Low</p>	

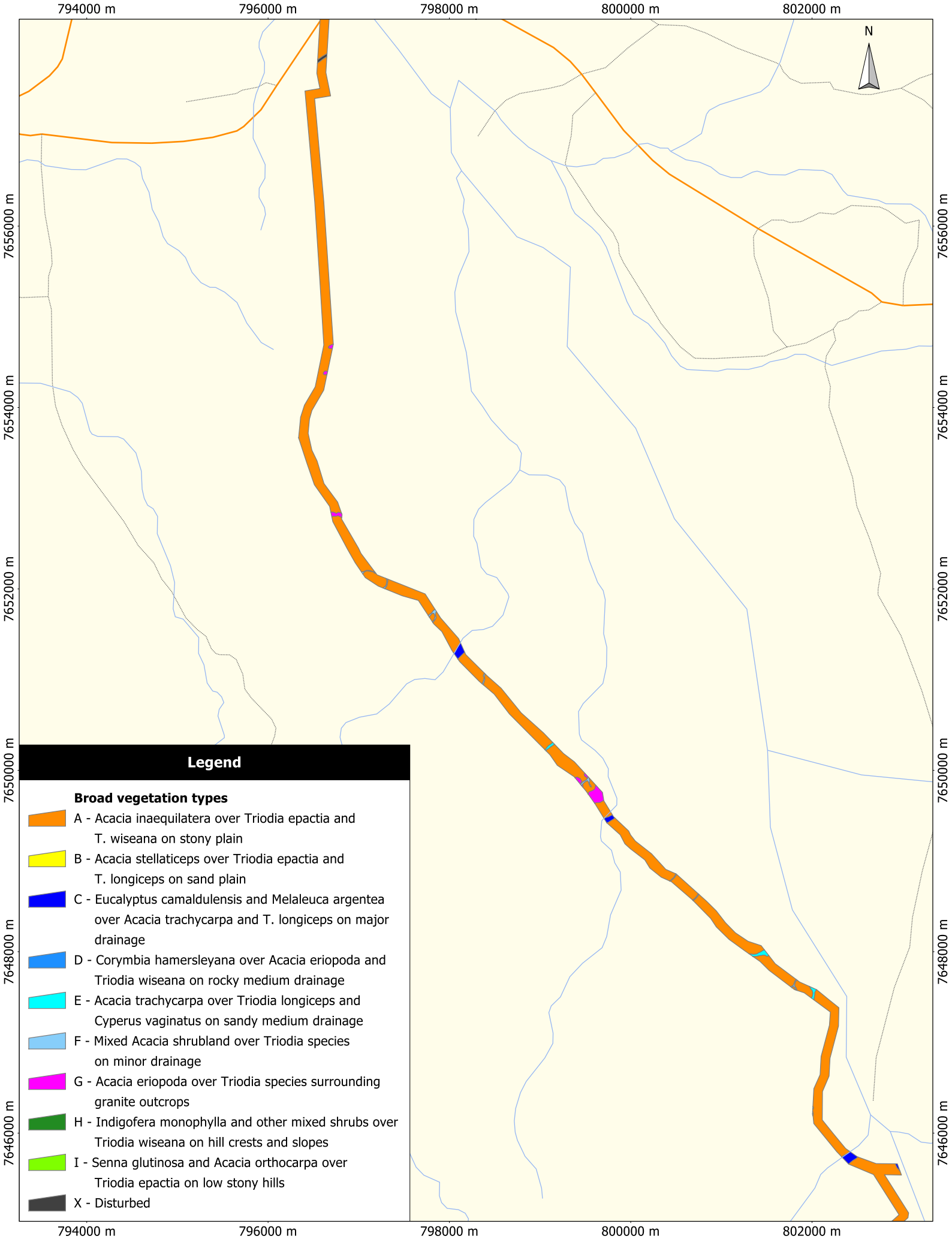
Type	Vegetation description	Photo
F	<p><b>Mixed <i>Acacia</i> shrubland over <i>Triodia</i> species on minor drainage</b></p> <p><u>Description:</u> Mixed tall to medium open acacia shrubland with dominance varying from <i>Acacia eriopoda</i>, <i>A. inaequilatera</i>, or <i>A. stellaticeps</i>; with occasional emergent <i>Corymbia hamersleyana</i> or <i>Atalaya hemiglauca</i> trees; over mixed low shrubs; over <i>Triodia longiceps</i>, <i>T. wiseana</i>, and occasional <i>T. epactia</i> hummock grassland. Dominance of acacia species appeared to be driven by the dominant species in the surrounding vegetation that the minor drainage lines intersected.</p> <p><u>Extent and landform:</u> Occurs across the survey area, intersecting vegetation types A and B. Synonymous with the Minor Drainage fauna habitat. It falls in the Macroy and River Land Systems and covers 2.1 ha (0.5%) of the survey area. Soils are very dark brown to orange sand with zero to high (70%) rock cover.</p> <p><u>Vegetation condition:</u> Poor to very good</p> <p><u>Disturbances:</u> Feral animals.</p> <p><u>Conservation significant flora:</u> None</p> <p><u>GDV indicator species:</u> None</p> <p><u>Weeds:</u> None</p> <p><u>Significance:</u> Nil, Very Low</p>	
G	<p><b><i>Acacia eriopoda</i> over <i>Triodia</i> species surrounding granite outcrops</b></p> <p><u>Description:</u> <i>Acacia eriopoda</i> sparse low woodland over sparse to isolated mixed shrubs dominated by <i>Grevillea wickhamii</i> over open to sparse hummock grassland dominated by <i>Triodia epactia</i>, <i>T. wiseana</i>, and/or <i>T. longiceps</i>, surrounding granite outcrops.</p> <p><u>Extent and landform:</u> Occurs in small pockets in vegetation type A in the Macroy Land System. Synonymous with the Granite Outcrops fauna habitat. Only one relevé in the survey area sampled this vegetation type, but additional relevé data was collected outside the final version of the pipeline corridor, which helped define this vegetation type. Sampling additional relevés may define this vegetation type further, or indicate that it should be considered a sub-type of A. It covers 3.3 ha (0.8%) of the survey area but occurs more extensively outside. Soil was brown loam with medium (30%) rock cover.</p> <p><u>Vegetation condition:</u> Excellent</p> <p><u>Disturbances:</u> None</p> <p><u>Conservation significant flora:</u> None</p> <p><u>GDV indicator species:</u> None</p> <p><u>Weeds:</u> None</p> <p><u>Significance:</u> Local, Low</p>	

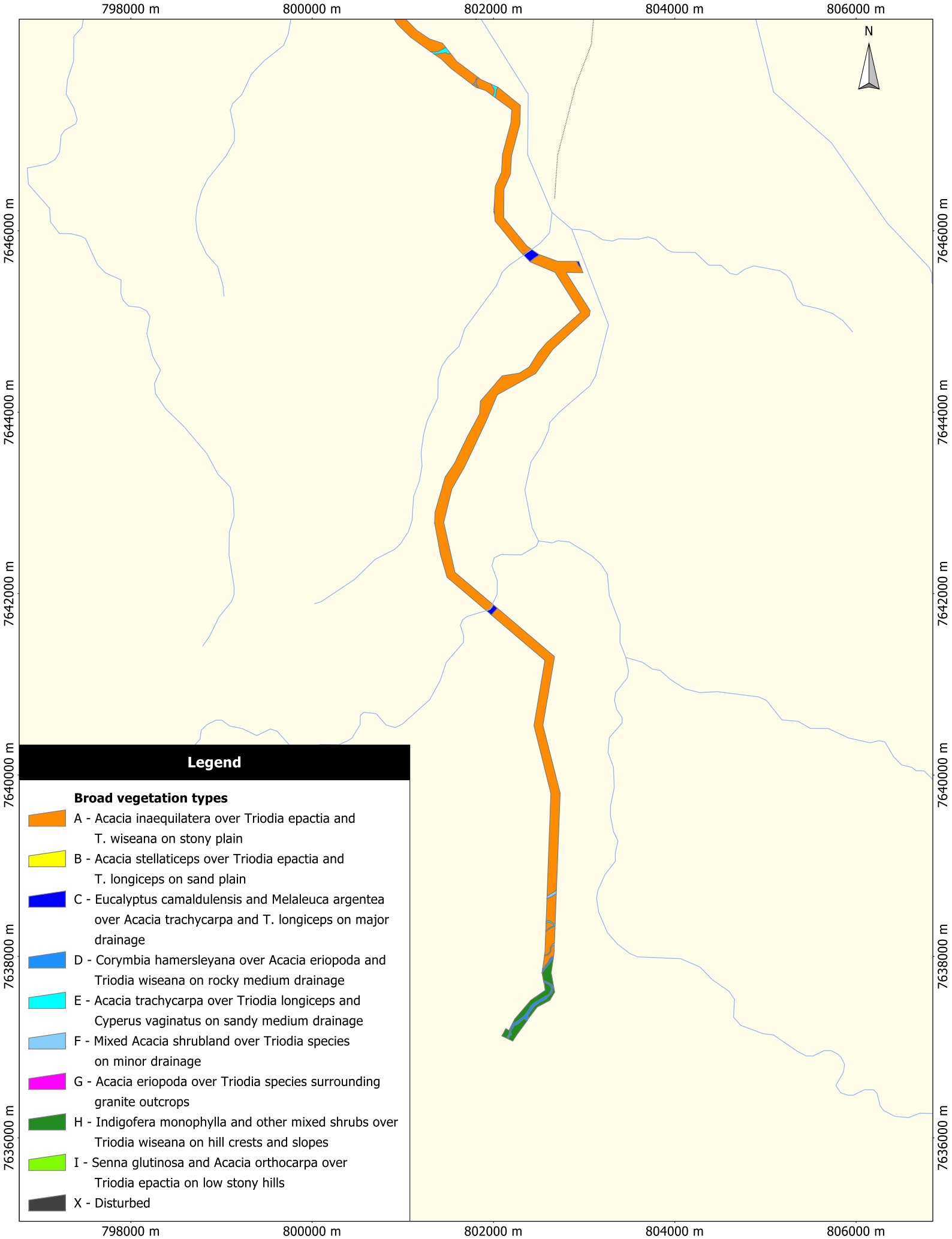
Type	Vegetation description	Photo
H	<p><b><i>Indigofera monophylla</i> and other mixed shrubs over <i>Triodia wiseana</i> on hill crests and slopes</b></p> <p><u>Description:</u> Sparse mixed medium to low shrubland with <i>Indigofera monophylla</i>, <i>Grevillea pyramidalis</i>, <i>Corchorus parviflorus</i>, <i>Senna glutinosa</i> and <i>Hakea lorea</i>; over <i>Triodia wiseana</i> hummock grassland</p> <p><u>Extent and landform:</u> Southernmost part of the survey area, in the Talga land system. Synonymous with the Hill crest / hill slope fauna habitat. Vegetation type H continues into the Warrawoona project area where it matches VT6 mapped by Woodman (2020). It covers 8.8 ha (2.1% of the survey area). Soils are dark brown clay-loams with very high (80-100%) rock cover.</p> <p><u>Vegetation condition:</u> Very good to excellent.</p> <p><u>Disturbances:</u> Weeds</p> <p><u>Conservation significant flora:</u> <i>Ptilotus mollis</i> (P4) recorded in this habitat but outside of survey area</p> <p><u>GDV indicator species:</u> <i>Atalaya hemiglauca</i><sup>F</sup></p> <p><u>Weeds:</u> *<i>Aerva javanica</i></p> <p><u>Significance:</u> Local, Very Low</p>	
I	<p><b><i>Senna glutinosa</i> and <i>Acacia orthocarpa</i> over <i>Triodia epactia</i> on low stony hills</b></p> <p><u>Description:</u> Mixed open tall to medium shrubland dominated by <i>Senna glutinosa</i> and <i>Acacia orthocarpa</i>, with <i>A. inaequilatera</i> and <i>Grevillea wickhamii</i>; over mixed low shrubs; over <i>Triodia epactia</i> and occasional <i>T. wiseana</i> hummock grassland.</p> <p><u>Extent and landform:</u> The survey corridor intersected this vegetation type in three places, where the pipeline corridor ran over the foothills of a low hill. It is synonymous with the Low Stony Hills fauna habitat. It occurred only in the Macroy Land System and was surrounded by vegetation type A, covering an area of 0.9 ha (0.2%) of the survey area. Soils ranged from sand, loam, clay-loam. Rock cover was medium (30%) to very high (80-100%).</p> <p><u>Vegetation condition:</u> Very good to excellent</p> <p><u>Disturbances:</u> Feral animals and tracks</p> <p><u>Conservation significant flora:</u> None</p> <p><u>GDV indicator species:</u> <i>Atalaya hemiglauca</i><sup>F</sup></p> <p><u>Weeds:</u> None</p> <p><u>Significance:</u> Local, Very Low</p>	



Type	Vegetation description	Photo
X	<p><b><i>Disturbed areas with variety of vegetation</i></b></p> <p>This is not a vegetation type as the flora within may have been planted (rehabilitation) and/or the soil has been altered or disturbed severely. This area includes several artificial water bodies (dams) which support flora species associated with drainage or groundwater. Several phreatophytes were recorded in these disturbed areas. Combined they cover 25.9 ha (6.3%) of the survey area.</p> <p><u>Vegetation condition:</u> Poor</p> <p><u>Disturbances:</u> Heavily modified area, clearing, cattle, tracks, litter, artificial water bodies.</p> <p><u>Conservation significant flora:</u> none</p> <p><u>GVD indicator species:</u> <i>Acacia ampliceps</i>, <i>Melaleuca argentea</i>, <i>Atalaya hemiglauca</i><sup>F</sup></p> <p><u>Weeds:</u> *<i>Calotropis procera</i>, *<i>Cenchrus ciliaris</i></p>	
<p>Vegetation Types were ranked for significance (High, Moderate, Low or Very Low) according to the criteria in Appendix II.</p>		







## 4.3 Vertebrate fauna desktop results

### 4.3.1 Assemblage

A total of 329 vertebrate fauna species were identified as having the potential to occur within the survey area in the desktop assessment (Appendix XII). This comprised 37 native and 10 introduced mammal species, 162 bird species, 106 reptile species, 10 amphibian species and 4 fish. Not all species are likely to occur in the survey area due to the large search extent of the desktop assessment. Additionally, many species tend to be patchily distributed even where appropriate habitats are present, and many species of birds can occur as regular migrants, occasional visitors or vagrants.

### 4.3.2 Introduced (feral) vertebrate fauna

The desktop study identified 10 species of introduced (feral) fauna which have been recorded previously within 100 km of the survey area (Appendix XII). These were all mammals. Based on distribution, database records and habitat preferences, all species were likely to occur in the survey area. These were dromedary camel (*Camelus dromedarius*), cat (*Felix catus*), house mouse (*Mus musculus*), rabbit (*Oryctolagus cuniculus*), pig (*Sus scrofa*), red fox (*Vulpes vulpes*), cow (*Bos taurus*), donkey (*Equus asinus*), horse (*Equus caballus*) and dog (*Canis familiaris*).

### 4.3.3 Conservation Significant Vertebrate Fauna

A total of 32 species of conservation significance were identified in the desktop assessment as potentially occurring within the survey area, including nine mammals, 19 birds and 4 reptiles (Appendix VII). This comprised eight species listed as Threatened (5 mammals, 2 bird and 1 reptile), 1 species as Other Specially Protected under the BC Act and seven species listed as Priority by the DBCA (4 mammals and 3 reptiles). 19 bird species are listed as Migratory (all birds) under the EPBC Act and/or BC Act and 28 are listed as marine under the EPBC Act. Note, marine species are not discussed further in this report because although they are listed under s248 of the EPBC Act, marine species are not considered Matters of National Environmental Significance (MNES).

Excluding migratory birds, of the species of conservation significance identified as potentially occurring within the survey area, one species was "Confirmed" (Pilbara leaf-nosed bat), five species assessed as "Highly Likely", five species as "Likely" and the remainder were listed as "Possible" (4 species) or "Unlikely" (1 species) due to lack of suitable habitat and/or based on species distribution and lack of contemporary records (Table 16).

Migratory birds were assessed as "Possible (infrequent visitor)" (7 species) to "Unlikely" to occur (8 species), dependent on the species distribution and contemporary records primarily due to the presence of habitat within the major and medium drainage lines and the dams within the historical mining areas. One migratory bird was confirmed on the survey area (Common sandpiper). Of the Migratory birds Australian Painted-snipe is also listed Endangered (EPBC and BC Act) and Curlew sandpiper is listed Critically Endangered (EPBC and BC Act). Both species are ranked as "Unlikely" to occur based on habitat and species distribution.



**Table 16 Desktop results: Conservation significant fauna recorded within 100 km of the survey area**

Species	Likelihood	Recorded on survey area	Details
Northern quoll <i>Dasyurus hallucatus</i> BCA: EN EPBC: EN	Highly Likely	No but known population located on Warrawoona Gold Project within the Rocky Breakaway habitat	Northern quoll are likely to inhabit the survey area in particular the, Granite Outcrop, Low Stony Hill habitats. Northern quoll have been recorded denning from the Rocky Breakaway habitat of the Warrawoona Gold Project (Biologic 2019a) and the closest DBCA (2020) records are 16km to the south west of Warrawoona Gold Project from 2014. Moore et al. (2021) concluded that habitat selection by Northern quolls occurred at multiple scales: i) at the within-patch scale, quolls were more likely to use patches with more denning crevices and vegetation cover, (ii) at the patch scale, quolls were more likely to use patches with smaller amounts of edge habitat relative to patch area, and (iii) at the landscape scale, quolls were more likely to use areas with higher rocky habitat extent. The Northern quoll likely utilise granite outcrops on the survey area for shelter/ dispersal and foraging however it is noted that the granite outcrops and low rocky hills within the survey area are small, lacking microhabitat complexity (cracks, crevices, rock pools) and some are burnt – making them less useful as a refuge or denning site than granite outcrops known to support high populations of Northern quoll such as Red Rock at Indee station (Dunlop 2017, Moore et al. 2021) .  Potential foraging/dispersal: Hillcrest/Hillslope habitat, Low Stony Hills, Granite Outcrop and the drainage habitats
Night parrot <i>Pezoporus occidentalis</i> BCA: CR EPBC: EN	Unlikely	No	Based on accepted records, Night parrot habitat comprises long-unburnt mature <i>Triodia</i> grasslands forming mosaics with samphire and chenopod shrublands (Jackett et al. 2017, McDougall et al. 2009, Murphy et al. 2017) including genera such as <i>Atriplex</i> , <i>Bassia</i> and <i>Maireana</i> , on floodplains and claypans, and on the margins of salt lakes, creeks or other sources of water (McGilp 1931, Wilson 1937). Contemporary Western Australian Pilbara/Murchison records include records north east of Wiluna (Hamilton et al. 2017, Jackett et al. 2017), Lake Disappointment (Great Sandy Desert) (Harewood 2018), Great Sandy Desert (Caccetta 2018) , south of Newman (Ison 2017), salt lake systems on Martu County (Michelmore & Birch 2020) and near the Fortescue Marsh (Davis & Metcalf 2008).  The current interim guidelines for preliminary surveys of Night parrot in Western Australia suggest the species requires large, dense <i>Triodia</i> hummocks primarily old-growth (often more than 50 years unburnt) for roosting and nesting (DPaW 2017). Local records of the Night parrot are scarce, there are historical records for Night parrot from the Marble Bar area (database source Birds Australia Atlas 1 - ALA 2021) with the nearest contemporary record of the species observed at

Species	Likelihood	Recorded on survey area	Details
			<p>Minga Well, a station bore and livestock watering point with large pools of water near Fortescue Marsh (Davis &amp; Metcalf 2008). Suitable habitat occurs within long unburnt patches of the Triodia dominated Stony Plain and Sand Plain, however Night parrot was not detected via SM4 and habitats of the survey area do not include mosaics with samphire and chenopod shrublands or salt lake margin.</p> <p>Possible foraging/dispersal habitat : Stony Plain, Sand Plain</p>
Ghost bat <i>Macroderma gigas</i> BCA: VU EPBC: VU	Highly Likely	No but roosts located on Warrawoona Gold Project	<p>The Warrawoona Gold Project is proximal to two significant roosts, the Klondyke Queen (permanent diurnal and maternity roost) and Bow Bells South (occasional diurnal roost). Additionally, the Comet mine (nocturnal refuge) is located 7 kilometres south of Marble Bar (Biologic 2019d). The Ghost bat will often forage more broadly across habitats, often utilising drainage lines and other habitats where prey species are likely to be most abundant (Richards et al. 2008, Tidemann et al. 1985). No caves or old workings were recorded on the survey area; until the habitat requirement for Ghost bat in the Pilbara is refined it is assumed that suitable foraging habitat exists across all habitats of the survey area.</p> <p>Potential Foraging/ dispersal: Drainage Lines, Hillcrest/ Hillslope, Stony Plain, Low Stony Hills, Granite Outcrop</p>
Pilbara leaf-nosed bat <i>Rhinonictis aurantia</i> <i>(Pilbara)</i> BCA: VU EPBC: VU	Confirmed	Yes and roosts located on and proximal to Warrawoona Gold Project	<p>Pilbara leaf-nosed bat forages in caves and along waterbodies with fringing vegetation (DoEE 2016). Bat Call (2021) confirmed that the timing of the Pilbara leaf-nosed Bat calls recorded during the survey were consistent with Pilbara leaf-nosed bat originating from known diurnal roosts (Klondyke Queen and Bow Bells South). Bow Bells South the permanent diurnal and maternal roost is located approximately 6 km NW of the start of the survey area. Pilbara leaf-nosed Bat were recorded on and nearby to the survey area from the following habitats: Major Drainage, Medium Drainage – rocky, Artificial water body within the disturbed area. Further information is located in Table 18.</p> <p>Potential Foraging/ dispersal habitat includes: Drainage Lines (TSSC Priority 4), Hillcrest/ Hillslope (TSSC Priority 5) Low Stony Hills (TSSC Priority 5), Stony Plain (TSSC Priority 5) and Sand Plain (TSSC Priority 5).</p>

Species	Likelihood	Recorded on survey area	Details
Greater bilby <i>Macrotis lagotis</i> BCA: VU EPBC: VU	Highly Likely	No	There are Greater bilby records proximal to the survey area from 2014 in the DBCA threatened species database, however the database does not indicate type of record or source (DBCA 2020). No evidence of Greater bilby was recorded during the current survey; nor was the species detected via targeted searches for the Warrawoona Gold Project (Biologic 2019a), however, the species likelihood of occurrence is rated as “Highly Likely” based on the presence of suitable habitat and records in the vicinity of the survey area. Within the Pilbara region the species is often sparsely distributed and occurs in relatively low abundance, often also making detection difficult (Southgate et al. 2019).  Habitat within the survey area considered most suitable to support the species is the Sand Plain habitat.
Grey falcon <i>Falco hypoleucos</i> BCA: VU EPBC: VU	Likely	No	Grey falcon commonly nests in timbered areas, particularly tall trees along watercourses, and forages in open or more sparsely vegetated habitats (Garnett et al. 2011). Medium and Major Drainage habitats are likely to provide suitable nesting habitat for the species. Grey falcon is likely to forage more broadly across all habitats within the survey area particularly Stony Plain and Sand Plain habitats.  The Grey falcon was recorded in 2006 approximately 20 km north west of the Moolyella borefield at Doolena Gorge (DBCA 2020) and in 2021 on the Big Schist Pipeline corridor (Rapallo in prep).
Pilbara olive python <i>Liasis olivaceus barron</i> BCA: VU EPBC: VU	Highly Likely	No but one individual recorded from the Warawoona Gold Project	Within inland Pilbara the species is most often encountered near permanent waterholes in rocky ranges or among riverine vegetation (Pearson 1993).  The nearest record of Pilbara olive python is located within the Klondyke Queen historic underground proximal to the Warawoona Gold Project (Biologic 2019a). Additional records are approximately 20 km north-west of the Warrawoona Gold Project (DBCA 2020) and the species was recorded from within the Coronna Downs project area (MWH, Australia 2016). Habitat suitable for the species within the survey area includes the drainage habitats used for foraging and dispersal. The mapped granite outcrop habitat within the survey area is small and burnt therefore unlikely to be important habitat for Pilbara olive python.
Northern brushtail possum <i>Trichosurus vulpecula arnhemensis</i> BCA: VU	Possible	No	Little ecological information is known about the Pilbara population of the species, it has a patchy distribution and is infrequently recorded. The species is omnivorous but often feeds on flowers and insects (Cruz et al. 2012). Northern brushtail possum has been recorded approximately 45 km southwest of the Warrawoona Gold Project (Biologic 2020). The species is most often recorded from major drainage lines that contain large hollow-bearing eucalypts and rocky habitats (i.e.

Species	Likelihood	Recorded on survey area	Details
			gorge/ gully habitat) where suitable shelter sites are present throughout its arid distribution (Kerle et al. 1992); Van Dyck & Strahan 2008).
Peregrine falcon <i>Falco peregrinus</i> BCA: OS	Likely	No	In arid areas, the Peregrine falcon is most often encountered along cliffs above rivers, ranges and wooded watercourses where it hunts birds (Johnstone & Storr 1998) . It typically nests on rocky ledges occurring on tall, vertical cliff faces between 25 m and 50 m high (Olsen & Olsen 1989). The Peregrine falcon was recorded in 2001, approximately 10 km west of the Warrawoona Gold Project (DBCA 2020). The Peregrine falcon is considered rare over much of its range (Johnstone & Storr 1998), however, the Drainage habitats are likely to provide suitable foraging habitat for the species.
<i>Ctenotus nigrilineatus</i> DBCA: P1	Possible	No	Records have been collected from spinifex plains at the base of granite outcrops (How et al. 1991, How & Dell 2004) and sand and stony soils often associated with <i>Acacia trachycarpa</i> over <i>Triodia pungens</i> near drainage (Rapallo 2006).  Potential habitats within the survey area may include the Stony Plain, Sand Plain and Granite Outcrop. The closest record of <i>Ctenotus nigrilineatus</i> is located ~57 km east of the Warrawoona Gold Project from 2000 (DBCA 2017 TPF records cited in Biologic 2019b).
Gane’s blind snake ( <i>Anilius ganei</i> ) DBCA: P1	Possible	No	Little is known of the species’ ecology, but this species is often associated with moist soils and leaf litter within gorges and gullies (Wilson & Swan 2017) and potentially within a wide range of other stony habitats. The species has been recorded from numerous habitats but is most likely to be present in rocky terrain and along drainage lines (Biologic 2020). The closest record is a 2014 record from McPhee’s Creek, 36 km to the south west of the Warrawoona Gold Project (Biologic 2020). Habitat suitable for the species within the survey area includes Major Drainage and Medium Drainage.
<i>Ctenotus uber johnstonei</i> DBCA: P2	Possible	No	Little is known about the habitat preferences of this species, but within the Pilbara the taxon is known from stony hillslopes and plains habitats with variable vegetation cover, often dominated by open Acacia shrubland ( <i>Acacia xiphophylla</i> ) and <i>Triodia</i> hummock grassland (Cogger 2014).  Records for this species are few, <i>Ctenotus uber johnstonei</i> has been previously recorded approximately 68 km south of the Warrawoona Gold Project (Biologic 2020). Habitat suitable for the species within the survey area includes Hillcrest/ Hillslope, Stony Plain and Low Stony Hills within the study area.

Species	Likelihood	Recorded on survey area	Details
Brush-tailed mulgara <i>Dasycercus blythi</i> DBCA: P4	Highly Likely	No but recorded from the Warawoona Gold Project	The Brush-tailed mulgara occurs in <i>Triodia</i> sand plain and gibber plain habitats (Pavey et al. 2012). Mulgara are renowned for using multiple burrow systems within a home-range and changing these frequently (Körtner et al. 2007). Habitat within the survey area considered most suitable to support the species is the Sandy Plain habitat. Brush-tailed mulgara has been recorded from the Sandy Plain habitat of the Warawoona Gold Project (Biologic 2019a).
Long-tailed Dunnart <i>Sminthopsis longicaudata</i> DBCA: P4	Likely	No	The Long-tailed dunnart has a relatively widespread distribution, but is sparsely distributed and can be locally uncommon within the Pilbara region. The species typically occurs on plateaus near breakaways and scree slopes, and on rugged boulder-strewn scree slopes (Gibson & McKenzie 2012). Its core habitat includes rocky scree slopes with hummock grass and shrubs, and tall open <i>Acacia</i> shrubland and woodlands (Burbidge et al. 2008). The nearest DBCA (2020) record of this species is located approximately 17 km south-east of the Warawoona Gold Project from 2003. Habitat within the survey area considered most suitable to support the species is the Hillcrest/Hillslope habitat.
Spectacled hare-wallaby <i>Lagorchestes conspicillatus leichardti</i> DBCA: P4	Likely	No	The Spectacled Hare-wallaby is patchily distributed throughout the Pilbara region with few records of the species. The nearest record of this species is 1.1 km north-east of the Warawoona Gold Project from an unknown date (DBCA 2020). The Sandplain and Stony Plain habitat which comprises expanses of <i>Triodia</i> hummock grasslands provides suitable habitat for the species.
Western pebble-mound mouse <i>Pseudomys chapmani</i> DBCA: P4	Likely	No but one individual recorded from the Warawoona Gold Project	The Western pebble-mound mouse occurs on the gentler slopes of rocky ranges where the ground is covered with a stony mantle and vegetated by hard spinifex, often with a sparse overstorey of eucalypts and scattered shrubs (Anstee & Armstrong 2001). Mounds (active and inactive) have been recorded within the Warawoona Gold Project and the species may occur on the Hillcrest/Hillslope habitat. The closest DBCA (2020) records are 20km to the west of the Warawoona Gold Project. The Hillcrest/Hillslope and Stony Plain habitat provides suitable habitat for the species.
Fork-tailed swift <i>Apus pacificus</i> BCA: MI EPBC:MI	Unlikely - Aerial Species	No	This species is migratory, and would forage above the survey area during summer (Johnstone & Storr 1998). The species is predominantly aerial so may be observed, but would not typically utilise the habitats of the survey area (Higgins 1999).

Species	Likelihood	Recorded on survey area	Details
Oriental plover <i>Charadrius veredus</i> BCA: MI EPBC:MI	Possible - infrequent visitor	No	This migratory species utilises a variety of habitats, including coastal habitats, such as estuarine mudflats and sandbanks, on sandy or rocky ocean beaches as well as open inland environments such as, semi-arid or arid grasslands, where the grass is short and sparse (Johnstone & Storr 2004). There is a DBCA (2020) Bird Atlas 2 record, from 5 km east of the survey area (2005) and suitable habitat may occur within the Sand Plain, Major Drainage and Medium Drainage habitats. Despite the 2005 record, the likelihood of occurrence is ranked as possible because the Oriental plover are regarded as casual in the Pilbara interior, occurring mainly on coastal plains south to Cardabia but also Barrow Island on southward passage (Johnstone et al. 2013).
Common sandpiper <i>Actitis hypoleucos</i> BCA: MI EPBC:MI	Confirmed	Yes	Common sandpiper favours tidal and reef flats, beaches, saltwork ponds, river pools, flooded claypans, freshwater soaks and ephemeral waters. Usually in ones or twos, occasionally in small parties (Johnstone et al. 2013). There are DBCA (2020) Bird Atlas 2 records from the early 2000s from Marble Bar: Chinaman Pool and Dooleana Gorge and the species was recorded on the dam (FH36) in the mining disturbance area during the survey. Suitable habitat occurs within the Major Drainage and artificial water bodies located on the survey area.
Sharp-tailed sandpiper <i>Calidris acuminata</i> BCA: MI EPBC:MI	Possible - infrequent visitor	No	Sharp-tailed sandpiper favours flooded samphire flats and grasslands, mangrove creeks mudflats, beaches, river pools, saltwork ponds, sewage ponds and freshwater soaks (Johnstone et al. 2013). There are DBCA (2020) Bird Atlas 2 records from 2005 within 6 km of the survey area. Suitable habitat may occur within the Major Drainage and artificial water bodies located on the survey area. The species is ranked as 'possible' as it is common but widespread inland with most records associated with areas of temporary flooding (e.g. cyclonic rains) (Johnstone et al. 2013).
Common greenshank <i>Tringa nebularia</i> BCA: MI EPBC:MI	Possible - infrequent visitor	No	Inhabits tidal mudflats, mangrove creeks, flooded samphire flats, beaches, river pools, and saltwork and sewage ponds (Johnstone et al. 2013). There is a DBCA (2020) Bird Atlas 2 record from 2005 within 6 km of the survey area. Suitable habitat may occur within the Major Drainage and artificial water bodies located on the survey area. The species is ranked as 'possible' as it is uncommon south of Dampier and interior, occurring generally in ones, twos or small parties, compared to Eighty Mile Beach and Roebuck Bay where at arrival have recorded a population in excess of 3,000 birds (Johnstone et al. 2013). This species may appear anywhere where there is a small amount of water even for a short while.
Wood sandpiper <i>Tringa glareola</i>	Possible - infrequent visitor	No	Mainly river pools, sewage ponds, flooded claypans, freshwater lagoons and bore overflows (Johnstone et al. 2013). There are DBCA (2020) Bird Atlas 2 record from early 2000s within 6 km of the survey area. Suitable habitat may occur within the Major Drainage and artificial water

Species	Likelihood	Recorded on survey area	Details
BCA: MI EPBC:MI			bodies located on the survey area. The species is ranked as 'possible' as the species is likely a passage migrant with peak numbers along Port Hedland-Shay Gap area in September after which several locations in that area are less commonly utilised (Johnstone et al. 2013).
Osprey <i>Pandion haliaetus</i> BCA: MI EPBC:MI	Possible - infrequent visitor	No	Occurs mainly in sheltered seas around islands, tidal creeks, estuaries and saltwork ponds, also large river pools (Johnstone et al. 2013). There are DBCA (2020) Bird Atlas 2 record from the early 2000s within 20km of the survey area from the Coongan River and Doolena Gorge. Suitable habitat may occur within the Major Drainage and artificial water bodies located on the survey area. The species is ranked as 'possible' as the species is regarded as a rare visitor to interior along larger rivers, e.g. Wittenoom Gorge, Carawine Gorge (Johnstone et al. 2013).
Glossy ibis <i>Plegadis falcinellus</i> EPBC:MI	Possible - infrequent visitor	No	Occurs in freshwater wetlands, irrigated areas, margins of dams, floodplains, brackish and saline wetlands, tidal mudflats, pastures, lawns and public gardens (Johnstone et al. 2013). There is a 2018 Birddata record for Marble Bar (Birdlife Australia 2020b). Suitable habitat may occur within the Major Drainage and artificial water bodies located on the survey area. The species is ranked as 'possible' as the species is nomadic. Rare to very common visitor or drought refugee (Johnstone et al. 2013).
Yellow wagtail <i>Motacilla flava</i> BCA: MI EPBC:MI	Possible - infrequent visitor	No	An uncommon but regular visitor to the Pilbara region (Johnstone et al. 2013). Occupies a range of damp or wet habitats with low vegetation, although favours edges of fresh water, especially sewage ponds. There is a 2010 Birddata record for Marble Bar (Birdlife Australia 2020b). Suitable habitat may occur within the Major Drainage and artificial water bodies located on the survey area. The species is ranked as 'possible' as the species is an infrequent visitor with few records for the Pilbara.
<i>Australian painted-snipe</i> <i>Rostratula australis</i> BCA: EN EPBC:EN	Unlikely	No	Generally, occupies shallow terrestrial freshwater wetlands (i.e. temporary and permanent lakes, swamps and claypans) with emergent tussocks of grass, sedges, rushes or reeds, or samphire (Johnstone & Storr 1998). The closest published record is from at Coondiner Pool, located on Roy Hill Pastoral station ~160 km south (Knuckey et al. 2013).  Suitable habitat may occur within the Major Drainage and artificial water bodies located on the survey area, however the species is rarely recorded and has not been recorded within 100km of the survey area.

Species	Likelihood	Recorded on survey area	Details
<i>Eastern curlew</i> <i>Numenius madagascariensis</i> BCA: MI/CR EPBC:MI/CR	Unlikely	No	<p>Mainly tidal mudflats, also reef flats, sandy beaches and rarely near-coastal lakes including saltwork ponds (Johnstone &amp; Storr 1998). The closest records are from Port Hedland ~158 km north west (Birdlife Australia 2020b).</p> <p>Suitable habitat may occur within the Major Drainage and artificial water bodies located on the survey area, however the species is rarely recorded and has not been recorded within 100km of the survey area.</p>
<i>Pectoral sandpiper</i> <i>Calidris melanotos</i> BCA: MI EPBC:MI	Unlikely	No	<p>Coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands (Johnstone &amp; Storr, 2004; Johnstone et al., 2013). It prefers wetlands with open fringing mudflats and low, emergent or fringing vegetation (Geering et al. 2007).</p> <p>Closest record is ~158 km (NW) – 1998 (DBCA 2017 TPF records cited in Biologic 2019b)</p> <p>Suitable habitat may occur within the Major Drainage and artificial water bodies located on the survey area, however the species is rarely recorded and has not been recorded within 100km of the survey area.</p>
<i>Oriental pratincole</i> <i>Glareola maldivarum</i> BCA: MI EPBC:MI	Unlikely	No	<p>Prefers open plains, floodplains or short grasslands, often with extensive bare areas. They often occur near terrestrial wetlands (such as billabongs, lakes or creeks), and artificial wetlands (such as reservoirs, saltworks and sewage farms) (Johnstone &amp; Storr 1998). This species is considered due to the protected matters search and is not record based. Closest record is ~100 km (NNW) – 1980</p> <p>(DBCA 2017 TPF records cited in Biologic 2019b). Suitable habitat may occur within the Major Drainage and artificial water bodies located on the survey area, however the species is rarely recorded and has not been recorded within 100km of the survey area.</p>
<i>Grey wagtail</i> <i>Motacilla cinerea</i> BCA: MI EPBC:MI	Unlikely	No	<p>A rare vagrant to Western Australia where it has been recorded within various habitats with open waterbodies (Johnstone &amp; Storr 2004). This species is considered due to the protected matters search and is not record based. Closest record is ~539 km (NE) – 2013 (DBCA 2017 TPF records cited in Biologic 2019b). Suitable habitat may occur within the Major Drainage and artificial water bodies located on the survey area, however the species is rarely recorded and has not been recorded within 500km of the survey area.</p>
<i>Barn swallow</i> <i>Hirundo rustica</i>	Unlikely	No	<p>The Barn Swallow is recorded in open country in coastal lowlands, often near water, towns and cities. Found near freshwater wetlands, paperbark <i>Melaleuca</i> woodland, mesophyll shrub thickets and tussock grassland (Schodde &amp; Mason 1999). (The Barn Swallow is a non-breeding</p>



Species	Likelihood	Recorded on survey area	Details
BCA: MI EPBC:MI			summer visitor to the Pilbara. The Barn swallow favours areas near water (Johnstone et al. 2013). This species is considered due to the protected matters search and is not record based. Closest record is ~133 km (NW) – 2013 (DBCA 2017 TPF records cited in Biologic 2019b). Suitable habitat may occur within the Major Drainage and artificial water bodies located on the survey area, however the species is rarely recorded and has not been recorded within 100km of the survey area.
Curlew sandpiper <i>Calidris ferruginea</i> BCA: CR EPBC:CR/MIG	Unlikely	No	Inhabits intertidal mudflats in sheltered coastal areas (i.e. estuaries, bays, inlets and lagoons) (Geering et al. 2007). This rare species generally roosts on bare dry shingle, shell or sand beaches, sandspits and islets in or around coastal or near-coastal lagoons and other wetlands (Geering et al. 2007).  Suitable habitat may occur within the Major Drainage and artificial water bodies located on the survey area, however the species is rarely recorded and has not been recorded within 100km of the survey area.
Status: BCA = Western Australian Biodiversity Conversation Act 2016. DBCA refers to the priority list maintained by the Department of Biodiversity, Conservation and Attractions. EPBC = Commonwealth Environment Protection and Biodiversity Conservation Act 1999. See Appendix III for conservation codes.			

#### 4.4 Vertebrate fauna survey results

The survey recorded 92 vertebrate fauna species from the Moolyella pipeline corridor (Appendix XII). These comprised 63 birds, 12 mammals, 16 reptiles, and one species of frog. One introduced species, the cattle or cow (*Bos taurus*) was recorded during the survey. Most fauna records came from opportunistic sightings while traversing the survey area, while additional records of mammals and reptiles were picked up on the cameras. The majority of mammal species recorded were bats (seven species) which were all recorded from SM4 ultrasonic recorders.

Two conservation significant species were recorded during the survey (Appendix XII). These were the Pilbara leaf-nosed bat and the common sandpiper. Both species are discussed in more detail below.

The Pilbara leaf-nosed bat (Vulnerable, BCA and EPBC Act) was recorded as a foraging visitor via calls captured on the SM4 ultrasonic recorders. Since the survey area does not support any caves, the species would not be a resident within the survey area. The common sandpiper (migratory BCA and EPBC) was recorded opportunistically at one of the dams in the disturbed areas (vegetation type X). This species can move large distances in response to availability of water bodies and would not be restricted to the survey area.

##### **Northern quoll (*Dasyurus hallucatus*)**

The Northern quoll is listed as Endangered under the EPBC act and the BC Act. The species, once widely distributed across northern Australia, is now restricted to three isolated populations; the Pilbara, the Kimberley and Northern Territory, and Queensland, in addition to a number of islands along the north coast (DoEE 2016). Such declines are primarily due to the western expansion of the cane toad which is highly toxic to predators when consumed (Woinarski et al. 2008). Other threats include predation from feral predators such as foxes and cats, inappropriate fire regimes, disease, habitat degradation through grazing as well as habitat destruction through mining and agriculture (Woinarski et al. 2011). Northern quoll are relatively common in the northern Pilbara region (generally within 150 km of the coast) but are much less common in southern and south-eastern parts of the region (Cramer et al. 2016). The Northern quoll is both arboreal and terrestrial, inhabiting ironstone and sandstone ridges, scree slopes, granite boulders and outcrops, drainage lines and riverine habitats (Braithwaite & Griffiths 1994, Oakwood 2002). Rocky habitats tend to support higher densities, as they offer protection from predators and are generally more productive in terms of availability of resources (Braithwaite & Griffiths 1994, Oakwood 2002). Other microhabitat features important to the species include: rock cover; proximity to permanent water and time-since last fire (Woinarski et al. 2008). Dens occur in a wide range of situations including: rock overhangs, tree hollows, hollow logs, termite mounds, goanna burrows and human dwellings/infrastructure, where individuals usually den alone (Oakwood 2002, Woinarski et al. 2008).

The Northern quoll is moderately common through part of the Pilbara (within 150 km of the coast) and therefore usually present where suitable rocky habitat is present. Northern quoll are present in the hard rocky habitats of the Pilbara that provide denning habitat and safety from predators and fire (Hill & Ward 2010, Turpin & Bamford 2014). Northern quoll have been recorded denning from the Rocky Breakaway habitat of the Warrawoona Gold Project (Biologic 2019a) and the closest DBCA (2020) records are 16km to the south west of the Warrawoona Gold Project from 2014.

Northern quoll are likely to inhabit the survey area in particular the Low Stony Hill habitats and granite outcrops on the survey area for shelter/ dispersal and foraging however it is noted that the low stony hills and granites are small habitats with limited complexity (deep cracks and crevices) and the granite outcrops on the survey area tended to be small and burnt, impacting vegetation cover – making it less

useful as a refuge or denning site (Moore et al. 2021). Drainage habitats are known foraging and dispersal pathways for Northern quoll.

Core Northern quoll habitat in the region is found in the Rocky Breakaway habitat of the Warrawoona Ranges to the south of the corridor where Northern quoll have been recorded denning (Biologic 2019a). This habitat does not fall within the survey area. The Rocky Breakaway habitat within the higher elevations of the Warrawoona range fits the definition of critical Northern quoll habitat (Moore et al. 2021) defined by large areas of condensed, complex rocky habitat, with intact vegetation occurring within and in the areas surrounding. The Rocky Breakaway habitat is extensive and predominately intact (only 0.8 ha of this habitat has been approved for clearance within the Warrawoona Gold Project). Habitat complexity within-patch scale (Moore et al. 2021) is present for denning via the deep cracks and crevices of the extensive outcropping. The species is rated as “Highly Likely” to occur on the survey area (Table 16).

### **Night parrot (*Pezoporus occidentalis*)**

The Night parrot (Endangered (EPBC/BC Act) is a small, elusive ground dwelling parrot endemic to Australia (DPaW 2017). This cryptic nocturnal parrot inhabits arid and semi-arid areas that comprise dense, low vegetation. The distribution, ecology and habitat preferences of the night Parrot is very poorly understood.

Based on accepted records, Night parrot habitat comprises long-unburnt mature *Triodia* grasslands forming mosaics with samphire and chenopod shrublands (Jackett et al. 2017, McDougall et al. 2009, Murphy et al. 2017) including genera such as *Atriplex*, *Bassia* and *Maireana*, on floodplains and claypans, and on the margins of salt lakes, creeks or other sources of water (McGilp 1931, Wilson 1937).

Contemporary Western Australian Pilbara/Murchison records include records from north east of Wiluna (Hamilton et al. 2017, Jackett et al. 2017), Lake Disappointment (Great Sandy Desert) (Harewood 2018), Great Sandy Desert (Caccetta 2018) south of Newman (Ison 2017), salt lake systems on Martu County (Michelmore & Birch 2020) and near to the Fortescue Marsh (Davis & Metcalf 2008).

The current interim guidelines for preliminary surveys of Night parrot in Western Australia suggest the species require large, dense *Triodia* hummocks primarily old-growth (often more than 50 years unburnt) for roosting and nesting (DPaW 2017). Local records of the Night parrot are scarce, there are historical records for Night parrot from the Marble Bar area (Birds Australia Atlas 1 ALA 2021), with the nearest contemporary record of the species observed at Minga Well, a station bore proximal to the Fortescue Marsh located approximately 250 km to the south west of the Warrawoona Gold Project (Davis & Metcalf 2008). Possible foraging habitat occurs within long unburnt patches of the *Triodia* dominated Stony Plain and Sand Plain, however Night parrot was not detected via SM4 recorder and habitats of the survey area do not include mosaics with samphire and chenopod shrublands or salt lake margin. The species is rated as “Unlikely” to occur on the survey area (Table 16).

### **Ghost bat (*Macroderma gigas*)**

This species is listed as Vulnerable under the EPBC Act and the BC Act. The Ghost bat formerly occurred over a wide area of central, northern and southern Australia but has declined significantly in the southern parts of its’ range in the last 200 years (Armstrong & Anstee 2000). The species now occurs in only a few highly disjunct sites across northern Australia, confined to the Kimberley and Pilbara regions in Western Australia (Van Dyck & Strahan 2008). In the Pilbara region, the species roosts in deep, complex caves

beneath bluffs of low rounded hills, often composed of Marra Mamba or banded iron formation, granite rock piles and abandoned mines (Armstrong & Anstee 2000). They roost either individually or in colonies (Churchill 2008) and move between a number of caves, both seasonally and as dictated by weather changes (Van Dyck & Strahan 2008).

A permanent diurnal and maternity roost occurs within the disused Klondyke Queen mine, proximal to the Warrawoona Gold Project (Biologic 2019d).

No additional natural caves were recorded within the survey area and none are likely to occur based on the habitats and landforms present.

Ghost bat will often forage more broadly across habitats, often utilising drainage lines and other habitats where prey species are likely to be most abundant (Richards et al. 2008, Tidemann et al. 1985). However, until habitat requirements for Ghost bat in the Pilbara are refined it is assumed that suitable foraging habitat exists across all habitats of the survey area: Drainage Lines, Hillcrest/ Hillslope, Stony Plain, Low Stony Hills, and Granite Outcrop.

The species is rated as “Highly Likely” to occur on the survey area (Table 16).

#### **Pilbara leaf-nosed bat (*Rhinocterus aurantia*)**

This species is listed as Vulnerable under the EPBC Act and the BC Act. The Pilbara leaf-nosed bat is restricted to the Pilbara region and is thought to have been separated from populations of the Orange Leaf-nosed Bat in the Kimberley, Northern Territory and western Queensland for at least 30,000 years (Churchill 1991). The species is heavily reliant on warm (28-32 °C), humid (85 to 100 %) sites for roosting (Anstee & Armstrong 2001) which enable individuals to reduce water loss and energy expenditure (Baudinette et al. 2000). The distribution of the species is therefore limited by the scarcity of caves that possess the required microclimates (Anstee & Armstrong 2001, Churchill 1991).

Two roosts for the species occur within the Warrawoona Gold Project. The disused Klondyke Queen (occasional diurnal roost) and Bow Bells South workings (Permanent diurnal and maternal roost) (Biologic 2019d). The permanent diurnal and maternal roost is located approximately 6 km north west of the southern end of the survey area.

Foraging habitat for the Pilbara leaf-nosed bat is diverse. The species generally hunts with a manoeuvrable flight through riparian vegetation in gorges, and over hummock grassland and sparse tree and shrub savannah (Churchill 1994). In the Pilbara, Pilbara leaf-nosed bat has been observed in *Triodia* hummock grasslands covering low rolling hills and shallow gullies, with scattered *Eucalyptus camaldulensis* along the creeks (TSSC, 2016), and has also been recorded over small watercourses, amongst granite boulder terrain, over pools and low shrubs in ironstone gorges, above low shrubs and around pools in gravelly watercourses with *Melaleuca leucadendron*, such as within the Barlee Range Nature Reserve (Armstrong 2001).

Five priority foraging categories exist for the Pilbara leaf-nosed bat, these are ‘Gorges with pools (Priority 1)’; ‘Gullies (Priority 2)’; ‘Rocky Outcrop (Priority 3)’; ‘Major watercourses (Priority 4)’ and ‘Open grassland and woodland (Priority 5)’ (TSSC, 2016).

The Pilbara leaf-nosed bat will potentially forage over most habitats within the survey area. Significant foraging habitats within the survey area are Major Drainage (classified as Priority 4 foraging habitat - TSSC, 2016). Additional foraging habitat is considered to include Hillcrest/ Hillslope, Stony Plain, Low Stony Hills, Granite Outcrop all classified as low significance, Priority 5 foraging habitat TSSC, 2016). Low

Stony Hills, Granite Outcrop are not regarded as Priority 3 Habitat as the outcrops of the survey area are small, typically without the rocky complexity of the Rocky Breakaway habitat.

During the September 2020 fauna survey of the Moolyella Pipeline Corridor: Pilbara leaf-nosed bat calls were recorded via SM4 on the survey area with the timing of the calls, consistent with foraging visits and none indicated nearby diurnal roosting sites (Bat Call, WA 2021). No caves or old workings were located on the survey area. The Pilbara Leaf-nosed bat calls recorded during the survey were from a *Eucalyptus* dominated Major Drainage habitat near a pool adjacent to the survey area, from two large dams located within the corridor and from the Stony Plain Habitat (Bat Call, WA 2021) (Appendix XIII).

#### **Pilbara olive python (*Liasis olivaceus barroni*)**

The Pilbara olive python is listed as Vulnerable under the EPBC Act and the BC Act. It is moderately common through the ranges of the Pilbara and Mt Augustus, where it inhabits water courses and pools in rocky gorges and gullies. This species is primarily nocturnal and tends to shelter in small caves or under vegetation during the day, although it is occasionally active after sunrise, particularly in the warmer summer months (Pearson 1993). The Pilbara olive python is known from a number of sites throughout the Pilbara and is associated with drainage systems, including areas with localised drainage and watercourses (Pearson 1993).

The nearest record of Pilbara olive python is from the historical Klondyke Queen underground proximal to the Warawoona Gold Project (Biologic 2019a). Additional records are from approximately 20 km north-west of the Warawoona Gold Project DBCA (2020) and from within the Corunna Downs project area (MWH, Australia 2016). Habitat suitable for the species within the survey area includes the drainage habitats used for foraging and dispersal. The species is rated as “Highly Likely” to occur on the survey area (Table 16) however it is noted that core habitat of Rocky Breakaway (Biologic 2019a) does not occur on the survey area, rather the high elevation areas of the Warawoona Ranges that contain high complexity habitat (deep cracks and crevices).

#### **Gane’s blind snake (*Anilius ganei*)**

Gane’s blind snake (*Anilius ganei*) – is listed Priority 1 by the DBCA. Gane’s blind snake is endemic to the Pilbara region. Little is known of this species’ ecology or habitat, but it is assumed that, like other blind snakes, it feeds primarily on ants, ant larvae, termites and other small insects (Cogger 2014). Blind snakes usually remain in the topsoil or in ant and termite mounds, only coming to the surface at night or after rain. Records of the species are often associated with moist gorges and gullies (Cogger 2014).

The species has been recorded from various habitats but is most likely to be present in rocky terrain and along drainage lines (Biologic 2020). The closest record is a 2014 record from McPhee’s Creek, 36 km to the south west of the Warawoona Gold Project (Biologic 2020). The species is rated as “Possible” to occur on the survey area (Table 16).

#### ***Ctenotus uber johnstonei***

*Ctenotus uber johnstonei* is listed Priority 2 by the DBCA and occurs in reddish soils within the interior of Western Australia (Wilson & Swan 2017). Little is known about the habitat preferences of this species, but within the Pilbara the taxon is known from stony hillslopes and plains habitats with variable vegetation cover, often dominated by open Acacia shrubland (*Acacia xiphophylla*) and Triodia hummock grassland (Cogger 2014).

Records for this species are few, *Ctenotus uber johnstonei* has been previously recorded approximately 68 km south of the Warrawoona Gold Project (Biologic 2020). Habitat suitable for the species within the survey area includes Hillcrest/ Hillslope, Stony Plain and Low Stony Hills within the study area. The species is rated as “Possible” to occur on the survey area (Table 16).

#### **Western Pebble-mound mouse (*Pseudomys chapmani*)**

This species is listed as Priority 4 by DBCA. The Western pebble-mound mouse has experienced a significant decline in their range through the Gascoyne and Murchison and is now considered endemic to the Pilbara (Start et al. 2000). This species almost exclusively occurs on the gentler slopes of rocky ranges where the ground is covered with a stony mantle and vegetated by hard spinifex, often with a sparse overstorey of eucalypts and scattered shrubs (Anstee & Armstrong 2001).

Western pebble-mound mouse has been recorded from the Warrawoona Gold Project within the Hillcrest/ Hillslope and Stony Plain habitat. The closest DBCA (2020) records are 20 km to the west of Warrawoona Gold Project from 2014. The Hillcrest/Hillslope and Stony Plain habitat provides suitable habitat for the species. The species is rated as “Likely” to occur on the survey area (Table 16).

#### **Peregrine falcon (*Falco peregrinus*)**

The Peregrine falcon is listed under the BC Act as “Other Specially Protected Fauna (OS)” and is considered rare over much of its range (Johnstone & Storr 1998). In arid areas, it is most often encountered along cliffs above rivers, ranges and wooded watercourses where it hunts birds (Johnstone & Storr 1998). It typically nests on rocky ledges occurring on tall, vertical cliff faces between 25 and 50 metres high (Olsen & Olsen 1989).

The Peregrine falcon was recorded in 2001 approximately 10 km west of the Warrawoona Gold Project DBCA (2020). The Peregrine Falcon is considered rare over much of its range (Johnstone & Storr 1998), however, the Drainage habitats are likely to provide suitable foraging habitat for the species. The species is rated as “Likely” to occur on the survey area (Table 16).

#### **Greater bilby (*Macrotis lagotis*)**

The Greater bilby is listed as Vulnerable under the EPBC Act, BC Act, and by the IUCN. Extant population of the Greater bilby occur in a variety of habitats, usually on landforms with level to low slope topography and light to medium soils. Within the Pilbara region the species is recorded within spinifex sandplains associated with paleo-drainage lines and perched drainage lines where the substrate of sand, soil, sandy clay, or sandy gravel is suitable for burrowing (Dziminski & Carpenter 2017).

Greater bilbies are recorded as having low site fidelity and high mobility (Southgate et al. 2007); males regularly move three to five kilometres between burrows on consecutive days; and have been recorded moving up to 15 km in a few weeks (Southgate & Possingham 1995).

There are Greater bilby records proximal to the survey area from 2014 in the DBCA threatened species database, however the database does not indicate type of record or source DBCA (2020). No evidence of Greater bilby was recorded during the current survey; nor was the species detected via targeted searches for the Warrawoona Gold Project (Biologic 2019a). Habitat within the survey area considered most suitable to support the species is the Sandy Plain habitat. The species is rated as “Highly Likely” to occur on the survey area (Table 16).

Preclearance surveys will determine presence of Greater bilby burrows at the time of clearing and allow for avoidance.

### **Northern brushtail possum (*Trichosurus vulpecula arnhemensis*)**

The Northern brushtail possum (*Trichosurus vulpecula arnhemensis*) is listed as Vulnerable under the BC Act. The species occurs from the northwest Pilbara, through the Kimberley and into the Northern Territory (Van Dyck & Strahan 2008). Little ecological information is known about the Pilbara population of the species, it has a patchy distribution and is infrequently recorded. The species is omnivorous but often feeds on flowers and insects (Cruz et al. 2012). Northern brushtail possum has been recorded approximately 45 km south west of the Warrawoona Gold (Biologic 2020). The species is most often recorded from major drainage lines that contain large hollow-bearing eucalypts and rocky habitats (i.e. gorge/ gully habitat) where suitable shelter sites are present throughout its arid distribution (Kerle et al. 1992); Van Dyck & Strahan 2008). The species is considered “Possible” to occur within the survey area within the Major Drainage Line habitats.

### **Grey Falcon (*Falco hypoleucos*)**

The Grey falcon is currently listed as Vulnerable under the EPBC and BC Act. This species appears to have a distribution centred on ephemeral or permanent creek lines (Garnett & Crowley 2000), with numerous records from the Fortescue Marsh region (DBCA 2017 TPF records cited in Biologic 2019b).

Grey Falcons prefer sparsely-treed, open plains and creek lines for hunting. They typically nest in the abandoned nest of a raptor or corvid (Olsen & Olsen 1986) in trees or man-made structures, most notably repeater towers.

The species commonly nests in timbered areas, particularly tall trees along watercourses, and forages in open or more sparsely vegetated habitats (Garnett et al. 2011). Medium and Major Drainage habitats are likely to provide suitable nesting habitat for the species. Grey falcon is likely to forage more broadly across all habitats within the survey area, particularly Stony Plain and Sandy Plain habitats.

The Grey falcon was recorded in 2006 approximately 20 km north west of the Moolyella borefield at Doolena Gorge (DBCA 2020) and on the Big Schist Pipeline corridor in 2021 (Rapallo in prep). The species is rated as “Likely” to occur on the survey area (Table 16).

### ***Ctenotus nigrilineatus***

This species is currently listed as Priority 1 by DBCA. Records of *Ctenotus nigrilineatus* have been collected from spinifex plains at the base of granite outcrops (How et al. 1991, How & Dell 2004) and sand and stony soils often associated with *Acacia trachycarpa* over *Triodia pungens* near drainage (Rapallo 2006).

Potential habitats within the survey area may include the Stony Plain, Sandy Plain and Granite Outcrop. The closest record of *Ctenotus nigrilineatus* is located ~57 km east of the Warrawoona Gold Project from 2000 (DBCA 2017 TPF records cited in Biologic 2019b). The species is rated as “Possible” to occur on the survey area (Table 16).

### **Spectacled Hare-wallaby (*Lagorchestes conspicillatus leichardti*)**

This species is currently listed as Priority 3 by DBCA. The Spectacled hare-wallaby is sparsely distributed and generally uncommon across northern Australia, distributed from northern Queensland in the east, to the Pilbara where the species is considered relatively rare (Van Dyck & Strahan 2008). The species shelters within grass tussocks and spinifex hummocks and low shrubs (Ingleby & Westoby 1992).

The nearest record of this species is 1.1 km north-east of the Warrawoona Gold Project from an unknown date (DBCA 2020). The Sandplain and Stony Plain habitat which comprises expanses of *Triodia* hummock



grasslands provides suitable habitat for the species. The species is rated as “Likely” to occur on the survey area (Table 16), however it is acknowledged that Spectacled hare-wallaby is locally uncommon.

#### **Brush-tailed mulgara (*Dasyercus blythi*)**

The Brush-tailed mulgara (DBCA Priority 4) is a small carnivorous marsupial occurring from southwestern Queensland across the Simpson, Tanami, and Great Sandy Deserts and central Western Australia, including parts of the Pilbara SEWPAC 2011). The Brush-tailed mulgara occurs in *Triodia* sand plain and gibber plain habitats (Pavey et al. 2012). Mulgara can use multiple burrow systems within a home-range and changing these frequently (Körtner et al. 2008). Brush-tailed mulgara has been recorded from the Sandy Plain habitat of the Warrawoona Gold Project (Biologic 2019a). Habitat within the survey area considered most suitable to support the species is the Sandy Plain habitat. The species is rated as “Highly Likely” to occur on the survey area (Table 16).

Preclearance surveys will determine presence of mulgara burrows at the time of clearing and allow for avoidance.

#### **Long-tailed Dunnart (*Sminthopsis longicauda*)**

This species is currently listed as Priority 4 by DBCA. It is a nocturnal and agile species that is distributed through the Pilbara, north eastern goldfields and Gibson desert, south to the Nullarbor Plain, to central Northern Territory and western South Australia (Van Dyck & Strahan 2008). Its core habitat includes rocky scree slopes with hummock grass and shrubs, and tall open Acacia shrubland and woodlands (Mckenzie et al. 2008).

The Long-tailed dunnart has a relatively widespread distribution, but is sparsely distributed and can be locally uncommon within the Pilbara region. The species typically occurs on plateaus near breakaways and scree slopes, and on rugged boulder-strewn scree slopes (Gibson & McKenzie 2012). Its core habitat includes rocky scree slopes with hummock grass and shrubs, and tall open Acacia shrubland and woodlands (Burbidge et al. 2008).

The nearest DBCA (2020) record of this species is located approximately 17 km south-east of the Warrawoona Gold Project from 2003. Habitat within the survey area considered most suitable to support the species is the Hillcrest/Hillslope habitat. The species is rated as “Likely” to occur on the survey area (Table 16).

#### **Fork-tailed swift (*Apus pacificus*)**

The fork-tailed swift (Migratory EPBC/BC Act) is a wide ranging but sparsely distributed species that occurs in a wide range of dry and/or open habitats (Johnstone & Storr 1998). The species does not breed in Australia, migrating from breeding grounds in the northern Hemisphere. The species usually arrives in Australia in October, where it remains in various parts of the continent to as long as April. The species is often observed during foraging or migration, with flocks ranging from 10 to 1,000 individuals (Higgins 1999).

The fork-tailed swift is migratory, and would forage above the survey area during summer (Johnstone & Storr 1998). The species is predominately aerial (Higgins 1999), may be observed but would not typically utilise the habitats of the survey area. The species is rated as “Unlikely” to occur on the survey area (Table 16).

#### **Common sandpiper (*Actitis hypoleucos*)**



The Common sandpiper (Migratory EPBC/BC Act) favours tidal and reef flats, beaches, saltwork ponds, river pools, flooded claypans, freshwater soaks and ephemeral waters. Usually in ones or twos, occasionally in small parties (Johnstone et al. 2013). There are Bird Atlas 2 records from the early 2000s from Marble Bar: Chinaman Pool and Dooleana Gorge (DBCA 2020) and the species was recorded on the dam (FH36) in the mining disturbance area during the survey. Suitable habitat occurs within the Major Drainage and artificial water bodies located on the survey area. The species is rated as “Confirmed” to on the survey area (Table 16).

#### **Sharp-tailed sandpiper (*Calidris acuminata*)**

The Sharp-tailed sandpiper (Migratory EPBC/BC Act) favours flooded samphire flats and grasslands, mangrove creeks mudflats, beaches, river pools, saltwork ponds, sewage ponds and freshwater soaks (Johnstone et al. 2013). There are Bird Atlas 2 records from 2005 (DBCA 2020) within 6 km of the survey area. Suitable habitat may occur within the Major Drainage and artificial water bodies located on the survey area. The species is ranked as ‘possible’ as it is common but widespread inland with most records associated with areas of temporary flooding (e.g. cyclonic rains) (Johnstone et al. 2013). The species is rated as a “Possible (infrequent visitor)” to the survey area (Table 16).

#### **Common greenshank (*Tringa nebularia*)**

The Common greenshank (Migratory EPBC/BC Act) inhabits tidal mudflats, mangrove creeks, flooded samphire flats, beaches, river pools, and saltwork and sewage ponds (Johnstone et al. 2013). There is a Bird Atlas 2 record from 2005 (DBCA2020) within 6 km of the survey area. Suitable habitat may occur within the Major Drainage and artificial water bodies located on the survey area. The species is uncommon south of Dampier and within the interior, occurring generally in ones, twos or small parties, compared to Eighty Mile Beach and Roebuck Bay where at arrival (Johnstone et al. 2013) recorded a population in excess of 3,000 birds. This species may appear anywhere where there is a small amount of water even for a short while. The species is rated as “Possible (infrequent visitor)” to the survey area (Table 16).

#### **Wood sandpiper (*Tringa glareola*)**

Wood Sandpiper (Migratory EPBC/BC Act) inhabits river pools, sewage ponds, flooded claypans, freshwater lagoons and bore overflows (Johnstone et al. 2013). There are Bird Atlas 2 records from the early 2000s (DBCA 2020) within 6 km of the survey area. Suitable habitat may occur within the Major Drainage and artificial water bodies located on the survey area. The species is ranked as “Possible (infrequent visitor)” to the survey area as the species is likely a passage migrant with peak numbers along Port Hedland-Shay Gap area in September after which several locations in that area are less commonly utilised (Johnstone et al. 2013).

#### **Oriental plover (*Charadrius veredus*)**

Oriental Plover (Migratory EPBC/BC Act) utilises a variety of habitats, including coastal habitats, such as estuarine mudflats and sandbanks, on sandy or rocky ocean beaches as well as open inland environments such as, semi-arid or arid grasslands, where the grass is short and sparse (Johnstone & Storr 2004).

There is a Bird Atlas 2 record (DBCA 2020) 5 km east of the survey area from 2005 and suitable habitat may occur within the Sand Plain, Major Drainage and Medium Drainage. Despite the 2005 record, the likelihood of occurrence is ranked as “Possible (infrequent visitor)” because the Oriental plover is regarded as casual in the Pilbara interior, occurring mainly on coastal plains south to Cardabia but also Barrow Island on southward passage (Johnstone et al. 2013).

### **Osprey (*Pandion haliaetus*)**

Osprey (Migratory EPBC/BC Act) inhabit mainly sheltered seas around islands, tidal creeks, estuaries and saltwork ponds, also large river pools (Johnstone et al. 2013). There are Bird Atlas 2 records (DBCA 2020) from the early 2000s within 20km of the survey area from the Coongan River and Doolena Gorge. Suitable habitat may occur within the Major Drainage and artificial water bodies located on the survey area. The species is ranked as “Possible (infrequent visitor)” as the species is regarded as a rare visitor to the interior along larger rivers, e.g. Wittenoom Gorge, Carawine Gorge (Johnstone et al. 2013).

### **Glossy ibis (*Plegadis falcinellus*)**

Glossy Ibis (Migratory EPBC/BC Act) occurs in freshwater wetlands, irrigated areas, margins of dams, floodplains, brackish and saline wetlands, tidal mudflats, pastures, lawns and public gardens (Johnstone et al. 2013). There is a 2018 Birddata record for Marble Bar (Birdlife Australia 2020b). Suitable habitat may occur within the Major Drainage and artificial water bodies located on the survey area. The species is ranked as “Possible (infrequent visitor)” as the species is an infrequent visitor with few records for the Pilbara.

### **Yellow wagtail (*Motacilla flava*)**

Yellow wagtail (Migratory EPBC/BC Act). An uncommon but regular visitor to the Pilbara region (Johnstone et al. 2013). The species occupies a range of damp or wet habitats with low vegetation although favours edges of fresh water, especially sewage ponds. There is a 2010 Birddata record for Marble Bar (Birdlife Australia 2020b). Suitable habitat may occur within the Major Drainage and artificial water bodies located on the survey area. The species is ranked as “Possible (infrequent visitor)” as the species is an infrequent visitor with few records for the Pilbara.

### **Migratory Species Unlikely to occur on the survey area**

Seven migratory species are considered “Unlikely” to occur within the survey area due to their rare occurrence in the Pilbara region, the absence of suitable habitat within the survey area and/or the occurrence of the survey area well outside the species’ known or expected distribution and absence of recorded occurrences proximal to the survey area; Australian painted snipe, Oriental pratincole, Barn swallow, Grey wagtail, Eastern curlew, Pectoral sandpiper and Curlew sandpiper. The occurrence of these species is likely to be infrequent and limited only to rare occasions, such rare vagrants and/or migrating individuals blown off course by cyclonic activity.

#### **4.4.1 Fauna habitat descriptions**

A total of 9 broad fauna habitat types were recorded for the survey area. Habitat descriptions and the extent of each of these habitat types is presented in Table 17. Habitat data is detailed in Appendix IX and mapped in Figure 11, Figure 12 and Figure 13. Figure 1Table 12

Stony Plain was the dominant broad fauna habitats within the survey area, covering approximately 318.9 hectares (78%), followed by Sand Plain: 41.6 hectares (10.1%), Major Drainage: 8.3 hectares (2%), Hillcrest /Hillslope: 7.7 hectares (1.9%). The remaining four broad fauna habitats each covered less than 1 percent of the survey area : Medium drainage – Rocky (2.4 hectares), Medium drainage – Sandy (1.7 hectares), Low Stony Hills (0.9 hectares) and Granite Outcrop (3.3 hectares).

The condition of habitats within the study area ranged from Excellent to Good (sometimes Poor) as described in section 4.2.4 and Table 15. The largest disturbance was caused by cattle grazing and mining

(Appendix IX). Disturbance from cattle grazing was the greatest in the drainage line habitats. Habitats were predominately long unburnt except for the Granite Outcrop habitats.

#### **4.4.2 Habitat Ranking and Extent**

Of the 9 broad fauna habitats recorded within the corridor, the Major Drainage habitat and Sand Plain habitat are ranked as high significance for vertebrate fauna due to the potential to provide core habitat for species of conservation significance (Appendix II). The remainder were deemed to be of moderate significance, either due to foraging/dispersal habitats, or habitats known to support priority or migratory species. All habitats are represented outside of the survey area, throughout the region and in conservation estate. Refer to Table 17 for further detail.

##### **Sand Plain**

Sand Plain habitat was ranked as High significance due to the potential for Greater bilby and Brush-tailed mulgara breeding, foraging and dispersal habitat. Both species are rated as “Highly Likely” to occur on the survey area.

There are Greater bilby records proximal to the corridor from 2014 in the DBCA threatened species database, however the database does not indicate type of record or source (DBCA 2020). No evidence of Greater bilby was recorded during the current survey; nor was the species detected via targeted searches for the Warrawoona Gold Project (Biologic 2019a).

Greater bilbies are recorded as having low site fidelity and high mobility (Southgate et al. 2007); males regularly move three to five kilometres between burrows on consecutive days; and have been recorded moving up to 15 km in a few weeks (Southgate & Possingham 1995).

Brush-tailed mulgara has been recorded from the Sandy Plain habitat of the Warrawoona Gold Project (Biologic 2019a). Mulgara can use multiple burrow systems within a home-range and changing these frequently (Körtner et al. 2008).

Sand Plain habitat provides breeding, shelter, foraging, dispersal habitat for the Spectacled hare-wallaby (DBCA Priority 4) and supporting habitat (dispersal and foraging habitat) for Grey falcon, Pilbara leaf-nosed bat, and Ghost bat. Sand Plain habitat contains some suitable areas of habitat for the Night parrot but the species was not recorded on the survey area via acoustic recorder).

A total of 41.6 ha of the corridor (10 %) comprises Sand Plain habitat and a substantial amount is known to occur outside the corridor to the south of the Warrawoona Gold Project. The habitat type is widespread in the broader landscape (Biologic 2019a) and not restricted to the corridor. Fauna occurring on the Sand Plain Habitat are therefore unlikely to be substantially impacted by clearing for a pipeline, from a regional perspective.

Local populations of Greater bilby and Brush-tailed mulgara may be temporarily impacted by clearing of any active burrows. Clearing activities should be managed to avoid burrows to minimise impacts to such species. Neither Greater bilby, Brush-tailed mulgara or species known to use the Sand Plain habitat would not be restricted to the Sand Plain habitat of the survey area.

##### **Major Drainage**

The Major Drainage habitat provides a range of microhabitats and a stable source of food and water, within vast landscape of relatively resource-poor spinifex plains (How et al. 1991). More specifically,

nectivorous avifauna benefit from the flowering plants and hollow-nesting species make use of the large eucalypts that line the banks (Burbidge et al. 2010). Mammal, reptile and amphibian fauna may also congregate around permanent water pools (How et al. 1991).

Due to the widespread availability of microhabitats, such as leaf litter accumulations, large trees, hollows, and semi-permanent/permanent water sources, the Major Drainage habitat provides foraging and dispersal habitat for Northern quoll, Pilbara leaf-nosed bat, Pilbara olive python and Peregrine Falcon and Northern Brushtail Possum and where there is sufficient moisture Gane's blind snake. Grey falcon may utilise the Major Drainage habitat for nesting and foraging.

Until habitat preferences are further defined for Ghost bat it is assumed that the Major Drainage habitat is also utilised in some capacity by Ghost bat.

Migratory bird species can use drainage systems as conduits for movement throughout an otherwise arid landscape (Storr 1984, Bamford et al. 2008).

Migratory species assessed as "Possible infrequent visitors" to the Major Drainage habitat

- Oriental plover
- Common sandpiper (recorded)
- Sharp-tailed sandpiper
- Common greenshank
- Wood sandpiper
- Osprey
- Glossy ibis

Local populations of Northern quoll, Pilbara leaf-nosed bat, Pilbara olive python, Peregrine Falcon, Northern Brushtail Possum, Gane's blind snake and migratory birds are not anticipated to be impacted by the clearing of a narrow corridor of Major Drainage habitat beyond temporary displacement and direct short-term impact from machinery because this habitat does not contain critical or preferred breeding habitat for the majority of these species.

Northern quoll, Pilbara olive python and Peregrine Falcon breeding habitat is located within the Rocky breakaway habitat of the Warrawoona Gold Project and will not be impacted by the proposal. The Rocky breakaway habitat is extensive and predominately intact (only 0.8 ha of this habitat has been approved for clearance within the Warrawoona Gold Project).

Both Gane's blind snake and the Northern Brushtail Possum have a patchy distribution and are infrequently recorded. The migratory birds are all infrequent visitors to the area.

The Pilbara leaf-nosed bat will potentially forage over most habitats within the corridor with Major Drainage containing most significant foraging habitats due to proximity of pools, however it is noted that the Pilbara leaf-nosed bat was also recorded foraging at the artificial water bodies that occur on the survey area. Ghost bat will potentially forage over most habitats of the survey area.

Grey Falcon does use the Major Drainage habitats for breeding, however it is noted that this habitat is not restricted and the species has not been recorded nesting on survey area.

A total of 8.3 ha of the corridor (2%) comprises of Major Drainage habitat. The habitat type is widespread in the broader landscape, and the affected areas are contiguous with surrounding occurrences of Major

Drainage habitat. Fauna occurring within this habitat type are therefore unlikely to be substantially impacted by clearing for a pipeline, from a regional perspective.

Stony Plain, the dominant habitat within the corridor (78%) provides breeding, shelter, foraging, dispersal habitat for the priority listed Western Pebble-mound mouse and Spectacled hare-wallaby and supporting habitat (dispersal and foraging habitat) for Grey falcon, Pilbara leaf-nosed bat, and Ghost bat. Stony Plain provides potential *Ctenotus nigrilineatus* habitat. Stony Plain habitat contains some suitable areas of habitat for the Night parrot, however the species was not recorded on the survey area via acoustic recorder).



Minor Drainage, Medium Drainage – rocky and Medium Drainage – sandy habitats provides potential dispersal and foraging habitat for Pilbara olive python, Ghost bat, Pilbara Leaf-nosed bat, Peregrine falcon, Grey Falcon, Oriental plover (Migratory BC/EPBC Act) and where there is sufficient moisture, Gane's blind snake. As these habitats are primarily dispersal and foraging habitat for conservation significant species, fauna occurring within this habitat type are unlikely to be substantially impacted by clearing for a pipeline, from a regional perspective.

Hillcrest/ Hillslope, provides supporting habitat (dispersal and foraging habitat) for Ghost bat, Pilbara Leaf-nosed bat and Long-tailed dunnart and breeding, shelter, foraging, dispersal habitat for the priority listed Western pebble-mound mouse. Hillcrest/ Hillslope contains potential habitat for *Ctenotus uber johnstonei*, Hillcrest/ Hillslope habitat is primarily dispersal and foraging habitat for listed threatened species. Fauna occurring within this habitat type are unlikely to be substantially impacted by clearing for a pipeline, from a regional perspective.



Low Stony Hills and Granite Outcrop provides potential dispersal and foraging habitat for Ghost bat, Pilbara Leaf-nosed bat, Northern quoll. Granite Outcrop provides potential *Ctenotus nigrilineatus* habitat. These habitat are primarily dispersal and foraging habitat for listed threatened species. Fauna occurring within this habitat type and are unlikely to be substantially impacted by clearing for a pipeline corridor from a regional perspective.

Given the habitats are represented outside of the survey area, throughout the region and in conservation estate and primarily represent foraging and dispersal habitat of listed threatened species rather than breeding habitat, with management (clearing protocols and preclearance surveys), clearing within the survey area is unlikely to impact local populations beyond temporary displacement.




**Table 17 Broad fauna habitats identified in the survey area**



Habitat	Description	Extent	Photos
<p><b>Low Stony Hills</b></p> <p>Potential Conservation Significance Species</p> <ul style="list-style-type: none"> <li>▪ Ghost bat (foraging/ dispersal)</li> <li>▪ Pilbara leaf-nosed bat ( foraging/ dispersal)</li> <li>▪ Northern quoll (foraging/ dispersal)</li> </ul> <p>Area : 0.9 hectares Percentage of survey area: 0.2%</p> <p><b>Significance: Moderate</b></p>	<p>Low undulating stony hills or rises with <i>Triodia</i> spp. grassland and/or sparse open acacia shrubland on gravelly clay loam substrate, this habitat contains small rocky outcrops, typically not large enough or with enough cracking/crevices to provide shelter for denning species such as Northern quoll.</p>	<p>Low Stony Hills habitat Is distributed across the Pilbara region typically as part of stony plain habitat.</p> <p>The low stony hills habitat is not restricted to the survey area and is represented in conservation estate.</p>	
<p><b>Stony Plain</b></p> <p>Potential Conservation Significance Species</p> <ul style="list-style-type: none"> <li>▪ Night parrot (possible foraging/ dispersal)</li> <li>▪ Ghost bat (foraging/ dispersal)</li> <li>▪ Pilbara leaf-nosed bat ( foraging/ dispersal)</li> <li>▪ Grey falcon (foraging)</li> <li>▪ Spectacled hare-wallaby (breeding/ shelter, foraging/ dispersal)</li> <li>▪ <i>Ctenotus nigrilineatus</i> (possible habitat)</li> <li>▪ Western pebble-mound mouse (breeding/ shelter, foraging/ dispersal)</li> </ul> <p>Area : 318.9 hectares Percentage of survey area: 78%</p> <p><b>Significance: Moderate</b></p>	<p>Gently undulating stony plain with <i>Triodia</i> hummock grasses and scattered shrubland patches on gritty/gravelly clay loam substrates. This habitat contains small rocky outcrops.</p>	<p>Stony Plain habitat is common and widespread within the survey area and more broadly across the Pilbara region.</p> <p>The stony plain habitat is not restricted to the survey area and is represented in conservation estate.</p>	

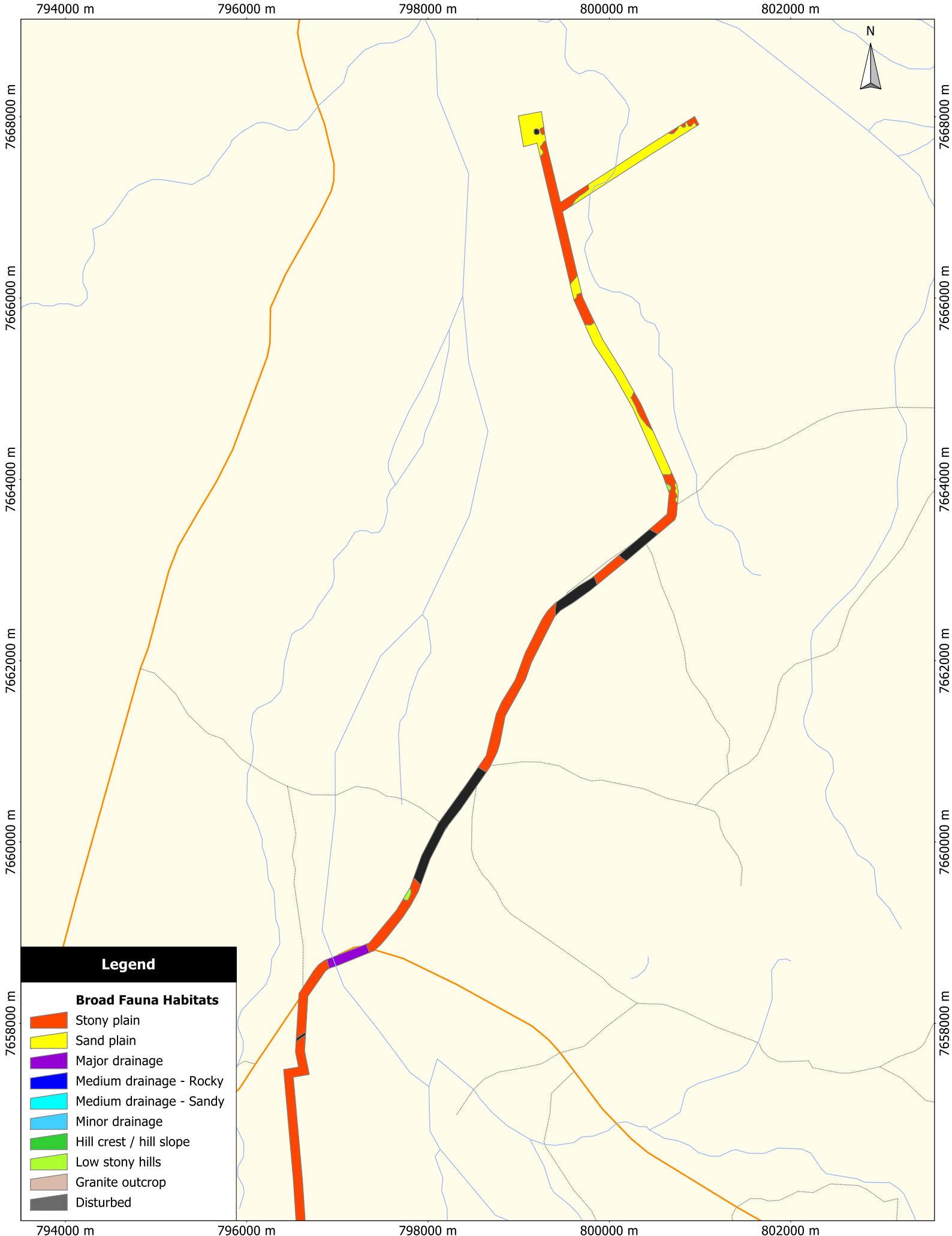


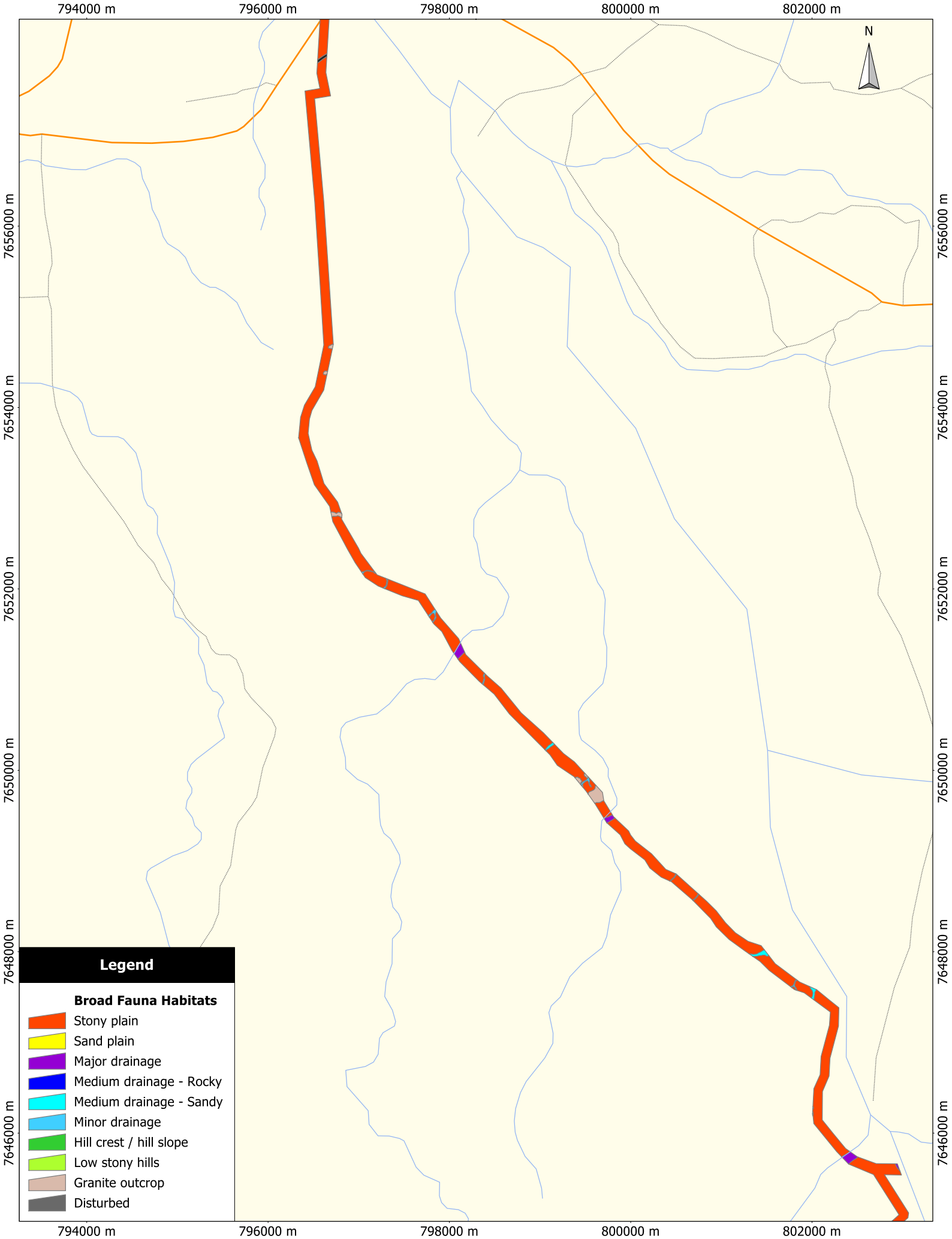
Habitat	Description	Extent	Photos
<p><b>Sand Plain</b></p> <p>Potential Conservation Significance Species</p> <ul style="list-style-type: none"> <li>▪ Night parrot (possible foraging/ dispersal)</li> <li>▪ Ghost bat (foraging/ dispersal)</li> <li>▪ Pilbara Leaf-nosed Bat ( foraging/ dispersal)</li> <li>▪ Greater bilby (breeding/foraging/ dispersal)</li> <li>▪ Brush-tailed mulgara ((breeding/foraging/ dispersal)</li> <li>▪ Grey falcon (foraging)</li> <li>▪ Spectacled hare-wallaby (breeding/ shelter, foraging/ dispersal)</li> <li>▪ <i>Ctenotus nigrilineatus</i> (possible habitat)</li> </ul> <p>Area : 41.6 hectares Percentage of survey area: 10.1 %</p> <p><b>Significance: High</b></p>	<p>Sand Plain habitat is variable, occurring in an extensive area in the northern part of the corridor, and as pockets within the Stony Plain habitat. Vegetation comprises low mixed shrubland dominated by Acacia, Grevillea, and Hakea, sometimes with an overstorey of eucalypt woodland or sparsely scattered trees. The understorey is Triodia hummock grassland.</p>	<p>Sand Plain habitat is regionally common throughout the Pilbara region.</p> <p>The sand plain habitat is not restricted to the survey area and is represented in conservation estate.</p>	
<p><b>Major Drainage</b></p> <p>Potential Conservation Significance Species</p> <ul style="list-style-type: none"> <li>▪ Ghost bat (foraging/ dispersal)</li> <li>▪ Pilbara leaf-nosed bat ( foraging/ dispersal)</li> <li>▪ Grey falcon (breeding/ nesting, foraging)</li> <li>▪ Pilbara olive python (foraging/dispersal)</li> <li>▪ Northern Brushtail Possum (foraging/ dispersal)</li> <li>▪ Peregrine falcon (foraging/ dispersal)</li> <li>▪ Oriental plover (infrequent visitor)</li> <li>▪ Common sandpiper (confirmed)</li> <li>▪ Sharp-tailed sandpiper (infrequent visitor)</li> <li>▪ Common greenshank (infrequent visitor)</li> <li>▪ Wood sandpiper (infrequent visitor)</li> <li>▪ Osprey (infrequent visitor)</li> <li>▪ Glossy ibis (infrequent visitor)</li> <li>▪ Gane's blind snake (DBCA Priority 1)</li> </ul> <p>Area : 8.3 hectares Percentage of survey area: 2 %</p> <p><b>Significance: High</b></p>	<p>Wide seasonally fed drainage lines characterised by wide non-vegetated channels and sandy banks with fringing riparian vegetation comprising scattered Eucalyptus species over a patchy understorey often dominated by Acacia spp. and small ephemerals grasses and herbs. Can contain Melaleuca species in-between major channels.</p> <p>Water can be present in large pools following recent rainfall; however, some drainage lines are seasonally dry and dependent on large rainfall events. Pools can be groundwater fed.</p> <p>Contains microhabitat such as leaf litter accumulations, large trees, hollows.</p>	<p>Brockman and Chinaman's creek are tributaries of the Talga River. The tributaries are continuous for some distance outside of the survey area and are representative of major drainage habitat occurring across the Pilbara region.</p> <p>The major drainage habitat is not restricted to the survey area and is represented in conservation estate.</p>	

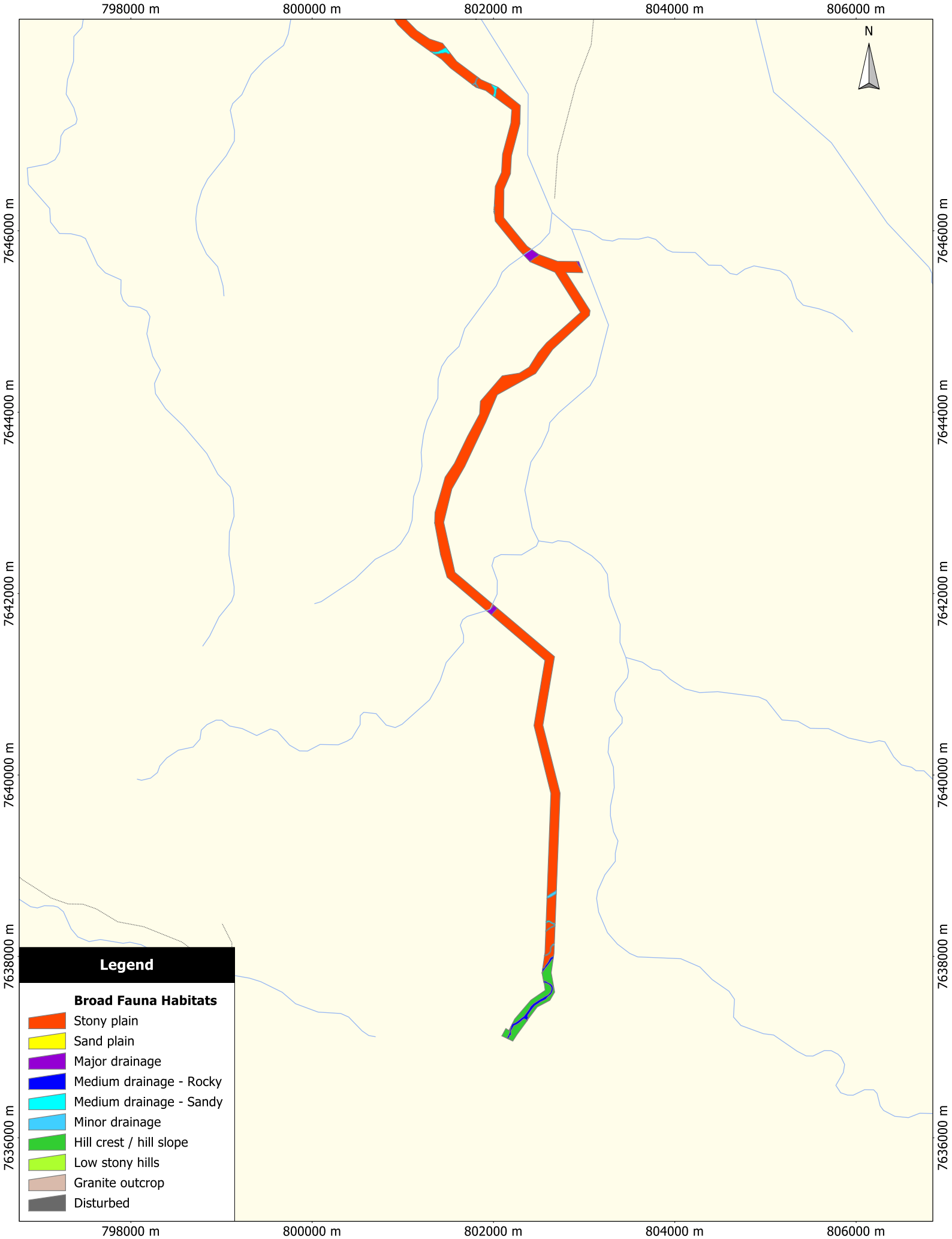


Habitat	Description	Extent	Photos
<p><b>Medium Drainage – Rocky</b></p> <p>Potential Conservation Significance Species</p> <ul style="list-style-type: none"> <li>▪ Ghost bat (foraging/ dispersal)</li> <li>▪ Pilbara leaf-nosed bat ( foraging/ dispersal)</li> <li>▪ Grey falcon (breeding/ nesting, foraging)</li> <li>▪ Pilbara olive python (foraging/dispersal)</li> <li>▪ Peregrine falcon (foraging/ dispersal)</li> <li>▪ Oriental plover (occasional visitor)</li> <li>▪ Gane’s blind snake (DBCA Priority 1)</li> </ul> <p>Area : 2.4 hectares Percentage of survey area: 0.6 %</p> <p><b>Significance: Moderate</b></p>	<p>Medium Drainage Line - Rocky incised drainage channels lined with large eucalyptus trees typically dissecting the Hillcrest/Hillslope or stony plain habitat of the southern portion of the survey area corresponding to the Warrawoona Range.</p> <p>Contains microhabitat such as leaf litter accumulations, large trees, hollows.</p>	<p>Predominantly a subset of the major drainage habitat: Medium Drainage Lines – Rocky occurs throughout the Pilbara region due to the topography of the region.</p> <p>The medium drainage -rocky habitat is not restricted to the survey area and is represented in conservation estate.</p>	
<p><b>Medium Drainage – Sandy</b></p> <p>Potential Conservation Significance Species</p> <ul style="list-style-type: none"> <li>▪ Ghost bat (foraging/ dispersal)</li> <li>▪ Pilbara leaf-nosed bat ( foraging/ dispersal)</li> <li>▪ Grey falcon (breeding/ nesting, foraging)</li> <li>▪ Pilbara olive python (foraging/dispersal)</li> <li>▪ Peregrine falcon (foraging/ dispersal)</li> <li>▪ Oriental plover (occasional visitor)</li> <li>▪ Gane’s blind snake (DBCA Priority 1)</li> </ul> <p>Area : 1.7 hectares Percentage of survey area: 0.4 %</p> <p><b>Significance: Moderate</b></p>	<p>Sandy medium drainage lines intersecting the survey area in many places throughout the pipeline corridor. The vegetation comprises tall to medium sparse shrubland dominated by <i>Acacia trachycarpa</i> over mixed low shrubs, with an understorey of open to sparse spinifex grassland.</p>	<p>Predominantly a subset of the major drainage habitat: Medium Drainage Lines – Sandy occurs throughout the Pilbara region.</p> <p>The medium drainage – sandy habitat is not restricted to the survey area and is represented in conservation estate.</p>	
<p><b>Minor Drainage</b></p> <p>Potential Conservation Significance Species</p> <ul style="list-style-type: none"> <li>▪ Ghost bat (foraging/ dispersal)</li> <li>▪ Grey falcon (foraging)</li> <li>▪ Pilbara olive python (foraging/dispersal)</li> <li>▪ Peregrine falcon (foraging/ dispersal)</li> </ul> <p>Area : 2.1 hectares Percentage of survey area: 0.5 %</p> <p><b>Significance: Moderate</b></p>	<p>The Minor Drainage habitat represents the narrow drainage channels within the stony plain and sandy plain habitat. Vegetation typically represents that of the surrounding stony/sandy plain or denser patches of mixed shrubs including <i>Acacia</i>.</p> <p>Substrate is generally gravelly with occasional sandy patches.</p>	<p>The Minor Drainage Line habitat is common throughout the Pilbara bioregion particularly within the Chichester and Hamersley subregions where it is associated with the Stony Plain habitats.</p> <p>The minor drainage habitat is not restricted to the survey area and is represented in conservation estate.</p>	

Habitat	Description	Extent	Photos
<p><b>Hillcrest/Hillslope</b></p> <p>Potential Conservation Significance Species</p> <ul style="list-style-type: none"> <li>▪ Ghost bat (foraging/ dispersal)</li> <li>▪ Pilbara leaf-nosed bat ( foraging/ dispersal)</li> <li>▪ Western pebble-mound mouse (breeding/ shelter, foraging/ dispersal)</li> <li>▪ Long-tailed dunnart (foraging/ dispersal)</li> <li>▪ Potential <i>Ctenotus uber johnstonei</i> habitat</li> </ul> <p>Area : 7.7 hectares Percentage of survey area: 1.9 %</p> <p><b>Significance: Moderate</b></p>	<p>Hillcrest/Hillslope habitat is dominated by varying species of <i>Triodia</i> with scattered Eucalypts. Typically, rocky substrate, often with exposed bedrock, and skeletal red soils. This habitat typically does not contain the extensive cracks and crevices of the rocky breakaway habitat.</p>	<p>This habitat corresponds to the slopes of the Warrawoona Range that occurs at the southern end of the survey area.</p> <p>This habitat is broadly represented across the Pilbara region in areas of topography typically the slopes and crests of hills that contain gorges and gullies. This habitat type is represented in conservation estate</p>	
<p><b>Granite Outcrop</b></p> <p>Potential Conservation Significance Species</p> <ul style="list-style-type: none"> <li>▪ Ghost bat (foraging/ dispersal)</li> <li>▪ <i>Ctenotus nigrilineatus</i> (possible habitat)</li> <li>▪ Northern quoll (foraging/ dispersal)</li> </ul> <p>Area : 0.8 hectares Percentage of survey area: 0.2 %</p> <p>Area : 3.3 hectares Percentage of survey area: 0.8%</p> <p><b>Significance: Moderate</b></p>	<p>Exposed granite outcrops with tors/boulders with sparse vegetation. The granite outcrops of the survey area are predominately small domes with associated small boulders. Not the large granites such as those outcrops at Red Rock Indee station, known as high quality Northern quoll habitat (Dunlop 2017)</p>	<p>This habitat is not common in the Pilbara, however granite tor fields also occur in the Boolaloo Land System (van Vreeswyk et al. 2004).</p> <p>This habitat largely falls outside of the survey area as care was taken to avoid these outcrops during project design.</p> <p>This habitat is well represented within the Abydos/Woodstock Reserve (How et al. 1991, How &amp; Cooper 2002).</p>	
<p><b>Disturbed</b></p>	<p>Historical Mining Disturbance</p>	<p>Not a habitat</p>	







### **4.4.3 Habitat Features**

#### **Caves**

No additional natural caves were recorded within the survey area and none are likely to occur based on the habitats and landforms present.

#### **Water Bodies**




Three natural water bodies were recorded adjacent to the survey area (within 500 metres) at Narri and the central survey area (Figure 5, Table 18). Some of these water features are likely to represent intermediate to permanent water sources due to characteristics such as presence of sedges and persistence of pools post wet season. Rock pools at Narri appear to have developed on the upstream side of dolerite dyke (Calidus Resources unpublished data). Two large dams (artificial water body) are also located on the survey area. All water features show signs of disturbance from cattle.

Note the pools outside of the survey area were not surveyed for flora and vegetation assessment.



Pilbara Leaf-nosed bat was recorded foraging from *Eucalyptus* dominated Major Drainage habitat near a pool at Narri (FH87) and from both recorders deployed on the dam (FH36, FH34) located within the historical mining disturbance (Figure 7).



**Table 18 Water bodies recorded in the survey area**

Site	Type	Location	Description	Broad Habitat	Permanent Water	Photo	Conservation Significant Bats
FH036	Dam	Pipeline Corridor	Dam Large artificial water body in mining disturbance	Disturbed	N/A		PlnB recorded 29 <sup>th</sup> September 2020 SM4 located on dam edge SM4 5458 200929 BCS12 Distance to Bow Bells South: 19 km to the S
FH034	Dam	Pipeline Corridor	Dam Large artificial water body in mining disturbance	Disturbed	N/A		PlnB recorded 29 <sup>th</sup> September 2020. SM4 located on dam edge (SM4 4031 200929 BC S6)  Distance to Bow Bells South 20 km to the S
FH087	Pool in creek	Adjacent to Pipeline Corridor (within 500 m)	Drainage line with standing water. Sedges all eaten back by cattle. Mixed acacia shrub Fringing Eucalypts.	Major Drainage	Possible due to presence of sedges. Pool very small in September 2020.		PlnB recorded 25-26 <sup>th</sup> September 2020 from SM4 located 280 metres SW of pool in section of dry creek line (SM4 5458 200925 BCS 10)  Distance to Bow Bells South: 6 km to the WSW



Site	Type	Location	Description	Broad Habitat	Permanent Water	Photo	Conservation Significant Bats
FH106	Rock Pool	Adjacent to Pipeline Corridor (within 500 m)  Narri Borefield Area	Rock pools have developed on upstream side of dolerite dyke. Appears spring fed.	Major Drainage	Possible		No (SM4 not deployed) closest SM4 was 1.2km to the SSE (SM4 4031 200925 BCS4)
FH113	Pool in creek	Adjacent to Pipeline Corridor (within 500 m)  Narri Borefield Area	Eucalypts with sedge understory. Standing water	Major Drainage	Possible due to presence of sedges		PlnB recorded 25-26 <sup>th</sup> September 2020 from SM4 located 320 metres to the sw (SM4 4031 200925 BCS4)  Distance to Bow Bells South 8.6km to SW

## 4.5 Survey adequacy and limitations

The EPA Technical guidance for detailed flora surveys recommends a minimum of three quadrats in each vegetation unit, with additional quadrats required in widespread vegetation units. There are no specific guidelines for the number or placement of relevés during reconnaissance flora surveys (EPA 2016a).

The flora survey was considered adequate to meet the survey objectives outlined in section 1.2. The assessment is a reconnaissance level survey, designed to verify desktop information and enable broad-scale vegetation mapping. Although the survey was conducted during sub-optimal conditions, the EPA guidance (EPA 2016a) does not prescribe timing as is the case for detailed and targeted level flora surveys. As such, the survey met (EPA 2016a) guidance for a reconnaissance flora and vegetation survey.

The terrestrial vertebrate fauna survey was conducted in accordance with EPA (2020) *Technical Guidance – Terrestrial Vertebrate Fauna Surveys for environmental impact assessment*. The requirements for a basic fauna survey are habitat assessment, photographs, and mapping, to gather broad fauna and habitat information to verify desktop results. As such, the survey met EPA (2020) guidance for a basic fauna survey.

An assessment of the potential survey limitations are presented in Table 19 and Table 20.

**Table 19** Limitations of the reconnaissance flora survey

Aspect	Limitation	Discussion
Scope and intensity	No	Scope and intensity of survey were suitable to achieve the aims of a reconnaissance flora and vegetation survey, as per EPA (2016a). Vegetation types could be classified, described, and mapped at a broad scale across the survey area to meet survey objectives outlined in section 1.2.
Availability of contextual information at a regional and local scale	No	Sufficient desktop flora and vegetation information was available for the region to place the survey area in a regional context.
Competency/experience of the team carrying out the survey, including experience in bioregion surveyed	No	The senior botanist involved in the field survey has extensive experience conducting flora and vegetation surveys throughout Western Australia, particularly the Pilbara. The botanist has flora and vegetation surveying experience from Western Australia and is also an accomplished botanical illustrator working with the WA Herbarium.
Proportion of flora recorded and/or collected, any identification issues	No	The survey comprised a reconnaissance flora and vegetation survey as per EPA (2016a). Flora taxa encountered in the survey area were collected, either at relevés, or opportunistically.
Was the appropriate area fully surveyed (effort and extent)	No	The survey area was adequately assessed at the intensity appropriate for a reconnaissance flora survey. Changes to the pipeline corridor made during the survey led to 13 relevés (out of a total 74 surveyed) being outside of the final survey area. Vegetation notes and habitat assessment points were used to inform mapping.
Access restrictions within the survey area	No	The survey area was accessible. A number of tracks were in sufficient condition to allow vehicle access, and this allowed the survey team to access all corners of the survey area.

Aspect	Limitation	Discussion
Survey timing, rainfall, season of survey	Yes	<p>At client request, the flora survey was completed in late September and early October 2020, which is outside the EPA (2016a) recommended timing for flora surveys in the Eremaean botanical province. Rainfall during the three months preceding the survey was low, and no rainfall was recorded during the survey.</p> <p>Climatic conditions were considered adequate for the purpose of a reconnaissance survey, which serves to provide context and gather broad information about the survey area. However, as expected for surveying in the dry time of year, the proportion of annual species relative to perennial species was low.</p> <p>The desktop review identified eight conservation significant taxa that were considered likely to highly likely to occur in the survey area, but only one was recorded. Six of the eight taxa were small annual or short-live perennial species, the other two were small shrubs. The survey period of September/October fell within the flowering period for four of these taxa, but the conditions were very dry therefore the possibility of additional conservation significant taxa occurring in the survey area cannot be discounted.</p> <p>Although the survey was conducted during sub-optimal conditions, the Technical Guidance (EPA 2016a) does not prescribe timing as is the case for detailed and targeted level surveys.</p>
Disturbances that may have affected the results of the survey (e.g. fire, flooding, clearing)	No	The survey area contained localised disturbances affecting minor parts of the areas, including tracks, mining disturbance, and clearing and disturbance from cattle. There was sufficient good quality vegetation available outside of these disturbances, and relevés were positioned to avoid disturbed areas.

**Table 20** Limitations of the basic fauna survey

Aspect	Limitation	Discussion
Scope and intensity	No	Scope and intensity of survey were suitable to achieve the aims of a basic fauna survey as outlined in EPA (2020).
Availability of contextual information at a regional and local scale	No	Sufficient desktop information was available at both the bioregional and local scale to place the survey area in a regional context.
Competency/experience of the team carrying out the survey, including experience in bioregion surveyed	No	The senior ecologist has eight years of experience conducting fauna surveys on a wide range of fauna groups across Australia. The ecologist involved in the survey is an experienced herpetologist, including three years of experience conducting terrestrial fauna surveys in Australia.
Proportion of fauna recorded and/or collected, any identification issues	Yes	The survey comprised a basic fauna survey as per EPA (2020). The desktop study identified 329 potential species of vertebrate fauna and the field component verified the desktop and identified habitats of the survey area with a focus on potential conservation significant fauna habitat.
Was the appropriate area fully surveyed (effort and extent)	No	The survey area was adequately assessed at the intensity appropriate for a basic fauna survey. Absence of vehicle tracks to some parts of the survey area was compensated for by traverses on foot.

Aspect	Limitation	Discussion
Access restrictions within the survey area	No	The survey area was accessible. A number of tracks were in sufficient condition to allow vehicle access, and this allowed the survey team to access all corners of the survey area.
Survey timing, rainfall, season of survey	No	The basic fauna survey was completed in September 2020. This falls within the EPA (2020) recommended timing to survey reptiles in the Eremaean botanical province. The survey was sufficient to meet EPA (2020) requirements for a basic field survey, and to meet survey objectives outlined in section 1.2.
Disturbances that may have affected the results of the survey (e.g. fire, flooding, clearing)	No	The survey area contained localised disturbances affecting minor parts of the areas, including tracks, mining disturbance, and clearing. There was sufficient good quality vegetation available outside of these disturbances, and habitat sites were positioned to avoid disturbed areas.

## 5 Conclusion

### Flora and vegetation

A reconnaissance flora and vegetation survey was completed over 8 days across the survey area with all major vegetation types visited and sampled. A total of 61 non-permanent relevés were sampled to record the broad vegetation types and their condition, as well as collecting an inventory of flora species present.

The reconnaissance survey recorded:

115 vascular flora taxa from 28 families, including 110 native species and six introduced taxa;

One priority listed species was recorded: the grass *Eragrostis crateriformis* (DBCA Priority 3) recorded from a single location in the northern part of the survey corridor, within vegetation type A (*Acacia inaequilatera* over *Triodia epactia* and *T. wiseana* on stony plain).

The survey recorded one Declared Pest, \**Calotropis procera* (rubber bush) which is listed as a Declared Pest – s22(2) and a Pilbara region priority alert weed.

No TECs were recorded from the survey area.

No PECs were recorded from the survey area.

Of the nine vegetation types mapped in the survey area, two vegetation types were considered locally significant on the basis of supporting the priority 3 species *Eragrostis crateriformis* (vegetation type A) and the priority four species *Ptilotus mollis* (vegetation type H).

Vegetation types C,D, and E containing groundwater dependent taxa associated with drainage habitats were considered locally significant as was the granite outcrop (G) and low stony hills vegetation type (I), due to the small size (0.8% and 0.2% of the survey area).

The vegetation condition ranged from Excellent to Good (sometimes Poor).

### Vertebrate Fauna

A basic survey was completed over 8 days across the survey area with all major habitat types visited and sampled. Habitat data was recorded at 69-point locations throughout the survey area.

A total of 329 vertebrate fauna species were identified as having the potential to occur within the survey area. This comprises 37 native and 10 introduced mammal species, 162 bird species, 106 reptile species, 10 amphibian species and 4 fish.

A total of 32 species of conservation significance were identified in the desktop assessment as potentially occurring within the survey area. This comprised eight species listed as Threatened (5 mammals, 2 bird and 1 reptile), 1 species as Other Specially Protected and seven Priority species. 19 bird species are listed as Migratory

Excluding migratory birds, of the species of conservation significance identified as potentially occurring within the survey area, one species was “Confirmed” (Pilbara leaf-nosed bat) and five species assessed as “Highly Likely” (Northern quoll, Ghost bat, Greater bilby, Pilbara olive python, Brush-tailed mulgara). Five species were assessed as “Likely” (Long-tailed Dunnart, Spectacled hare-wallaby, Western pebble-mound mouse, Grey falcon and Peregrine falcon) and the remainder were listed as “Possible” (4 species)

or “Unlikely” (1 species) due to lack of suitable habitat and/or based on species distribution and lack of contemporary records.

Migratory birds were assessed as “Possible (infrequent visitor)” (7 species) to “Unlikely” to occur (8 species), dependent on the species distribution and contemporary records primarily due to the presence of habitat within the major and medium drainage lines and the dams within the historical mining areas. One migratory bird was confirmed on the survey area (Common sandpiper).

The survey recorded 92 vertebrate fauna species from the survey area. These comprised 63 birds, 12 mammals, 16 reptiles, and one species of frog.

Two conservation significant species were recorded during the survey. These were the Pilbara leaf-nosed bat (Vulnerable under the BCA and EPBC Act) and the common sandpiper (Migratory BCA and EPBC Act). The Pilbara leaf-nosed bat was picked up as a foraging visitor on one of the SM4 ultrasonic recorders. And the Common sandpiper was recorded opportunistically at one of the artificial dams in the disturbed areas.

Stony Plain was the dominant broad fauna habitat within the survey area, covering approximately 318.9 hectares (78%), followed by Sand Plain: 41.6 hectares (10.1%), Major Drainage: 8.3 hectares (2%), Hillcrest /Hillslope: 7.7 hectares (1.9%). The remaining four broad fauna habitats each covered less than 1 percent of the survey area : Medium drainage – Rocky (2.4 hectares), Medium drainage – Sandy (1.7 hectares), Low Stony Hills (0.9 hectares) and Granite Outcrop (3.3 hectares).

Of the 9 broad fauna habitats recorded within the corridor, the Major Drainage habitat and Sand Plain habitat were assessed as high significance for vertebrate fauna due to the potential to provide core habitat for species of conservation significance. The remainder were deemed to be of moderate significance, either due to foraging/dispersal habitats, or habitats known to support priority or migratory species.

Given the habitats are represented outside of the survey area, throughout the region and in conservation estate and primarily represent foraging and dispersal habitat of listed threatened species rather than breeding habitat, with management (clearing protocols and preclearance surveys), clearing within the survey area is unlikely to impact local populations beyond temporary displacement.

Note Pilbara leaf-nosed bat and Ghost bat breeding habitat is located within the old workings proximal to the Warrawoona Gold project and breeding habitat will not be impacted by clearing in pipeline corridor. No additional roosts were located during the survey.

## 6 References

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## 7 Appendices

No	Title
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## Appendix I Likelihood of occurrence matrix: Vertebrate fauna

Species records relative to survey area	Habitat suitability			
	High (breeding and foraging)	Medium (foraging habitat)	Low (dispersal habitat)	Unsuitable <sup>6)</sup>
Records within 10 km <sup>1)</sup>	Highly Likely	Likely	Likely	Possible
Records within 50 km <sup>2)</sup>	Likely	Possible	Possible	Unlikely
Records within 100 km <sup>3)</sup>	Possible	Possible	Possible	Unlikely
Records within 200 km <sup>4)</sup>	Possible	Unlikely	Unlikely	Unlikely
No records within 200 km <sup>5)</sup>	Unlikely	Unlikely	Unlikely	Highly unlikely

*Footnotes for highly cryptic or poorly known species for which there are few records, and for under-surveyed areas:*

1 – survey area occurs within currently known range and species has high dispersal capability.

2 – survey area occurs within currently known range and species has low dispersal capability.

3 – survey area occurs on margin of currently known range and species has high dispersal capability.

4 – survey area occurs outside of currently known range and species has high dispersal capability.

5 – survey area occurs outside of currently known range and species has low dispersal capability.

*Footnotes with habitat suitability:*

6 – Depending on a species' ecology, 'unsuitable' can either mean 'not preferred' or 'not containing resources', or it can be 'prohibitive' (i.e. absence of water for aquatic species). This distinction affects the final likelihood score in this column.

## Appendix II Significance assessment criteria: Habitat and vegetation

### Habitat significance assessment criteria

Rank	Criteria
High	Fauna listed as threatened under the EPBC Act and/ or BC Act and fauna listed as Species of Special Conservation Interest or Other Specially Protected Species have been recorded breeding from this habitat type within the survey area
	Fauna listed as threatened under the EPBC Act and/ or BC Act and fauna listed as species of Special Conservation Interest or Other Specially Protected Species have been recorded foraging or sheltering from this habitat type within the survey area where the species is solely reliant on this habitat type for foraging or sheltering
	Habitat known to be suitable core habitat (breeding), for EPBC Act and/ or BC Act listed threatened fauna and/or fauna listed as species of Special Conservation Interest or Other Specially Protected Species, and there are records of this species within 40km <sup>2</sup>
	Habitat known to be suitable core habitat (foraging or sheltering), for EPBC Act and/ or BC Act listed threatened fauna and or fauna listed as species of Special Conservation Interest or Other Specially Protected Species, and there are records of this species within 40km <sup>2</sup> and the species is solely reliant on this habitat type for foraging or sheltering.
	Habitat is regionally uncommon or limited in extent and known to support species listed as: <ul style="list-style-type: none"> <li>▪ Threatened fauna under the EPBC Act and/or BC Act, but it is not their core habitat (e.g. may be used periodically/ seasonally or for dispersal).</li> <li>▪ DBCA listed Priority fauna which are known to be <u>solely</u> reliant on this habitat.</li> </ul>
	Habitat known to support EPBC Act and/or BC Act listed Migratory fauna such as breeding grounds, or important feeding grounds such as Eighty Mile Beach (including ephemeral habitats) defined via international agreement e.g. RAMSA and also Important Bird Areas (Dutson et al. 2009) <a href="https://www.birdlife.org.au/documents/OTHPUB-IBA-supp.pdf">https://www.birdlife.org.au/documents/OTHPUB-IBA-supp.pdf</a>
Moderate	Habitat known to regularly support EPBC Act and/or BC Act listed Migratory fauna – (not breeding grounds or important feeding grounds)
	Habitat that is regionally uncommon (e.g. occurs in small and isolated areas) and supports a particularly diverse and uncommon faunal assemblage.
	Habitat is common and widespread and known to support species listed as: Threatened fauna under the EPBC Act and/or BC Act but it is not their core habitat (e.g. may be used periodically/ seasonally or for dispersal, or foraging habitats that where the species is not solely reliant on that habitat for resources, is an occasional visitor or foraging habitat is marginal. Species of Special Conservation Interest or Other Specially Protected Species under the BC Act but it is not their core habitat (e.g. may be used periodically/ seasonally or for dispersal) or foraging habitats that where the species is not solely reliant on that habitat for resources, is an occasional visitor or foraging habitat is marginal. DBCA listed Priority fauna which are known to be <u>solely</u> reliant on this habitat
Low	<ul style="list-style-type: none"> <li>▪ Habitat is widespread/common and does not solely support any DBCA listed Priority fauna</li> <li>▪ Habitat has minimal records of EPBC Act and/or BC Act listed Migratory fauna – (not breeding grounds or important feeding grounds). Especially so if these records are &gt; 10 years old.</li> </ul>

Vegetation significance assessment criteria

Score	Criteria
High	Supports threatened flora species/ threatened ecological community listed under the EPBC Act and/ or BC Act or supports a: unique or regionally significant population of Priority 1 or Priority 2 species; a unique or regionally significant priority ecological community or occurs in association with a major river or creek system.
Moderate	Supports a population of priority 1, priority 2 flora species or an unlisted species that is restricted and warrants listing/ priority ecological community or occurs in association with a major river or creek system or supports a unique/ unusual floral assemblage not recognised by DBCA as a PEC.
Low	Supports a population of priority 3 or priority 4 species / priority ecological community or occurs in association with a medium ephemeral river or creek system with sensitive obligate phreatophytic vegetation or supports a unique/ unusual floral assemblage or disturbance sensitive communities such as mulga on sheet flow, or occurs in association with a unique/ unusual landform or refugia such as gorges, high ranges, outcrops or seepage areas not common in the IBRA subregion
Very Low	Vegetation and landform is widespread/common and does not solely support priority 3 or priority 4 flora species. May contain, presumed facultative phreatophytic vegetation species not in association with a river or creek system typically in association with un-incised drainage lines and flood plains.
Negligible	Vegetation and landform is widespread/common and do not support priority flora species. May contain presumed facultative phreatophytic vegetation.

## Appendix III Conservation codes for Australian flora and fauna

### Threatened species under the Commonwealth EPBC Act

Threatened fauna and flora may be listed under Section 178 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) in any one of the following categories:

EX	Extinct
EW	Extinct in the wild
CR	Critically endangered
EN	Endangered
VU	Vulnerable
CD	Conservation dependent

### Migratory and Marine species under the Commonwealth EPBC Act

Migratory and Marine species are not listed as Threatened but are protected for other reason. Only Migratory species are considered Matters of National Environmental Significance (MNES) while Marine species are not.

MI	Migratory
MA	Marine

Migratory species listed under international agreements to which Australia is a party are protected under section 209 of the EPBC Act and are considered MNES. Listed migratory species are those listed in the:

- Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention)
- China-Australia Migratory Bird Agreement (CAMBA)
- Japan-Australia Migratory Bird Agreement (JAMBA)
- Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA)

Marine species are those listed under s248 of the EPBC Act. Marine species are not considered MNES.

### Conservation codes for Western Australian flora and fauna under the Western Australian Biodiversity Conservation Act 2016

Threatened, Extinct and Specially Protected fauna or flora are species which have been adequately searched for and are deemed to be, in the wild, threatened, extinct or in need of special protection, and have been gazetted as such.

The *Wildlife Conservation (Specially Protected Fauna) Notice 2018* and the *Wildlife Conservation (Rare Flora) Notice 2018* have been transitioned under regulations 170, 171 and 172 of the *Biodiversity Conservation Regulations 2018* to be the lists of Threatened, Extinct and Specially Protected species under Part 2 of the *Biodiversity Conservation Act 2016*.

Categories of Threatened, Extinct and Specially Protected fauna and flora are:

#### Threatened species

Listed by order of the Minister as Threatened in the category of critically endangered, endangered or vulnerable under section 19(1), or is a rediscovered species to be regarded as threatened species under section 26(2) of the *Biodiversity Conservation Act 2016* (BC Act).

Threatened fauna is that subset of 'Specially Protected Fauna' listed under schedules 1 to 3 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for Threatened Fauna.

Threatened flora is that subset of 'Rare Flora' listed under schedules 1 to 3 of the *Wildlife Conservation (Rare Flora) Notice 2018* for Threatened Flora.

The assessment of the conservation status of these species is based on their national extent and ranked according to their level of threat using IUCN Red List categories and criteria as detailed below.

**CR Critically endangered species**

Threatened species considered to be “facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines”. Listed as critically endangered under section 19(1)(a) of the BC Act in accordance with the criteria set out in section 20 and the ministerial guidelines.

Published under **schedule 1** of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for critically endangered fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for critically endangered flora.

**EN Endangered species**

Threatened species considered to be “facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines”. Listed as endangered under section 19(1)(b) of the BC Act in accordance with the criteria set out in section 21 and the ministerial guidelines. Published under **schedule 2** of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for endangered fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for endangered flora.

**VU Vulnerable species**

Threatened species considered to be “facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with criteria set out in the ministerial guidelines”. Listed as vulnerable under section 19(1)(c) of the BC Act in accordance with the criteria set out in section 22 and the ministerial guidelines.

Published under **schedule 3** of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for vulnerable fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for vulnerable flora.

**Extinct species**

Listed by order of the Minister as extinct under section 23(1) of the BC Act as extinct or extinct in the wild.

**EX Extinct species**

Species where “there is no reasonable doubt that the last member of the species has died”, and listing is otherwise in accordance with the ministerial guidelines (section 24 of the BC Act).

Published as presumed extinct under **schedule 4** of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for extinct fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for extinct flora.

**EW Extinct in the wild species**

Species that “is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; and it has not been recorded in its known habitat or expected habitat, at appropriate seasons, anywhere in its past range, despite surveys over a time frame appropriate to its life cycle and form”, and listing is otherwise in accordance with the ministerial guidelines (section 25 of the BC Act).

Currently there are no threatened fauna or threatened flora species listed as extinct in the wild. If listing of a species as extinct in the wild occurs, then a schedule will be added to the applicable notice.

**Specially protected species**

**MI Migratory species**

Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or the species is subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth; and listing is otherwise in accordance with the ministerial guidelines (section 15 of the BC Act).

Includes birds that are subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), and fauna subject to the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention), an environmental treaty under the United Nations Environment Program.

Migratory species listed under the BC Act are a subset of the migratory animals, that are known to visit Western Australia, protected under the international agreements or treaties, excluding species that are listed as Threatened species. Published as migratory birds protected under an international agreement under **schedule 5** of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018*.



**CD Species of 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). Published as conservation dependent fauna under **schedule 6** of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018*.

**OS Other specially protected species**

Fauna otherwise in need of special protection to ensure their conservation, and listing is otherwise in accordance with the ministerial guidelines (section 18 of the BC Act). Published as other specially protected fauna under **schedule 7** of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018*.

**Priority species**

Priority species are possibly threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Fauna or Priority Flora Lists under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened fauna or flora.

Species that are adequately known, are rare but not threatened, or meet criteria for near threatened, or that have been recently removed from the threatened species or other specially protected fauna lists for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring.

Assessment of Priority codes is based on the Western Australian distribution of the species, unless the distribution in WA is part of a contiguous population extending into adjacent States, as defined by the known spread of locations. In this report, priority species are given the codes P1, P2, P3 and P4.

**P1 Priority 1: Poorly-known species**

Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.

**P2 Priority 2: Poorly-known species**

Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.

**P3 Priority 3: Poorly-known species**

Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.

**P4 Priority 4: Rare, Near Threatened and other species in need of monitoring**

(a) **Rare.** Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These species are usually represented on conservation lands.

(b) **Near Threatened.** Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as Conservation Dependent.

(c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

**Appendix IV      Flora desktop results: All flora taxa**

Appendix IV – Flora desktop results: All vascular flora taxa

Family	Scientific Name	Status		Databases <sup>1</sup>			Reports reviewed for the desktop											
		BC Act	EPBC Act	NM	PM	TPFL	GHD17	MA07	WM12a	WM12b	WM12c	WM13a	WM13b	WM13c	WM14c	WM16	WM18	WM20
Acanthaceae	<i>Rostellularia adscendens</i> var. <i>latifolia</i>	P3		2		4						1	1	1	1	1		
Aizoaceae	* <i>Trianthema portulacastrum</i>										1							1
Aizoaceae	<i>Trianthema cusackianum</i>			3														
Aizoaceae	<i>Trianthema oxycalyptum</i> var. <i>oxycalyptum</i>			3														
Aizoaceae	<i>Trianthema pilosum</i>			3														
Aizoaceae	<i>Trianthema triquetrum</i>			3														
Aizoaceae	<i>Zaleya galericulata</i>			2														
Aizoaceae	<i>Zaleya galericulata</i> subsp. <i>galericulata</i>			3														
Amaranthaceae	* <i>Aerva javanica</i>			3				1	1	1	1	1	1	1	1	1		1
Amaranthaceae	* <i>Amaranthus viridis</i>															1		
Amaranthaceae	<i>Alternanthera nana</i>			2														
Amaranthaceae	<i>Alternanthera nodiflora</i>			3														
Amaranthaceae	<i>Amaranthus cuspidifolius</i>			2														
Amaranthaceae	<i>Amaranthus undulatus</i>			3														
Amaranthaceae	<i>Gomphrena canescens</i>			3														
Amaranthaceae	<i>Gomphrena canescens</i> subsp. <i>canescens</i>			3														
Amaranthaceae	<i>Gomphrena cunninghamii</i>			3														
Amaranthaceae	<i>Gomphrena leptoclada</i>			3														
Amaranthaceae	<i>Gomphrena leptoclada</i> subsp. <i>leptoclada</i>			2														
Amaranthaceae	<i>Gomphrena leptophylla</i>	P3		3		2					1							
Amaranthaceae	<i>Gomphrena tenella</i>			2														
Amaranthaceae	<i>Ptilotus aervoides</i>			3														
Amaranthaceae	<i>Ptilotus arthrolasius</i>			3														
Amaranthaceae	<i>Ptilotus astrolasius</i>			3														
Amaranthaceae	<i>Ptilotus auriculifolius</i>			3														
Amaranthaceae	<i>Ptilotus axillaris</i>			3														
Amaranthaceae	<i>Ptilotus calostachyus</i>			3														
Amaranthaceae	<i>Ptilotus clementii</i>			3														
Amaranthaceae	<i>Ptilotus exaltatus</i>			3														
Amaranthaceae	<i>Ptilotus fusiformis</i>			3														
Amaranthaceae	<i>Ptilotus gaudichaudii</i>			2														
Amaranthaceae	<i>Ptilotus helipteroides</i>			2														
Amaranthaceae	<i>Ptilotus incanus</i>			3														
Amaranthaceae	<i>Ptilotus mollis</i>	P4		3		16		1			1	2	1	1		1	1	1

Family	Scientific Name	Status		Databases <sup>1</sup>			Reports reviewed for the desktop											
		BC Act	EPBC Act	NM	PM	TPFL	GHD17	MA07	WM12a	WM12b	WM12c	WM13a	WM13b	WM13c	WM14c	WM16	WM18	WM20
Amaranthaceae	<i>Ptilotus nobilis</i>			3														
Amaranthaceae	<i>Ptilotus polystachyus</i>			3														
Amaranthaceae	<i>Ptilotus wilsonii</i>	P1				2												
Apocynaceae	* <i>Calotropis procera</i>						1									1		1
Apocynaceae	<i>Gymnanthera cunninghamii</i>	P3				2		1	1	1	2				1			
Apocynaceae	<i>Marsdenia angustata</i>			3														
Apocynaceae	<i>Schenkia clementii</i>			2														
Araliaceae	<i>Trachymene oleracea</i>			3														
Araliaceae	<i>Trachymene oleracea subsp. oleracea</i>			3														
Asphodelaceae	* <i>Aloe vera var. officinalis</i>			3														
Asteraceae	* <i>Bidens bipinnata</i>										1					1		
Asteraceae	* <i>Flaveria trinervia</i>			3							2	1	1	1	1	1		1
Asteraceae	* <i>Sonchus oleraceus</i>										1					1	1	
Asteraceae	<i>Blumea tenella</i>			3														
Asteraceae	<i>Calocephalus beardii</i>			3														
Asteraceae	<i>Centipeda minima</i>			2														
Asteraceae	<i>Centipeda minima subsp. macrocephala</i>			3														
Asteraceae	<i>Centipeda minima subsp. minima</i>			2														
Asteraceae	<i>Chrysocephalum apiculatum</i>			3														
Asteraceae	<i>Chrysocephalum pterochaetum</i>			2														
Asteraceae	<i>Ixiochlamys cuneifolia</i>			1														
Asteraceae	<i>Pentalepis trichodesmoides</i>			2														
Asteraceae	<i>Pentalepis trichodesmoides subsp. trichodesmoides</i>			3														
Asteraceae	<i>Peripleura virgata</i>			2														
Asteraceae	<i>Pluchea dentex</i>			3														
Asteraceae	<i>Pluchea ferdinandi-muelleri</i>			3														
Asteraceae	<i>Pluchea rubelliflora</i>			3														
Asteraceae	<i>Pluchea tetranthera</i>			3														
Asteraceae	<i>Podolepis capillaris</i>			2														
Asteraceae	<i>Pseudognaphalium luteoalbum</i>			3														
Asteraceae	<i>Pterocaulon serrulatum</i>			2														
Asteraceae	<i>Pterocaulon serrulatum var. velutinum</i>			2														
Asteraceae	<i>Pterocaulon sphacelatum</i>			3														
Asteraceae	<i>Pterocaulon sphaeranthoides</i>			3														
Asteraceae	<i>Rhodanthe margarethae</i>			3														
Asteraceae	<i>Streptoglossa adscendens</i>			1														

Family	Scientific Name	Status		Databases <sup>1</sup>			Reports reviewed for the desktop											
		BC Act	EPBC Act	NM	PM	TPFL	GHD17	MA07	WM12a	WM12b	WM12c	WM13a	WM13b	WM13c	WM14c	WM16	WM18	WM20
Asteraceae	<i>Streptoglossa decurrens</i>			3														
Asteraceae	<i>Streptoglossa odora</i>			3														
Bignoniaceae	<i>Byblis filifolia</i>			3														
Bixaceae	<i>Cochlospermum macnamarae</i>	P1		2		5				1					1	1		
Boraginaceae	<i>Heliotropium ammophilum</i>			2														
Boraginaceae	<i>Heliotropium chrysocarpum</i>			3														
Boraginaceae	<i>Heliotropium crispatum</i>			3														
Boraginaceae	<i>Heliotropium cunninghamii</i>			3														
Boraginaceae	<i>Heliotropium inexplicitum</i>			2														
Boraginaceae	<i>Heliotropium muticum</i>	P3		6		26			1	1	1	1			1	1	1	1
Boraginaceae	<i>Heliotropium pachyphyllum</i>			3														
Boraginaceae	<i>Heliotropium parviantrum</i>	P1				1												
Boraginaceae	<i>Heliotropium skeleton</i>			2														
Boraginaceae	<i>Heliotropium tenuifolium</i>			1														
Boraginaceae	<i>Trichodesma zeylanicum</i>			3														
Boraginaceae	<i>Trichodesma zeylanicum var. zeylanicum</i>			3														
Brassicaceae	<i>Lepidium catapycnon</i>	P4				2												
Brassicaceae	<i>Lepidium pholidogynum</i>			3														
Campanulaceae	<i>Lobelia arnhemiaca</i>			2														
Campanulaceae	<i>Wahlenbergia tumidifructa</i>			3														
Caryophyllaceae	<i>Polycarpaea corymbosa</i>			2														
Caryophyllaceae	<i>Polycarpaea corymbosa var. corymbosa</i>			3														
Caryophyllaceae	<i>Polycarpaea holtzei</i>			3														
Caryophyllaceae	<i>Polycarpaea longiflora</i>			3														
Celastraceae	<i>Stackhousia muricata</i>			1														
Chenopodiaceae	<i>Atriplex spinulosa</i>	P1				15												
Chenopodiaceae	<i>Dysphania kalpari</i>			2														
Chenopodiaceae	<i>Dysphania melanocarpa</i>			3														
Chenopodiaceae	<i>Dysphania melanocarpa forma leucocarpa</i>			2														
Chenopodiaceae	<i>Dysphania plantaginella</i>			3														
Chenopodiaceae	<i>Dysphania rhadinostachya subsp. inflata</i>			3														
Chenopodiaceae	<i>Dysphania rhadinostachya subsp. rhadinostachya</i>			3														
Chenopodiaceae	<i>Dysphania sphaerosperma</i>			3														
Chenopodiaceae	<i>Salsola australis</i>			3														
Chenopodiaceae	<i>Sclerolaena cornishiana</i>			3														
Chenopodiaceae	<i>Sclerolaena costata</i>			3														

Family	Scientific Name	Status		Databases <sup>1</sup>			Reports reviewed for the desktop											
		BC Act	EPBC Act	NM	PM	TPFL	GHD17	MA07	WM12a	WM12b	WM12c	WM13a	WM13b	WM13c	WM14c	WM16	WM18	WM20
Chenopodiaceae	<i>Sclerolaena densiflora</i>			1														
Chenopodiaceae	<i>Sclerolaena eriacantha</i>			1														
Chenopodiaceae	<i>Sclerolaena hostilis</i>			3														
Cleomaceae	<i>Cleome uncifera subsp. uncifera</i>			3														
Cleomaceae	<i>Cleome viscosa</i>			3														
Combretaceae	<i>Terminalia circumalata</i>			3														
Commelinaceae	<i>Cartonema parviflorum</i>			1														
Commelinaceae	<i>Commelina ensifolia</i>			1														
Convolvulaceae	<i>Bonamia erecta</i>			1														
Convolvulaceae	<i>Bonamia linearis</i>			2														
Convolvulaceae	<i>Bonamia media</i>			3														
Convolvulaceae	<i>Bonamia pannosa</i>			3														
Convolvulaceae	<i>Bonamia pilbarensis</i>			3														
Convolvulaceae	<i>Duperreya commixta</i>			1														
Convolvulaceae	<i>Evolvulus alsinoides</i>			2														
Convolvulaceae	<i>Evolvulus alsinoides var. decumbens</i>			2														
Convolvulaceae	<i>Evolvulus alsinoides var. villosicalyx</i>			3														
Convolvulaceae	<i>Ipomoea muelleri</i>			3														
Convolvulaceae	<i>Polymeria ambigua</i>			3														
Convolvulaceae	<i>Polymeria calycina</i>			2														
Convolvulaceae	<i>Polymeria mollis</i>			2														
Cucurbitaceae	* <i>Citrullus colocynthis</i>									1	1							
Cucurbitaceae	* <i>Citrullus lanatus</i>											2				1		
Cucurbitaceae	<i>Cucumis melo</i>			2														
Cucurbitaceae	<i>Cucumis sp. Barrow Island (D.W. Goodall 1264)</i>	P2					1											
Cucurbitaceae	<i>Cucumis variabilis</i>			3														
Cucurbitaceae	<i>Trichosanthes cucumerina</i>			2														
Cyperaceae	<i>Bulbostylis barbata</i>			3														
Cyperaceae	<i>Bulbostylis burbidgeae</i>	P4		3		6					2					1		
Cyperaceae	<i>Bulbostylis turbinata</i>			3														
Cyperaceae	<i>Cyperus betchei subsp. commiscens</i>			2														
Cyperaceae	<i>Cyperus bifax</i>			2														
Cyperaceae	<i>Cyperus cunninghamii</i>			3														
Cyperaceae	<i>Cyperus cunninghamii subsp. cunninghamii</i>			3														
Cyperaceae	<i>Cyperus difformis</i>			3														
Cyperaceae	<i>Cyperus hesperius</i>			3														

Family	Scientific Name	Status		Databases <sup>1</sup>			Reports reviewed for the desktop											
		BC Act	EPBC Act	NM	PM	TPFL	GHD17	MA07	WM12a	WM12b	WM12c	WM13a	WM13b	WM13c	WM14c	WM16	WM18	WM20
Cyperaceae	<i>Cyperus iria</i>			3														
Cyperaceae	<i>Cyperus ixiocarpus</i>			1														
Cyperaceae	<i>Cyperus squarrosus</i>			3														
Cyperaceae	<i>Cyperus vaginatus</i>			3														
Cyperaceae	<i>Eleocharis geniculata</i>			2														
Cyperaceae	<i>Fimbristylis dichotoma</i>			3														
Cyperaceae	<i>Fimbristylis elegans</i>			2														
Cyperaceae	<i>Fimbristylis microcarya</i>			2														
Cyperaceae	<i>Fimbristylis rara</i>			3														
Cyperaceae	<i>Fimbristylis sieberiana</i>	P3				1												
Cyperaceae	<i>Fimbristylis simulans</i>			3														
Cyperaceae	<i>Fimbristylis sp. Shay Gap (K.R. Newbey 10293)</i>	P1				3												
Cyperaceae	<i>Fuirena ciliaris</i>			2														
Cyperaceae	<i>Lipocarpa microcephala</i>			2														
Cyperaceae	<i>Schoenoplectiella laevis</i>			3														
Cyperaceae	<i>Schoenoplectus subulatus</i>			3														
Cyperaceae	<i>Schoenus coultasii</i>	P1		2		1										1		
Cyperaceae	<i>Schoenus falcatus</i>			2														
Droseraceae	<i>Drosera finlaysoniana</i>			3														
Eriocaulaceae	<i>Eriocaulon pusillum</i>			2												1		
Euphorbiaceae	* <i>Ricinus communis</i>							1										
Euphorbiaceae	<i>Adriana tomentosa var. tomentosa</i>			3														
Euphorbiaceae	<i>Croton aridus</i>	P3				1												
Euphorbiaceae	<i>Euphorbia australis</i>			3														
Euphorbiaceae	<i>Euphorbia australis var. australis</i>			3														
Euphorbiaceae	<i>Euphorbia australis var. subtomentosa</i>			3														
Euphorbiaceae	<i>Euphorbia biconvexa</i>			3														
Euphorbiaceae	<i>Euphorbia boophthona</i>			2														
Euphorbiaceae	<i>Euphorbia careyi</i>			1														
Euphorbiaceae	<i>Euphorbia clementii</i>	P3		2		11		1	1	1								1
Euphorbiaceae	<i>Euphorbia coghlanii</i>			3														
Euphorbiaceae	<i>Euphorbia inappendiculata var. inappendiculata</i>	P2				3												
Euphorbiaceae	<i>Euphorbia tannensis subsp. eremophila</i>			2														
Euphorbiaceae	<i>Euphorbia trigonosperma</i>			2														
Euphorbiaceae	<i>Euphorbia vaccaria var. eruroides</i>			1														
Fabaceae	* <i>Parkinsonia aculeata</i>														1			



Family	Scientific Name	Status		Databases <sup>1</sup>			Reports reviewed for the desktop											
		BC Act	EPBC Act	NM	PM	TPFL	GHD17	MA07	WM12a	WM12b	WM12c	WM13a	WM13b	WM13c	WM14c	WM16	WM18	WM20
Fabaceae	<i>*Vachellia farnesiana</i>			2				1			1	2	1	1	1	1		1
Fabaceae	<i>Acacia acradenia</i>			3														
Fabaceae	<i>Acacia ampliceps</i>			3														
Fabaceae	<i>Acacia ancistrocarpa</i>			3														
Fabaceae	<i>Acacia aphanoclada</i>	P1				38					1	1	1					
Fabaceae	<i>Acacia arrecta</i>			1														
Fabaceae	<i>Acacia bivenosa</i>			3														
Fabaceae	<i>Acacia colei var. ileocarpa</i>			1														
Fabaceae	<i>Acacia coriacea subsp. pendens</i>			3														
Fabaceae	<i>Acacia cowleana</i>			2														
Fabaceae	<i>Acacia cyperophylla var. omearana</i>	P1				18				1								
Fabaceae	<i>Acacia eriopoda</i>			3														
Fabaceae	<i>Acacia eriopoda x trachycarpa</i>			3														
Fabaceae	<i>Acacia fecunda</i>	P1				10												
Fabaceae	<i>Acacia glaucocaesia</i>			1														
Fabaceae	<i>Acacia gregorii</i>			2														
Fabaceae	<i>Acacia hilliana</i>			2														
Fabaceae	<i>Acacia inaequilatera</i>			3														
Fabaceae	<i>Acacia leeuweniana</i>	P1				19												
Fabaceae	<i>Acacia levata</i>	P3		2		13				1						1		
Fabaceae	<i>Acacia ligulata</i>			2														
Fabaceae	<i>Acacia maitlandii</i>			3														
Fabaceae	<i>Acacia orthocarpa</i>			3														
Fabaceae	<i>Acacia ptychophylla</i>			3														
Fabaceae	<i>Acacia pyrifolia</i>			3														
Fabaceae	<i>Acacia pyrifolia var. pyrifolia</i>			3														
Fabaceae	<i>Acacia retivenea subsp. clandestina</i>			2														
Fabaceae	<i>Acacia sabulosa</i>			2														
Fabaceae	<i>Acacia sericophylla</i>			2														
Fabaceae	<i>Acacia sp. indet.</i>									2								
Fabaceae	<i>Acacia sp. Marble Bar</i>			3														
Fabaceae	<i>Acacia sp. Marble Bar (J.G. &amp; M.H. Simmons 3499)</i>	P1				1												
Fabaceae	<i>Acacia sp. Nullagine (B.R. Maslin 4955)</i>	P1				1				1								
Fabaceae	<i>Acacia sphaerostachya</i>			2														
Fabaceae	<i>Acacia spondylophylla</i>			3														
Fabaceae	<i>Acacia stellaticeps</i>			3														

Family	Scientific Name	Status		Databases <sup>1</sup>			Reports reviewed for the desktop											
		BC Act	EPBC Act	NM	PM	TPFL	GHD17	MA07	WM12a	WM12b	WM12c	WM13a	WM13b	WM13c	WM14c	WM16	WM18	WM20
Fabaceae	<i>Acacia synchronicia</i>			2														
Fabaceae	<i>Acacia tenuissima</i>			1														
Fabaceae	<i>Acacia tetragonophylla</i>			3														
Fabaceae	<i>Acacia trachycarpa</i>			3														
Fabaceae	<i>Acacia trachycarpa x tumida var. pilbarensis</i>			3														
Fabaceae	<i>Acacia tumida var. pilbarensis</i>			3														
Fabaceae	<i>Acacia wanyu</i>			2														
Fabaceae	<i>Alysicarpus muelleri</i>			3														
Fabaceae	<i>Cajanus cinereus</i>			3														
Fabaceae	<i>Cajanus marmoratus</i>			1														
Fabaceae	<i>Crotalaria crispata</i>			2														
Fabaceae	<i>Crotalaria cunninghamii</i>			3														
Fabaceae	<i>Crotalaria cunninghamii subsp. sturtii</i>			3														
Fabaceae	<i>Crotalaria medicaginea</i>			2														
Fabaceae	<i>Crotalaria medicaginea var. neglecta</i>			3														
Fabaceae	<i>Crotalaria novae-hollandiae</i>			2														
Fabaceae	<i>Crotalaria novae-hollandiae subsp. novae-hollandiae</i>			2														
Fabaceae	<i>Crotalaria ramosissima</i>			3														
Fabaceae	<i>Cullen badocanum</i>			3														
Fabaceae	<i>Cullen cinereum</i>			2														
Fabaceae	<i>Cullen lachnostachys</i>			3														
Fabaceae	<i>Cullen leucanthum</i>			3														
Fabaceae	<i>Cullen leucochaites</i>			2														
Fabaceae	<i>Cullen martinii</i>			3														
Fabaceae	<i>Cullen pallidum</i>			3														
Fabaceae	<i>Cullen pogonocarpum</i>			3														
Fabaceae	<i>Cullen pustulatum</i>			2														
Fabaceae	<i>Cullen stipulaceum</i>			3														
Fabaceae	<i>Desmodium filiforme</i>			1														
Fabaceae	<i>Dichrostachys spicata</i>			3														
Fabaceae	<i>Erythrina vespertilio</i>			2														
Fabaceae	<i>Gastrolobium grandiflorum</i>			2														
Fabaceae	<i>Gompholobium simplicifolium</i>			3														
Fabaceae	<i>Indigastrum parviflorum</i>			2														
Fabaceae	<i>Indigofera ammobia</i>	P3					2											
Fabaceae	<i>Indigofera colutea</i>			3														

Family	Scientific Name	Status		Databases <sup>1</sup>			Reports reviewed for the desktop											
		BC Act	EPBC Act	NM	PM	TPFL	GHD17	MA07	WM12a	WM12b	WM12c	WM13a	WM13b	WM13c	WM14c	WM16	WM18	WM20
Fabaceae	<i>Indigofera hirsuta</i>			3														
Fabaceae	<i>Indigofera ixocarpa</i>	P2				4												
Fabaceae	<i>Indigofera linifolia</i>			3														
Fabaceae	<i>Indigofera linnaei</i>			2														
Fabaceae	<i>Indigofera monophylla</i>			3														
Fabaceae	<i>Indigofera rugosa</i>			3														
Fabaceae	<i>Indigofera trita</i>			3														
Fabaceae	<i>Indigofera trita subsp. trita</i>			2														
Fabaceae	<i>Isotropis atropurpurea</i>			3														
Fabaceae	<i>Leucaena leucocephala</i>			3														
Fabaceae	<i>Lotus australis</i>			1														
Fabaceae	<i>Parkinsonia aculeata</i>			3														
Fabaceae	<i>Petalostylis labicheoides</i>			3														
Fabaceae	<i>Rhynchosia australis</i>			3														
Fabaceae	<i>Rhynchosia bungarensis</i>	P4				1									1			
Fabaceae	<i>Rhynchosia minima</i>			3														
Fabaceae	<i>Rothia indica subsp. australis</i>	P3				4				1	1			1	1			
Fabaceae	<i>Senna artemisioides subsp. helmsii</i>			1														
Fabaceae	<i>Senna artemisioides subsp. oligophylla</i>			3														
Fabaceae	<i>Senna ferraria</i>			1														
Fabaceae	<i>Senna glaucifolia</i>			3														
Fabaceae	<i>Senna glutinosa</i>			3														
Fabaceae	<i>Senna glutinosa subsp. chatelainiana</i>			3														
Fabaceae	<i>Senna glutinosa subsp. glutinosa</i>			3														
Fabaceae	<i>Senna glutinosa subsp. pruinosa</i>			3														
Fabaceae	<i>Senna glutinosa subsp. x luerssenii</i>			3														
Fabaceae	<i>Senna notabilis</i>			3														
Fabaceae	<i>Senna stricta</i>			2														
Fabaceae	<i>Senna symonii</i>			3														
Fabaceae	<i>Senna venusta</i>			3														
Fabaceae	<i>Sesbania cannabina</i>			3														
Fabaceae	<i>Sesbania formosa</i>			3														
Fabaceae	<i>Swainsona decurrens</i>			3														
Fabaceae	<i>Swainsona formosa</i>			3														
Fabaceae	<i>Swainsona kingii</i>			3														
Fabaceae	<i>Swainsona stenodonta</i>			3														

Family	Scientific Name	Status		Databases <sup>1</sup>			Reports reviewed for the desktop												
		BC Act	EPBC Act	NM	PM	TPFL	GHD17	MA07	WM12a	WM12b	WM12c	WM13a	WM13b	WM13c	WM14c	WM16	WM18	WM20	
Fabaceae	<i>Swainsona thompsoniana</i>	P3																1	
Fabaceae	<i>Tephrosia clementii</i>			2															
Fabaceae	<i>Tephrosia densa</i>			3															
Fabaceae	<i>Tephrosia leptoclada</i>			1															
Fabaceae	<i>Tephrosia oxalidea</i>			2															
Fabaceae	<i>Tephrosia rosea var. clementii</i>			3															
Fabaceae	<i>Tephrosia rosea var. rosea</i>			1															
Fabaceae	<i>Tephrosia simplicifolia</i>			1															
Fabaceae	<i>Tephrosia sp. B Kimberley Flora</i>			3															
Fabaceae	<i>Tephrosia sp. Bungaroo Creek</i>			3															
Fabaceae	<i>Tephrosia sp. NW Eremaean</i>			3															
Fabaceae	<i>Tephrosia stipuligera</i>			1															
Fabaceae	<i>Tephrosia supina</i>			3															
Fabaceae	<i>Tephrosia virens</i>			3															
Fabaceae	<i>Vigna lanceolata</i>			3															
Fabaceae	<i>Vigna lanceolata var. lanceolata</i>			2															
Goodeniaceae	<i>Dampiera candidans</i>			3															
Goodeniaceae	<i>Goodenia forrestii</i>			3															
Goodeniaceae	<i>Goodenia lamprosperma</i>			3															
Goodeniaceae	<i>Goodenia microptera</i>			3															
Goodeniaceae	<i>Goodenia muelleriana</i>			3															
Goodeniaceae	<i>Goodenia nuda</i>	P4				1				1									
Goodeniaceae	<i>Goodenia scaevolina</i>			2															
Goodeniaceae	<i>Goodenia stobbsiana</i>			3															
Goodeniaceae	<i>Goodenia triodiophila</i>			3															
Goodeniaceae	<i>Scaevola amblyanthera</i>			2															
Goodeniaceae	<i>Scaevola amblyanthera var. centralis</i>			3															
Haloragaceae	<i>Haloragis gossei</i>			3															
Haloragaceae	<i>Haloragis gossei var. gossei</i>			2															
Haloragaceae	<i>Myriophyllum verrucosum</i>			3															
Hydrocharitaceae	<i>Najas tenuifolia</i>			3															
Hydrocharitaceae	<i>Vallisneria annua</i>			3															
Lamiaceae	<i>Clerodendrum floribundum var. angustifolium</i>			3															
Lamiaceae	<i>Clerodendrum floribundum var. ovatum</i>			3															
Lamiaceae	<i>Quoya zonalis K.A.Sheph. &amp; Hislop</i>	EN				80		1	1	2									
Lauraceae	<i>Cassytha capillaris</i>			2															

Family	Scientific Name	Status		Databases <sup>1</sup>			Reports reviewed for the desktop											
		BC Act	EPBC Act	NM	PM	TPFL	GHD17	MA07	WM12a	WM12b	WM12c	WM13a	WM13b	WM13c	WM14c	WM16	WM18	WM20
Lauraceae	<i>Cassytha filiformis</i>			1														
Loganiaceae	<i>Mitrasacme connata</i>			2														
Loranthaceae	<i>Amyema miquelii</i>			1														
Loranthaceae	<i>Amyema preissii</i>			3														
Loranthaceae	<i>Amyema sanguinea var. sanguinea</i>			2														
Loranthaceae	<i>Lysiana casuarinae</i>			3														
Loranthaceae	<i>Lysiana murrayi</i>			1														
Lythraceae	<i>Ammannia baccifera</i>			3														
Lythraceae	<i>Ammannia multiflora</i>			3														
Malvaceae	* <i>Malvastrum americanum</i>									1	1	2	1	1	1	1	1	1
Malvaceae	<i>Abutilon aff. hannii</i>									1	1	1				1	1	1
Malvaceae	<i>Abutilon fraseri</i>			1														
Malvaceae	<i>Abutilon hannii</i>			2														
Malvaceae	<i>Abutilon lepidum</i>			3														
Malvaceae	<i>Abutilon malvifolium</i>			3														
Malvaceae	<i>Abutilon sp.</i>			2														
Malvaceae	<i>Abutilon sp. Dioicum</i>			3														
Malvaceae	<i>Abutilon sp. Pilbara</i>			3														
Malvaceae	<i>Androcalva luteiflora</i>			3														
Malvaceae	<i>Corchorus carnarvonensis</i>			3														
Malvaceae	<i>Corchorus elachocarpus</i>			2														
Malvaceae	<i>Corchorus incanus</i>			2														
Malvaceae	<i>Corchorus incanus subsp. incanus</i>			3														
Malvaceae	<i>Corchorus laniflorus</i>			2														
Malvaceae	<i>Corchorus lasiocarpus subsp. lasiocarpus</i>			2														
Malvaceae	<i>Corchorus parviflorus</i>			3														
Malvaceae	<i>Corchorus sp. Yarrie (J. Bull &amp; D. Roberts CAL 01.05)</i>	P1				6												
Malvaceae	<i>Corchorus tridens</i>			3														
Malvaceae	<i>Corchorus walcottii</i>			3														
Malvaceae	<i>Gossypium australe</i>			3														
Malvaceae	<i>Gossypium sturtianum</i>			2														
Malvaceae	<i>Hibiscus austrinus</i>			2														
Malvaceae	<i>Hibiscus austrinus var. austrinus</i>			3														
Malvaceae	<i>Hibiscus coatesii</i>			3														
Malvaceae	<i>Hibiscus goldsworthii</i>			1														
Malvaceae	<i>Hibiscus leptocladus</i>			3														

Family	Scientific Name	Status		Databases <sup>1</sup>			Reports reviewed for the desktop											
		BC Act	EPBC Act	NM	PM	TPFL	GHD17	MA07	WM12a	WM12b	WM12c	WM13a	WM13b	WM13c	WM14c	WM16	WM18	WM20
Malvaceae	<i>Hibiscus sturtii</i>			2														
Malvaceae	<i>Hibiscus sturtii</i> var. <i>campylochlamys</i>			3														
Malvaceae	<i>Hibiscus sturtii</i> var. <i>platychlamys</i>			3														
Malvaceae	<i>Hibiscus verdcourtii</i>			2														
Malvaceae	<i>Melhania oblongifolia</i>			3														
Malvaceae	<i>Sida arenicola</i>			2														
Malvaceae	<i>Sida clementii</i>			2														
Malvaceae	<i>Sida echinocarpa</i>			3														
Malvaceae	<i>Sida fibulifera</i>			2														
Malvaceae	<i>Sida macropoda</i>			3														
Malvaceae	<i>Sida rohlena</i>			3														
Malvaceae	<i>Sida</i> sp. <i>Articulation below</i>			3														
Malvaceae	<i>Sida</i> sp. <i>Excedentifolia</i>			2														
Malvaceae	<i>Sida</i> sp. <i>Pilbara</i>			3														
Malvaceae	<i>Triumfetta appendiculata</i>			3														
Malvaceae	<i>Triumfetta chaetocarpa</i>			3														
Malvaceae	<i>Triumfetta clementii</i>			3														
Malvaceae	<i>Triumfetta maconochieana</i>			3														
Malvaceae	<i>Triumfetta propinqua</i>			3														
Malvaceae	<i>Waltheria indica</i>			2														
Malvaceae	<i>Waltheria virgata</i>			3														
Marsileaceae	<i>Marsilea</i> sp.			3														
Menispermaceae	<i>Tinospora smilacina</i>			2														
Molluginaceae	<i>Trigastrotheca molluginea</i>			3														
Montiaceae	<i>Calandrinia pentavalvis</i>			1														
Montiaceae	<i>Calandrinia quadrivalvis</i>			3														
Montiaceae	<i>Calandrinia stagnensis</i>			3														
Montiaceae	<i>Calandrinia tepperiana</i>			3														
Moraceae	<i>Ficus aculeata</i> var. <i>indecora</i>			3														
Moraceae	<i>Ficus brachypoda</i>			1														
Moraceae	<i>Ficus virens</i>			2														
Myrtaceae	<i>Corymbia flavescens</i>			3														
Myrtaceae	<i>Corymbia hamersleyana</i>			3														
Myrtaceae	<i>Eucalyptus camaldulensis</i>			2														
Myrtaceae	<i>Eucalyptus camaldulensis</i> subsp. <i>obtus</i>			3														
Myrtaceae	<i>Eucalyptus camaldulensis</i> subsp. <i>refulgens</i>			2														

Family	Scientific Name	Status		Databases <sup>1</sup>			Reports reviewed for the desktop											
		BC Act	EPBC Act	NM	PM	TPFL	GHD17	MA07	WM12a	WM12b	WM12c	WM13a	WM13b	WM13c	WM14c	WM16	WM18	WM20
Myrtaceae	<i>Eucalyptus leucophloia</i>			1														
Myrtaceae	<i>Eucalyptus leucophloia subsp. leucophloia</i>			3														
Myrtaceae	<i>Eucalyptus rowleyi</i>	P3				7												
Myrtaceae	<i>Eucalyptus victrix</i>			3														
Myrtaceae	<i>Melaleuca argentea</i>			3														
Myrtaceae	<i>Melaleuca glomerata</i>			3														
Myrtaceae	<i>Melaleuca lasiandra</i>			1														
Myrtaceae	<i>Melaleuca linophylla</i>			3														
Nyctaginaceae	<i>Boerhavia burbridgeana</i>			2														
Nyctaginaceae	<i>Boerhavia coccinea</i>			3														
Nyctaginaceae	<i>Boerhavia gardneri</i>			3														
Oleaceae	<i>Jasminum didymum</i>			1														
Oleaceae	<i>Jasminum didymum subsp. lineare</i>			3														
Onagraceae	<i>Ludwigia perennis</i>			3														
Orobanchaceae	<i>Buchnera linearis</i>			2														
Papaveraceae	* <i>Argemone ochroleuca</i>			6				1			1				1	1		
Passifloraceae	* <i>Passiflora foetida var. hispida</i>															1		
Pedaliaceae	<i>Josephinia eugeniae</i>			2														
Pedaliaceae	<i>Josephinia sp. Mt Edgar Station</i>			3														
Pedaliaceae	<i>Josephinia sp. Woodstock (A.A. Mitchell PRP 989)</i>	P1																1
Phrymaceae	<i>Mimulus gracilis</i>			2														
Phrymaceae	<i>Peplidium sp. E Evol. Fl. Fauna Arid Aust.</i>			2														
Phyllanthaceae	<i>Flueggea virosa</i>			2														
Phyllanthaceae	<i>Flueggea virosa subsp. melanthesoides</i>			3														
Phyllanthaceae	<i>Notoleptopus decaisnei</i>			3														
Phyllanthaceae	<i>Phyllanthus hebecarpus</i>	P3				2					1							
Phyllanthaceae	<i>Phyllanthus maderaspatensis</i>			3														
Plantaginaceae	<i>Stemodia grossa</i>			3														
Plantaginaceae	<i>Stemodia viscosa</i>			3														
Poaceae	* <i>Cenchrus ciliaris</i>			6				1	1	1	1	2	1	1	1	1	1	1
Poaceae	* <i>Cenchrus setiger</i>											1	1	1	1		1	1
Poaceae	* <i>Chloris barbata</i>											2					1	
Poaceae	* <i>Chloris virgata</i>											1						1
Poaceae	* <i>Cynodon dactylon</i>							1				2				1	1	
Poaceae	* <i>Digitaria ciliaris</i>											1						
Poaceae	* <i>Echinochloa colona</i>			2								1					1	



Family	Scientific Name	Status		Databases <sup>1</sup>			Reports reviewed for the desktop											
		BC Act	EPBC Act	NM	PM	TPFL	GHD17	MA07	WM12a	WM12b	WM12c	WM13a	WM13b	WM13c	WM14c	WM16	WM18	WM20
Poaceae	<i>*Eragrostis minor</i>																	1
Poaceae	<i>*Setaria verticillata</i>			2				1				1	1	1		1		
Poaceae	<i>Acrachne racemosa</i>			1														
Poaceae	<i>Amphipogon caricinus var. caricinus</i>			3														
Poaceae	<i>Aristida burbidgeae</i>			3														
Poaceae	<i>Aristida contorta</i>			3														
Poaceae	<i>Aristida holathera</i>			3														
Poaceae	<i>Aristida hygrometrica</i>			2														
Poaceae	<i>Aristida inaequiglumis</i>			1														
Poaceae	<i>Chloris pumilio</i>			2														
Poaceae	<i>Chrysopogon fallax</i>			3														
Poaceae	<i>Cymbopogon ambiguus</i>			3														
Poaceae	<i>Cymbopogon obtectus</i>			3														
Poaceae	<i>Cymbopogon procerus</i>			2														
Poaceae	<i>Cynodon convergens</i>			2														
Poaceae	<i>Cynodon prostratus</i>			2														
Poaceae	<i>Dactyloctenium radulans</i>			3														
Poaceae	<i>Dichanthium sericeum subsp. humilium</i>			3														
Poaceae	<i>Digitaria brownii</i>			3														
Poaceae	<i>Digitaria ctenantha</i>			3														
Poaceae	<i>Diplachne fusca subsp. fusca</i>			1														
Poaceae	<i>Enneapogon caeruleus</i>			3														
Poaceae	<i>Enneapogon lindleyanus</i>			3														
Poaceae	<i>Enneapogon polyphyllus</i>			3														
Poaceae	<i>Enneapogon robustissimus</i>			2														
Poaceae	<i>Enteropogon ramosus</i>			2														
Poaceae	<i>Eragrostis crateriformis</i>	P3		1		15					1	1	1	1	1	1		1
Poaceae	<i>Eragrostis cumingii</i>			3														
Poaceae	<i>Eragrostis desertorum</i>			2														
Poaceae	<i>Eragrostis dielsii</i>			3														
Poaceae	<i>Eragrostis eriopoda</i>			3														
Poaceae	<i>Eragrostis setifolia</i>			2														
Poaceae	<i>Eragrostis speciosa</i>			3														
Poaceae	<i>Eragrostis tenellula</i>			3														
Poaceae	<i>Eriachne aristidea</i>			3														
Poaceae	<i>Eriachne benthamii</i>			3														

Family	Scientific Name	Status		Databases <sup>1</sup>			Reports reviewed for the desktop											
		BC Act	EPBC Act	NM	PM	TPFL	GHD17	MA07	WM12a	WM12b	WM12c	WM13a	WM13b	WM13c	WM14c	WM16	WM18	WM20
Poaceae	<i>Eriachne ciliata</i>			3														
Poaceae	<i>Eriachne melicacea</i>			3														
Poaceae	<i>Eriachne mucronata</i>			3														
Poaceae	<i>Eriachne obtusa</i>			2														
Poaceae	<i>Eriachne pulchella</i>			3														
Poaceae	<i>Eriachne pulchella</i> subsp. <i>pulchella</i>			3														
Poaceae	<i>Eriachne tenuiculmis</i>			3														
Poaceae	<i>Eulalia aurea</i>			3														
Poaceae	<i>Heteropogon contortus</i>			3														
Poaceae	<i>Iseilema dolichotrichum</i>			2														
Poaceae	<i>Iseilema fragile</i>			2														
Poaceae	<i>Iseilema vaginiflorum</i>			3														
Poaceae	<i>Paraneurachne muelleri</i>			3														
Poaceae	<i>Paspalidium basicladum</i>			2														
Poaceae	<i>Paspalidium clementii</i>			3														
Poaceae	<i>Paspalidium rarum</i>			1														
Poaceae	<i>Paspalidium tabulatum</i>			3														
Poaceae	<i>Perotis rara</i>			2														
Poaceae	<i>Schizachyrium fragile</i>			2														
Poaceae	<i>Setaria dielsii</i>			2														
Poaceae	<i>Setaria surgens</i>			3														
Poaceae	<i>Sorghum plumosum</i>			2														
Poaceae	<i>Sporobolus actinocladus</i>			3														
Poaceae	<i>Sporobolus australasicus</i>			3														
Poaceae	<i>Themeda avenacea</i>			2														
Poaceae	<i>Themeda</i> sp. Hamersley Station (M.E. Trudgen 11431)	P3				1												
Poaceae	<i>Themeda triandra</i>			3														
Poaceae	<i>Tragus australianus</i>			2														
Poaceae	<i>Triodia angusta</i>			2														
Poaceae	<i>Triodia basitricha</i>	P3				4												
Poaceae	<i>Triodia brizoides</i>			3														
Poaceae	<i>Triodia chichesterensis</i>	P3				1												
Poaceae	<i>Triodia epactia</i>			3														
Poaceae	<i>Triodia longiceps</i>			3														
Poaceae	<i>Triodia wiseana</i>			3														
Poaceae	<i>Triraphis mollis</i>			2														

Family	Scientific Name	Status		Databases <sup>1</sup>			Reports reviewed for the desktop											
		BC Act	EPBC Act	NM	PM	TPFL	GHD17	MA07	WM12a	WM12b	WM12c	WM13a	WM13b	WM13c	WM14c	WM16	WM18	WM20
Poaceae	<i>Urochloa holosericea</i> subsp. <i>velutina</i>			2														
Poaceae	<i>Urochloa piligera</i>			2														
Poaceae	<i>Yakirra australiensis</i>			3														
Poaceae	<i>Yakirra australiensis</i> var. <i>australiensis</i>			2														
Polygalaceae	<i>Polygala glaucifolia</i>			3														
Polygalaceae	<i>Polygala isingii</i>			3														
Portulacaceae	* <i>Portulaca pilosa</i>															1		
Portulacaceae	<i>Portulaca ?digyna</i>														1	1	1	
Portulacaceae	<i>Portulaca conspicua</i>			2														
Portulacaceae	<i>Portulaca cyclophylla</i>			1														
Portulacaceae	<i>Portulaca digyna</i>			3														
Portulacaceae	<i>Portulaca oleracea</i>			3														
Posidoniaceae	<i>Potamogeton tepperi</i>			3														
Proteaceae	<i>Grevillea pyramidalis</i>			2														
Proteaceae	<i>Grevillea pyramidalis</i> subsp. <i>leucadendron</i>			3														
Proteaceae	<i>Grevillea pyramidalis</i> subsp. <i>pyramidalis</i>			1														
Proteaceae	<i>Grevillea wickhamii</i>			1														
Proteaceae	<i>Grevillea wickhamii</i> subsp. <i>aprica</i>			3														
Proteaceae	<i>Grevillea wickhamii</i> subsp. <i>hispidula</i>			1														
Proteaceae	<i>Hakea lorea</i> subsp. <i>lorea</i>			3														
Psilotaceae	<i>Psilotum nudum</i>			2														
Pteridaceae	<i>Acrostichum speciosum</i>			1											1			
Pteridaceae	<i>Cheilanthes brownii</i>			2														
Pteridaceae	<i>Cheilanthes sieberi</i> subsp. <i>pseudovellea</i>			3														
Pteridaceae	<i>Cheilanthes sieberi</i> subsp. <i>sieberi</i>			3														
Rubiaceae	<i>Dolichocarpa crouchiana</i>			3														
Rubiaceae	<i>Dolichocarpa</i> sp.														1			
Rubiaceae	<i>Dolichocarpa</i> sp. Hamersley Station (A.A. Mitchell PRP 1479)	P3				1												
Rubiaceae	<i>Synaptantha tillaeacea</i>			3														
Rubiaceae	<i>Synaptantha tillaeacea</i> var. <i>tillaeacea</i>			3														
Santalaceae	<i>Exocarpos sparteus</i>			3														
Santalaceae	<i>Santalum lanceolatum</i>			3														
Sapindaceae	<i>Atalaya hemiglauca</i>			3														
Scrophulariaceae	<i>Eremophila latrobei</i> subsp. <i>glabra</i>			1														
Scrophulariaceae	<i>Eremophila longifolia</i>			3														

Family	Scientific Name	Status		Databases <sup>1</sup>			Reports reviewed for the desktop											
		BC Act	EPBC Act	NM	PM	TPFL	GHD17	MA07	WM12a	WM12b	WM12c	WM13a	WM13b	WM13c	WM14c	WM16	WM18	WM20
Scrophulariaceae	<i>Eremophila maculata</i> subsp. <i>filifolia</i>	P1				3												
Scrophulariaceae	<i>Eremophila</i> sp.			3														
Solanaceae	* <i>Solanum nigrum</i>							1			1						1	
Solanaceae	<i>Nicotiana benthamiana</i>			3														
Solanaceae	<i>Nicotiana occidentalis</i> subsp. <i>occidentalis</i>			3														
Solanaceae	<i>Nicotiana rosulata</i> subsp. <i>rosulata</i>			2														
Solanaceae	<i>Nicotiana umbratica</i>	P3		3		8				1	1				1	1		
Solanaceae	<i>Physalis angulata</i>			2														
Solanaceae	<i>Solanum ashbyae</i>			3														
Solanaceae	<i>Solanum cleistogamum</i>			1														
Solanaceae	<i>Solanum dioicum</i>			1														
Solanaceae	<i>Solanum diversiflorum</i>			3														
Solanaceae	<i>Solanum horridum</i>			3														
Solanaceae	<i>Solanum lasiophyllum</i>			2														
Solanaceae	<i>Solanum phlomoides</i>			3														
Solanaceae	<i>Solanum</i> sp. Mosquito Creek (A.A. Mitchell et al. AAM 10795)	P1				9												
Stylidiaceae	<i>Stylidium desertorum</i>			3														
Stylidiaceae	<i>Stylidium weeliwoilli</i>	P3		2		1										1		
Typhaceae	<i>Typha domingensis</i>			1														
Violaceae	<i>Hybanthus aurantiacus</i>			3														
Zygophyllaceae	* <i>Tribulus terrestris</i>										1						1	1
Zygophyllaceae	<i>Tribulus astrocarpus</i>			2														
Zygophyllaceae	<i>Tribulus cistoides</i>			2														
Zygophyllaceae	<i>Tribulus hirsutus</i>			3														
Zygophyllaceae	<i>Tribulus platypterus</i>			3														
Zygophyllaceae	<i>Tribulus suberosus</i>			2														
Elatinaceae	<i>Bergia ammannioides</i>			2														
Elatinaceae	<i>Bergia pedicellaris</i>			2														

**Footnotes:**

**1 = Databases reviewed for the desktop**

NM DBCA (2021) NatureMap database

PM AWE (2021) Protected Matters Search Tool

TPFL DBCA Threatened and Priority Flora Database (including data from the WA Herbarium)

**2 = Survey reports reviewed for the desktop**

WM20 Woodman Environmental (2020) Warrawoona Gold Project. Detailed Flora and Vegetation Assessment.

MA07 Mattiske (2007). Flora and Vegetation and Assessment of Groundwater Dependent Ecosystems in the Panorama Project Survey Area.

WM12a Woodman Environmental (2012a) – mining project and infrastructure corridor to GNH

WM12b Woodman Environmental (2012b) – camp and haul road corridor to Marble Bar Road

WM12c Woodman Environmental (2012c) - mining area and Public Road Upgrade (PRU)

WM13a Woodman Environmental (2013a) - PRU supplementary survey

WM12c	Woodman Environmental (2012c) - mining area and Public Road Upgrade (PRU)
WM13a	Woodman Environmental (2013a) - PRU supplementary survey
WM13b	Woodman Environmental (2013b) - McPhee Creek Project Study Area
WM18	Woodman Environmental (2018) Corunna Downs Intersection Works Flora and Vegetation Assessment. Report for Atlas Iron Ltd. May 2018.
WM13c	Woodman Environmental (2013c) - Targeted significant flora survey
WM14a	Woodman Environmental (2014a) - Project Discharge Options
WM14b	Woodman Environmental (2014b) - Eastern Corridor (Yandeyarra to Mt Webber and McPhee Creek)
WM14c	Woodman Environmental (2014c) – Rail spur linking Eastern Corridor to a third party rail line
WM16	Woodman Environmental (2016) – Level 2 Flora and Vegetation Assessment
GHD17	GHD (2017) – Biological Assessments - M030 Material Pit Extraction Area 356 SLK; Coongan Gorge Road Realignment (Level 1 flora and vegetation surveys)
WM18	Woodman Environmental (2018) Corunna Downs Intersection Works Flora and Vegetation Assessment. Report for Atlas Iron Ltd. May 2018.

**Appendix V      Flora desktop results: Conservation significant flora and likelihood assessment**

## Appendix V – Flora desktop results: Conservation significant flora and likelihood assessment

Family	Scientific Name	Status	Total records	Growth form	Flowering period	Habitat information	Habitat in survey area	Distance	Likelihood rating
Acanthaceae	<i>Rostellularia adscendens</i> var. <i>latifolia</i>	P3	11	Herb or shrub, 3 m high.	April to May	Near creeks, rocky hills. Ironstone soils.	Yes	59 km	Unlikely
Amaranthaceae	<i>Gomphrena leptophylla</i>	P3	6	Prostrate or erect to spreading annual, herb, 0.15 m high, flowers white.	March to September	Sand, sandy to clayey loam, granite, quartzite. Open flats, sandy creek beds, edges salt pans & marshes, stony hillsides.	Yes	3-72 km	Likely
Amaranthaceae	<i>Ptilotus mollis</i>	P4	28	Compact, perennial shrub, to no info on FloraBase. 5 m high, soft grey foliage.	May or September	Stony hills and screes.	Yes	0-54 km	Highly likely
Amaranthaceae	<i>Ptilotus wilsonii</i>	P1	2	Shrub, ca 0.5 m high. Fl. green-white	October	Stony gravelly soils, rocky hills. Lower hill slope. Gravelly, calcrete / limestone - like rocky surface.	Yes	55-88 km	Unlikely
Apocynaceae	<i>Gymnanthera cunninghamii</i>	P3	8	Erect shrub, 1-2 m high	January to December	Sandy soils and drainage lines	Yes	56-76 km	Unlikely
Bixaceae	<i>Cochlospermum macnamarae</i>	P1	10	no info on FloraBase	No info	Granite boulders, skeletal brown sand	Yes	35-58 km	Possible
Boraginaceae	<i>Heliotropium murinum</i>	P3	12	Short-lived perennial, herb, up to 0.4 m high	May or September	Red sand. Sand plains. Flat. Brown light clay/sand over ironstone. 0-10% loose rock. Collection site: private property.	Yes	2-70 km	Highly likely
Boraginaceae	<i>Heliotropium muticum</i>	P3	28	Ascending to spreading perennial, herb, to 0.3 m high.	April to June, September	Flat terrain, low in landscape, skeletal red brown granitic soil, very gritty. Clay loams, floodplains, sandplains	Yes	7-65 km	Likely
Boraginaceae	<i>Heliotropium parviantrum</i>	P1	1	Erect annual, herb, to 0.15 m high	February to June	Sandy soils. Flats, plains, rocky slopes.	Yes	50 km	Unlikely
Brassicaceae	<i>Lepidium catapycnon</i>	P4	2	Erect annual, herb, to 0.15 m high	February to June	Sandy soils. Flats, plains, rocky slopes.	Yes	70km	Unlikely
Chenopodiaceae	<i>Atriplex spinulosa</i>	P1	15	Monoecious, erect annual herb to 0.2	No info	Quartz drainage lines and brown silty clay loams	Maybe	64-78 km	Unlikely
Cucurbitaceae	<i>Cucumis</i> sp. Barrow Island (D.W. Goodall 1264)	P2	1	no info on FloraBase	May	Lower footslope of a basalt hill	Maybe	30 km	Unlikely



Family	Scientific Name	Status	Total records	Growth form	Flowering period	Habitat information	Habitat in survey area	Distance	Likelihood rating
Cyperaceae	<i>Bulbostylis burbidgeae</i>	P4	12	Tufted, erect to spreading annual, grass-like or herb (sedge). 25 cm high, spikelets in a simple umbel or rarely solitary; stamens 3; involucre bracts long, hairy.	March, June to August	Granite outcrops, granitic soils, cliff bases.	Yes	13-15 km	Likely
Cyperaceae	<i>Fimbristylis sieberiana</i>	P3	1	Shortly rhizomatous, tufted perennial, grass-like or herb (sedge), 0.25-0.6 m high	May to June	Drainage line with black clay loam soil. Mud, skeletal soil pockets. Pool edges, sandstone cliff	No	88 km	Unlikely
Cyperaceae	<i>Fimbristylis</i> sp. Shay Gap (K.R. Newbey 10293)	P1	3	Tufted annual, grass-like or herb (sedge), 0.12-0.15 m high, inflorescence of 3-many spikelets	June to July	Sandy soil, basalt, Drainage line	Yes	48-67 km	Possible
Cyperaceae	<i>Schoenus coultasii</i> <sup>3</sup>	P1	4	no info on FloraBase	No info	Granite seepage area. Brown sandy loam.	Maybe	55-66 km	Unlikely
Euphorbiaceae	<i>Croton aridus</i>	P3	1	Monoecious, multi-stemmed evergreen shrub to 1.5m high	August	Deep red sand, pindan soil. Sandplains or ridges, spinifex sandplains	Maybe	73km	Unlikely
Euphorbiaceae	<i>Euphorbia clementii</i>	P3	17	Erect herb to 0.6 m high.	April	Gravelly hillsides, stony grounds. Drainage lines, red, orange sandy loams, some stony areas	Yes	2-80 km	Highly likely
Euphorbiaceae	<i>Euphorbia inappendiculata</i> var. <i>inappendiculata</i>	P2	3	no info on FloraBase	May	Claypan, red-brown sandy clay.	No	51-60 km	Unlikely
Fabaceae	<i>Acacia aphanoclada</i>	P1	41	Slender, wispy shrub, 1.7-5 m high.	August to October	Skeletal stony soils. Rocky hills, ridges & rises.	Yes	35-70 km	Possible
Fabaceae	<i>Acacia cyperophylla</i> var. <i>omearana</i>	P1	19	Tree, 4-10m high, minni-ritchi bark	March, April, August, October	Stony and gritty alluvium. Associated with creek and drainage lines on sandy and rocky soils	Yes	41-65 km	Possible
Fabaceae	<i>Acacia fecunda</i>	P1	10	Erect, obconic tree to 3m, grey bark, phyllodes are sub-glaucous, spikes	April, May, August, October	Quartzite gibbers, grey-red skeletal soil, creeklines, road verges. Base of hills, scree slopes.	Yes	65-70 km	Unlikely
Fabaceae	<i>Acacia leeuweniana</i>	P1	19	Narrow obconic tree to 14 m. Bark minni ritchi, inflorescence in spikes	No info	Gritty, skeletal red-grey sandy loam, light orange-brown gravelly sand, granite. In rock fissures in outcrops, among boulders	Yes	55 km	Unlikely

Family	Scientific Name	Status	Total records	Growth form	Flowering period	Habitat information	Habitat in survey area	Distance	Likelihood rating
Fabaceae	<i>Acacia levata</i>	P3	17	Spreading, multi-stemmed shrub, 1-3 m high, to 5 m wide.	May and October	Sand or sandy loam over granite. Hillslopes. Rocky hillslopes, stony clay loams, associated with spinifex	Yes	36-59 km	Possible
Fabaceae	<i>Acacia</i> sp. Marble Bar (J.G. & M.H. Simmons 3499)	P1	1	Shrub, inflorescence in spikes, to 30mm long. Fl. Yellow.	September	No info	No info	12 km	Possible
Fabaceae	<i>Acacia</i> sp. Nullagine (B.R. Maslin 4955)	P1	2	no info on FloraBase	No info	Rocky clay, low lying area between rocky hills.	Yes	35 km	Possible
Fabaceae	<i>Indigofera ammobia</i>	P3	2	no info on FloraBase	No info	Hummock sandplains	Yes	49 km	Possible
Fabaceae	<i>Indigofera ixocarpa</i>	P2	4	Shrub, to 1 m high	March, May	Stony alluvial soils Skeletal red soils over massive ironstone.	Yes	54 km	Unlikely
Fabaceae	<i>Rhynchosia bungarensis</i>	P4	2	Compact, prostrate shrub, to 0.5 m high	May, July, November	Granite outcrop, with boulders. Skeletal brown sandy loam. Pebbly, shingly coarse sand amongst boulders. Banks of flow line in the mouth of a gully in a valley wall.	Maybe	62-71 km	Unlikely
Fabaceae	<i>Rothia indica</i> subsp. <i>australis</i>	P3	8	Prostrate annual, herb, to 0.3 m high, densely covered in spreading hairs.	April to August	Sandy soils. Sandhills and sandy flats. Sandy drainage flat. Red/brown sandy loam. Some rocks	Yes	33-59 km	Possible
Fabaceae	<i>Swainsona thompsoniana</i>	P3	1	Erect, herb	April, June, August	No info	No info	38 km	Possible
Goodeniaceae	<i>Goodenia nuda</i>	P4	2	Erect to ascending herb, to 5 m high.	April to August	Open depression. Brown sandy loam with granite stones.	Maybe	36 km	Possible
Lamiaceae	<i>Quoya zonalis</i> <sup>1</sup> K.A.Sheph. & Hislop	EN	84	no info on FloraBase	June-September	Granite and rocky outcrops	Yes	60-85 km	Unlikely
Malvaceae	<i>Corchorus</i> sp. Yarrie (J. Bull & D. Roberts CAL 01.05)	P1	6	no info on FloraBase	May, June	Mesas (stony hills), an drainage lines associated with mesas	Yes	34-85 km	Possible
Myrtaceae	<i>Eucalyptus rowleyi</i>	P3	7	no info on FloraBase	June to July	Creeklines, grey sandy loams	Yes	69-77 km	Unlikely
Pedaliaceae	<i>Josephinia</i> sp. Woodstock (A.A. Mitchell PRP 989)	P1	1	Small herb or shrub to 0.4 m high. Pink to mauve foxglove-like flowers, serrated leaves, and woolly stems and abaxial surface of foliage.	No info	Sheet flow or drainage lines, on red sandy (granitic) plains. Loamy minor drainage line.	No info	7-65 km	Likely
Phyllanthaceae	<i>Phyllanthus hebecarpus</i>	P3	3	no info on FloraBase	No info	Granite outcrop and red sandy plain	Yes	59 km	Unlikely

Family	Scientific Name	Status	Total records	Growth form	Flowering period	Habitat information	Habitat in survey area	Distance	Likelihood rating
Poaceae	<i>Eragrostis crateriformis</i>	P3	23	Annual, grass-like or herb, 0.17-0.42 m high.	May or July	Creek banks, depressions, Claypans, red-brown clay loams	Yes	7-88 km	Highly likely
Poaceae	<i>Themeda</i> sp. Hamersley Station (M.E. Trudgen 11431)	P3	1	Tussocky perennial, grass-like or herb, 0.9-1.8 m high	August	Red clay. Clay pan, grass plain. Moist, red sand-loam along minor creek. Over dolerite (bright red rocks). Burnt in 2003.	Yes	45 km	Possible
Poaceae	<i>Triodia basitricha</i>	P3	4	no info on FloraBase	May	Ironstone hills	Maybe	47-75 km	Possible
Poaceae	<i>Triodia chichesterensis</i>	P3	1	no info on FloraBase	May	No info	No info	60 km	Unlikely
Rubiaceae	<i>Dolichocarpa</i> sp. Hamersley Station (A.A. Mitchell PRP 1479) <sup>2</sup>	P3	1	no info on FloraBase	No info	No info	No info	60 km	Unlikely
Scrophulariaceae	<i>Eremophila maculata</i> subsp. <i>filifolia</i>	P1	3	no info on FloraBase	July	Plain. Red sand. Collection site: rangeland.	Maybe	50 km	Possible
Solanaceae	<i>Nicotiana umbratica</i>	P3	15	Erect, short-lived annual or perennial, herb, 0.3-0.7 m high. Fl. White.	April to June	Shallow soils, outcrops. Rocky outcrops. Granite outcrops	Yes	25-55 km	Possible
Solanaceae	<i>Solanum</i> sp. Mosquito Creek (A.A. Mitchell et al. AAM 10795)	P1	9	no info on FloraBase	March, June, October	Drainage lines, semi-saline clay pans, stony undulating plains	Yes	37 km	Possible
Stylidiaceae	<i>Stylidium weeliwollii</i>	P3	4	Annual, herb, 0.1-0.25 m high, throat appendages 4, rod-shaped. Fl. pink & red.	August to September	Gritty sand soil, sandy clay. Edge of watercourses. Granite seepage area. Brown sandy loam.	Yes	65-75 km	Unlikely

**Footnotes:**

1 = Name change from: *Pityrodia* sp. Marble Bar

2 = Name change from: *Oldenlandia* sp. Hamersley Station

3 = Name change from: *Schoenus* sp. Marble Bar

**Appendix VI      Fauna desktop results: All fauna**

Appendix VI – Fauna desktop results: All vertebrate fauna

Family	Scientific name	Common name	Status		Databases <sup>1</sup>				Survey reports reviewed <sup>2</sup>										
			BC Act	EPBC	NM	PM	TPFa	BD	BA01	BA09a	BA09b	BL19	BT07	EC10	EC12	HO91	MO7	MWH16	OE11
<b>Birds</b>																			
Casuariidae	<i>Dromaius novaehollandiae</i>	Emu									1					1			
Anatidae	<i>Dendrocygna eytoni</i>	Plumed Whistling-Duck						1		1									
Anatidae	<i>Malacorhynchus membranaceus</i>	Pink-eared Duck			34			13											
Anatidae	<i>Cygnus atratus</i>	Black Swan			3			5			1			1					
Anatidae	<i>Aythya australis</i>	Hardhead			3			13											
Anatidae	<i>Anas superciliosa</i>	Pacific Black Duck			4			52	1	1					1	1			
Anatidae	<i>Anas gracilis</i>	Grey Teal			1292			42		1					1	1			
Anatidae	<i>Chenonetta jubata</i>	Australian Wood Duck			2			1											
Phasianidae	<i>Coturnix pectoralis</i>	Stubble Quail		MA												1			
Phasianidae	<i>Synoicus ypsilophorus</i>	Brown Quail			3			6	1	1					1				
Podicipedidae	<i>Tachybaptus novaehollandiae</i>	Australasian Grebe			3			20								1			
Podicipedidae	<i>Poliiocephalus poliocephalus</i>	Hoary-headed Grebe			229			10											
Columbidae	<i>Geophaps plumifera</i>	Spinifex Pigeon			3			67	1	1	1	1	1	1	1	1		1	1
Columbidae	<i>Phaps chalcoptera</i>	Common Bronzewing			224			9	1	1	1		1	1	1	1		1	1
Columbidae	<i>Ocyphaps lophotes</i>	Crested Pigeon			112			39	1	1	1		1		1	1		1	
Columbidae	<i>Geopelia cuneata</i>	Diamond Dove			3			75	1	1	1	1	1		1	1		1	
Columbidae	<i>Geopelia placida</i>	Peaceful Dove			3			47	1	1	1	1			1	1		1	1
Cuculidae	<i>Centropus phasianinus</i>	Pheasant Coucal			4			6	1	1			1		1	1			
Cuculidae	<i>Chalcites basalis</i>	Horsfield's Bronze-Cuckoo		MA	3	3		29	1	1			1		1			1	
Cuculidae	<i>Chalcites osculans</i>	Black-eared Cuckoo		MA							1					1			
Cuculidae	<i>Heteroscenes pallidus</i>	Pallid Cuckoo			3			42	1	1	1		1		1	1		1	
Otididae	<i>Ardeotis australis</i>	Australian Bustard			3			4	1	1	1		1		1	1		1	
Podargidae	<i>Podargus strigoides</i>	Tawny Frogmouth						2	1	1			1		1	1			1
Eurostopodidae	<i>Eurostopodus argus</i>	Spotted Nightjar		MA	3			5	1	1	1			1	1	1		1	1
Aegothelidae	<i>Aegotheles cristatus</i>	Australian Owlet-nightjar			4			4	1	1	1				1	1		1	
Apodidae	<i>Apus pacificus</i>	Fork-tailed Swift	MI	MI, MA		6									1	1			
Rallidae	<i>Hypotaenidia philippensis</i>	Buff-banded Rail			3			2								1			
Rallidae	<i>Zapornia tabuensis</i>	Spotless Crake		MA	141			2											
Rallidae	<i>Porphyrio porphyrio</i>	Purple Swamphen		MA	22			1											
Rallidae	<i>Tribonyx ventralis</i>	Black-tailed Native-hen			3			1											
Rallidae	<i>Fulica atra</i>	Eurasian Coot			3			19								1			

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Burhinidae	<i>Burhinus grallarius</i>	Bush Stone-curlew			3			11	1	1	1		1		1	1		1		
Recurvirostridae	<i>Himantopus leucocephalus</i>	Pied Stilt		MA	3			21								1				
Charadriidae	<i>Charadrius ruficapillus</i>	Red-capped Plover		MA	3			9												
Charadriidae	<i>Charadrius veredus</i>	Oriental Plover	MI	MI, MA	3	6	2	2								1				
Charadriidae	<i>Euseiornis melanops</i>	Black-fronted Dotterel			3			92	1	1	1				1	1		1		
Charadriidae	<i>Vanellus miles</i>	Masked Lapwing			3			10												
Charadriidae	<i>Erythronyx cinctus</i>	Red-kneed Dotterel			3			12												
Rostratulidae	<i>Rostratula australis</i>	Australian Painted-snipe	EN	EN			6													
Scolopacidae	<i>Numenius madagascariensis</i>	Eastern Curlew	CR	CR, MI, MA			3													
Scolopacidae	<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	MI	MI, MA	3	6	4	4												
Scolopacidae	<i>Calidris ferruginea</i>	Curlew Sandpiper	CR	CR, MI, MA			8													
Scolopacidae	<i>Calidris melanotos</i>	Pectoral Sandpiper	MI	MI, MA			6													
Scolopacidae	<i>Actitis hypoleucos</i>	Common Sandpiper	MI	MI, MA	3	6	4	9								1				
Scolopacidae	<i>Tringa nebularia</i>	Common Greenshank	MI	MI, MA	3		1	2								1				
Scolopacidae	<i>Tringa glareola</i>	Wood Sandpiper	MI	MI, MA	3		6	11								1				
Turnicidae	<i>Turnix velox</i>	Little Button-quail			3			4	1	1		1			1	1		1		
Glareolidae	<i>Stiltia isabella</i>	Australian Pratincole		MA	1			1								1				
Glareolidae	<i>Glareola maldivarum</i>	Oriental Pratincole	MI	MI, MA			6													
Laridae	<i>Chlidonias hybrida</i>	Whiskered Tern						1							1	1				
Ciconiidae	<i>Ephippiorhynchus asiaticus</i>	Black-necked Stork			3			17	1	1										
Pelicanidae	<i>Pelecanus conspicillatus</i>	Australian Pelican		MA	167			48	1							1				
Ardeidae	<i>Nycticorax caledonicus</i>	Nankeen Night-Heron		MA	98			16	1				1			1				
Ardeidae	<i>Bubulcus ibis</i>	Cattle Egret		MA			3													
Ardeidae	<i>Ardea pacifica</i>	White-necked Heron			3			57	1	1						1				
Ardeidae	<i>Ardea alba</i>	Great Egret		MA			3	38	1							1				
Ardeidae	<i>Ardea alba modesta</i>	Eastern Great Egret		MA	3															
Ardeidae	<i>Ardea intermedia</i>	Intermediate Egret		MA	3			7												
Ardeidae	<i>Egretta novaehollandiae</i>	White-faced Heron			5			67	1	1	1		1		1	1				
Ardeidae	<i>Egretta garzetta</i>	Little Egret		MA	3			12												
Threskiornithidae	<i>Threskiornis moluccus</i>	Australian White Ibis						4												
Threskiornithidae	<i>Threskiornis spinicollis</i>	Straw-necked Ibis		MA	3			32	1							1				
Threskiornithidae	<i>Plegadis falcinellus</i>	Glossy Ibis	MI	MI, MA	2		1	2												
Phalacrocoracidae	<i>Microcarbo melanoleucos</i>	Little Pied Cormorant			5			51	1							1				
Phalacrocoracidae	<i>Phalacrocorax sulcirostris</i>	Little Black Cormorant						55	1							1				

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Anhingidae	<i>Anhinga novaehollandiae</i>	Australasian Darter			3			57	1						1	1				
Pandionidae	<i>Pandion haliaetus</i>	Osprey	MI	MI	2	6	2	2												1
Accipitridae	<i>Elanus axillaris</i>	Black-shouldered Kite			2				1							1		1		
Accipitridae	<i>Hamirostra melanosternon</i>	Black-breasted Buzzard						1		1										
Accipitridae	<i>Lophoictinia isura</i>	Square-tailed Kite													1					
Accipitridae	<i>Aquila audax</i>	Wedge-tailed Eagle			3			10	1	1	1	1	1	1	1	1		1	1	
Accipitridae	<i>Hieraaetus morphnoides</i>	Little Eagle			3			16	1		1					1				
Accipitridae	<i>Circus approximans</i>	Swamp Harrier		MA	3			2												
Accipitridae	<i>Circus assimilis</i>	Spotted Harrier			3			15	1	1	1			1		1		1		
Accipitridae	<i>Accipiter fasciatus</i>	Brown Goshawk		MA	29			12	1	1			1	1		1		1	1	
Accipitridae	<i>Accipiter cirrocephalus</i>	Collared Sparrowhawk			6			1	1						1	1		1		
Accipitridae	<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle		MA	3	3		2												
Accipitridae	<i>Haliastur sphenurus</i>	Whistling Kite		MA	3			65	1	1	1				1				1	
Accipitridae	<i>Milvus migrans</i>	Black Kite			25			13		1					1	1		1		
Tytonidae	<i>Tyto alba</i>	Barn Owl			2											1		1		
Strigidae	<i>Ninox connivens</i>	Barking Owl			46					1						1				
Strigidae	<i>Ninox boobook</i>	Southern Boobook			5			19	1	1	1			1	1	1		1		
Meropidae	<i>Merops ornatus</i>	Rainbow Bee-eater		MA	3	3		93	1	1	1		1	1	1	1		1	1	
Alcedinidae	<i>Todiramphus sanctus</i>	Sacred Kingfisher		MA	3			42	1	1	1				1	1			1	
Alcedinidae	<i>Todiramphus pyrrhopygius</i>	Red-backed Kingfisher			3			27	1	1	1		1		1	1		1	1	
Alcedinidae	<i>Dacelo leachii</i>	Blue-winged Kookaburra			5			66	1	1	1		1	1	1	1		1	1	
Falconidae	<i>Falco cenchroides</i>	Nankeen Kestrel		MA	3			38	1	1	1	1		1	1	1		1	1	
Falconidae	<i>Falco longipennis</i>	Australian Hobby			2			1								1				
Falconidae	<i>Falco berigora</i>	Brown Falcon			3			23	1	1	1		1	1	1	1		1	1	
Falconidae	<i>Falco hypoleucos</i>	Grey Falcon	VU		2	3	1								1					
Falconidae	<i>Falco subniger</i>	Black Falcon			3			2												
Falconidae	<i>Falco peregrinus</i>	Peregrine Falcon	OS		3		1	3								1		1		
Cacatuidae	<i>Nymphicus hollandicus</i>	Cockatiel			75			22	1	1	1		1		1	1		1	1	
Cacatuidae	<i>Eolophus roseicapilla</i>	Galah			8			86	1	1	1	1	1	1	1	1		1	1	
Cacatuidae	<i>Cacatua sanguinea</i>	Little Corella			3			90	1	1	1			1	1	1		1	1	
Psittaculidae	<i>Barnardius zonarius</i>	Australian Ringneck			10			22	1	1	1			1	1	1		1	1	
Psittaculidae	<i>Pezoporus occidentalis</i>	Night Parrot	CR	EN		3														
Psittaculidae	<i>Neopsephotus bourkii</i>	Bourke's Parrot			5			1												
Psittaculidae	<i>Melopsittacus undulatus</i>	Budgerigar			8			35	1	1		1	1		1	1		1		
Ptilonorhynchidae	<i>Ptilonorhynchus guttatus</i>	Western Bowerbird			86			10	1	1			1		1	1		1	1	
Climacteridae	<i>Climacteris melanurus</i>	Black-tailed Treecreeper						2										1		



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Maluridae	<i>Malurus lamberti</i>	Variegated Fairy-wren			5			10	1	1	1		1	1	1	1		1	1	
Maluridae	<i>Malurus leucopterus</i>	White-winged Fairy-wren			85			10		1				1	1	1				
Maluridae	<i>Stipiturus ruficeps</i>	Rufous-crowned Emu-wren			1			1	1							1				
Maluridae	<i>Amytornis striatus whitei</i>	Pilbara Grasswren			280			4	1	1	1	1		1	1	1		1	1	
Meliphagidae	<i>Sugomel niger</i>	Black Honeyeater						2			1					1				
Meliphagidae	<i>Lichmera indistincta</i>	Brown Honeyeater			16			77	1	1	1		1	1	1	1		1	1	
Meliphagidae	<i>Melithreptus gularis</i>	Black-chinned Honeyeater			11			6	1	1			1		1			1		
Meliphagidae	<i>Certhionyx variegatus</i>	Pied Honeyeater							1		1					1				1
Meliphagidae	<i>Conopophila whitei</i>	Grey Honeyeater																		1
Meliphagidae	<i>Epthianura tricolor</i>	Crimson Chat			2			8	1						1	1		1		
Meliphagidae	<i>Acanthagenys rufogularis</i>	Spiny-cheeked Honeyeater			3			3			1				1	1				
Meliphagidae	<i>Gavicalis virescens</i>	Singing Honeyeater			3			38	1	1	1	1	1		1	1		1	1	
Meliphagidae	<i>Ptilotula keartlandi</i>	Grey-headed Honeyeater			106			38	1	1	1		1	1	1	1		1	1	
Meliphagidae	<i>Ptilotula plumula</i>	Grey-fronted Honeyeater						2												1
Meliphagidae	<i>Ptilotula penicillata</i>	White-plumed Honeyeater						130	1	1	1		1	1	1	1		1	1	
Meliphagidae	<i>Purnella albifrons</i>	White-fronted Honeyeater			1			1								1				
Meliphagidae	<i>Manorina flavigula</i>	Yellow-throated Miner			44			104	1	1	1	1	1	1	1	1		1	1	
Pardalotidae	<i>Pardalotus rubricatus</i>	Red-browed Pardalote			106			56	1	1	1		1		1	1		1		
Pardalotidae	<i>Pardalotus striatus</i>	Striated Pardalote			3			5	1	1				1						
Acanthizidae	<i>Gerygone fusca</i>	Western Gerygone							1							1				
Acanthizidae	<i>Smicrornis brevirostris</i>	Weebill			3			9	1		1	1		1	1	1		1	1	
Acanthizidae	<i>Acanthiza apicalis</i>	Inland Thornbill			1															
Acanthizidae	<i>Acanthiza robustirostris</i>	Slaty-backed Thornbill						1												
Pomatostomidae	<i>Pomatostomus temporalis</i>	Grey-crowned Babbler			5			44		1	1				1			1		
Campephagidae	<i>Coracina maxima</i>	Ground Cuckoo-shrike												1		1				
Campephagidae	<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike		MA	4			105	1	1	1		1	1	1	1		1	1	
Campephagidae	<i>Lalage tricolor</i>	White-winged Triller			3			24	1	1			1		1	1		1		
Pachycephalidae	<i>Pachycephala rufiventris</i>	Rufous Whistler			15			16	1		1			1	1			1		
Pachycephalidae	<i>Colluricincla harmonica</i>	Grey Shrike-thrush			4			36	1	1	1		1	1	1	1		1	1	
Oreoicidae	<i>Oreoica gutturalis</i>	Crested Bellbird			124			5	1	1	1				1	1		1	1	
Artamidae	<i>Gymnorhina tibicen</i>	Australian Magpie			3			35	1	1	1		1	1	1	1		1		
Artamidae	<i>Cracticus nigrogularis</i>	Pied Butcherbird			3			73	1	1	1		1	1	1	1		1	1	
Artamidae	<i>Cracticus torquatus</i>	Grey Butcherbird			3			1							1					
Artamidae	<i>Artamus personatus</i>	Masked Woodswallow			2			2		1			1		1	1				
Artamidae	<i>Artamus cinereus</i>	Black-faced Woodswallow			3			37	1	1	1	1	1	1	1	1		1	1	
Artamidae	<i>Artamus minor</i>	Little Woodswallow			3			34	1	1			1	1	1	1		1		

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Artamidae	<i>Artamus leucorhynchus</i>	White-breasted Woodswallow			1			1												
Rhipiduridae	<i>Rhipidura leucophrys</i>	Willie Wagtail			3			113	1	1	1	1	1	1	1		1	1		
Rhipiduridae	<i>Rhipidura fuliginosa albiscapa</i>	Tasmanian Grey Fantail															1			
Corvidae	<i>Corvus orru</i>	Torresian Crow			6			54	1	1	1	1	1	1	1		1	1		
Corvidae	<i>Corvus bennetti</i>	Little Crow			3			13			1					1		1		
Monarchidae	<i>Grallina cyanoleuca</i>	Maggie-lark		MA	3			154	1	1	1		1		1	1		1	1	
Petroicidae	<i>Petroica goodenovii</i>	Red-capped Robin														1				
Petroicidae	<i>Melanodryas cucullata</i>	Hooded Robin			10			1											1	
Dicaeidae	<i>Dicaeum hirundinaceum</i>	Mistletoebird			3			3	1	1						1			1	
Estrildidae	<i>Emblema pictum</i>	Painted Finch			3			73	1	1	1	1	1	1	1	1		1	1	
Estrildidae	<i>Neochmia ruficauda</i>	Star Finch			12			4			1				1	1				
Estrildidae	<i>Taeniopygia guttata</i>	Zebra Finch			3			112	1	1	1	1	1	1	1	1		1	1	
Motacillidae	<i>Anthus novaeseelandiae</i>	Australasian Pipit		MA	18			21		1	1				1	1			1	
Motacillidae	<i>Motacilla flava</i>	Yellow Wagtail	MI	MI, MA			6	1												
Motacillidae	<i>Motacilla cinerea</i>	Grey Wagtail	MI	MI, MA			6													
Alaudidae	<i>Mirafra javanica</i>	Horsfield's Bushlark			4			5			1	1			1					
Locustellidae	<i>Cincloramphus cruralis</i>	Brown Songlark						3	1						1	1				
Locustellidae	<i>Cincloramphus mathewsi</i>	Rufous Songlark						31	1						1				1	
Locustellidae	<i>Poodytes gramineus</i>	Little Grassbird			5			2				1								
Locustellidae	<i>Poodytes carteri</i>	Spinifexbird			3			15	1	1	1			1	1	1		1	1	
Acrocephalidae	<i>Acrocephalus australis</i>	Australian Reed-Warbler			7			15			1					1				
Hirundinidae	<i>Petrochelidon ariel</i>	Fairy Martin			6			51		1				1	1	1		1		
Hirundinidae	<i>Petrochelidon nigricans</i>	Tree Martin			196			30	1		1			1	1	1		1		
Hirundinidae	<i>Hirundo neoxena</i>	Welcome Swallow		MA	3			3												
Hirundinidae	<i>Hirundo rustica</i>	Barn Swallow	MI	MI, MA			6													
<b>Mammals</b>																				
Tachyglossidae	<i>Tachyglossus aculeatus</i>	Short-beaked Echidna			3				2	1		1		2		1		1	1	
Dasyuridae	<i>Dasyercus blythi</i>	Brush-tailed Mulgara, Ampurta	P4		2		3						1			1				
Dasyuridae	<i>Dasykaluta rosamondae</i>	Kaluta			3						1				1	1		1		
Dasyuridae	<i>Dasyurus hallucatus</i>	Northern Quoll	EN	EN	3	3	20		2	1	1	2	1	2	1	1		1	1	
Dasyuridae	<i>Ningau timealeyi</i>	Pilbara Ningau			33				2				1		1	1		1		
Dasyuridae	<i>Planigale ingrami</i>	Long-tailed Planigale			29													1	1	
Dasyuridae	<i>Planigale maculata</i>	Common Planigale							2		1			2	1	1				

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Dasyuridae	<i>Pseudantechinus roryi</i>	Rory's Pseudantechinus			2				2	1				2	1					
Dasyuridae	<i>Pseudantechinus woolleyae</i>	Woolley's Pseudantechinus			113							1			1	1		1	1	
Dasyuridae	<i>Sminthopsis longicaudata</i>	Long-tailed Dunnart	P4		3		5								1					
Dasyuridae	<i>Sminthopsis macroura</i>	Froggatt's Stripe-faced Dunnart			3						1		1			1				
Dasyuridae	<i>Sminthopsis youngsoni</i>	Lesser Hairy-footed Dunnart			2										1	1				
Thylacomyidae	<i>Macrotis lagotis</i>	Bilby, Dalgyte	VU	VU	247	3	70									1				1
Phalangeridae	<i>Trichosurus vulpecula arnhemensis</i>	Northern Brushtail Possum	VU																	1
Phalangeridae																				1
Macropodidae	<i>Lagorchestes conspicillatus</i>	Barrow Is. Spectacled Hare-wallaby			2		2													
Macropodidae	<i>Lagorchestes conspicillatus leichardti</i>	Spectacled Hare-wallaby	P4		3				2				1			1		1		
Macropodidae	<i>Osphranter robustus</i>	Euro, Biggada			40				2	1	1	1	1	2	1	1		1	1	
Macropodidae	<i>Osphranter rufus</i>	Red Kangaroo, Marlu			150						1					1		1		
Macropodidae	<i>Petrogale rothschildi</i>	Rothschild's Rock-wallaby			85				2	1				2	1	1		1	1	
Muridae	<i>*Mus musculus</i>	House Mouse			15	3			2		1		1	2		1		1		
Muridae	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	P4		65		9		2	1	1	1	1	2	1	1		1		
Muridae	<i>Pseudomys delicatulus</i>	Delicate Mouse			56				2						1	1		1		
Muridae	<i>Pseudomys desertor</i>	Desert Mouse			101				2		1		1	2	1			1		
Muridae	<i>Pseudomys hermannsburgensis</i>	Sandy Inland Mouse			11								1		1	1		1	1	
Muridae	<i>Zyomys argurus</i>	Common Rock-rat			3				2	1	1	1	1	2	1	1		1	1	
Leporidae	<i>*Oryctolagus cuniculus</i>	Rabbit				2														
Pteropodidae	<i>Pteropus alecto</i>	Black Flying-fox														1				
Rhinonycteridae	<i>Rhinonycteris aurantia (Pilbara)</i>	Pilbara Leaf-nosed Bat	VU	VU	6	3	20		2	1		2	1	2	1		1	1	1	
Megadermatidae	<i>Macroderma gigas</i>	Ghost Bat	VU	VU	45	3	68		2	1		2	1		1	1	1	1	1	
Emballonuridae	<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tailed Bat			3					1				2				1	1	
Emballonuridae	<i>Taphozous georgianus</i>	Common Sheath-tailed Bat			3				2	1		1		2	1	1		1	1	
Emballonuridae	<i>Taphozous hilli</i>	Hill's Sheath-tailed Bat			1															
Molossidae	<i>Austronomus australis</i>	White-striped Free-tailed Bat							2	1										
Molossidae	<i>Chaerephon jobensis</i>	Greater Northern Free-tailed Bat			3					1	1			2				1		

Family	Scientific name	Common name	Status		Databases <sup>1</sup>				Survey reports reviewed <sup>2</sup>											
			BC Act	EPBC	NM	PM	TPFa	BD	BA01	BA09a	BA09b	BL19	BT07	EC10	EC12	HO91	MO7	MWH16	OE11	BL20
Molossidae	<i>Ozimops lumsdenae</i>	Northern Free-tailed Bat												2				1		
Vespertilionidae	<i>Chalinolobus gouldii</i>	Gould's Wattled Bat			3						1			2	1			1	1	
Vespertilionidae	<i>Nyctophilus geoffroyi</i>	Lesser Long-eared Bat			116										1			1		
Vespertilionidae	<i>Scotorepens greyii</i>	Little Broad-nosed Bat			3					1			1	2	1	1		1	1	
Vespertilionidae	<i>Vespadelus finlaysoni</i>	Finlayson's Cave Bat			3				2	1	1	1		2	1	1		1	1	
Canidae	<i>*Vulpes vulpes</i>	Red Fox				3										1				
Canidae	<i>Canis familiaris sp.</i>	Dog / Dingo				3			2	1		1				1		1	1	
Felidae	<i>*Felis catus</i>	Cat			3	3			2	1	1				1	1		1	1	
Equidae	<i>*Equus asinus</i>	Donkey				3			2							1				
Equidae	<i>*Equus caballus</i>	Horse				3														
Suidae	<i>*Sus scrofa</i>	Pig				3														
Camelidae	<i>*Camelus dromedarius</i>	Dromedary, Camel			3	3			2	1					1	1		1		
Bovidae	<i>*Bos taurus</i>	European Cattle			3					1			1	2	1	1		1	1	
<b>Reptiles</b>																				
Cheluidae	<i>Chelodina steindachneri</i>	Flat-shelled Turtle			3										1	1		1		
Carphodactylidae	<i>Nephrurus levis</i>	Smooth Knob-tailed Gecko			4										1	1				
Carphodactylidae	<i>Nephrurus wheeleri</i>	Southern Banded Knob-tailed Gecko			20															
Diplodactylidae	<i>Crenadactylus ocellatus</i>	South-western Clawless Gecko							1						1					
Diplodactylidae	<i>Diplodactylus conspicillatus</i>	Variable Fat-tailed Gecko			3									1	1	1		1		
Diplodactylidae	<i>Diplodactylus galaxias</i>	Northern Pilbara Beak-faced Gecko													1					
Diplodactylidae	<i>Diplodactylus savagei</i>	Southern Pilbara Beak-faced Gecko			3				1	1	1		1	1	1			1	1	
Diplodactylidae	<i>Lucasium squarrosus</i>	Mottled Ground Gecko											1							
Diplodactylidae	<i>Lucasium stenodactylum</i>	Sand-plain Gecko			4					1	1		1	1	1	1		1	1	
Diplodactylidae	<i>Lucasium wombeyi</i>	Pilbara Ground Gecko			9					1	1		1	1	1			1	1	
Diplodactylidae	<i>Oedura fimbria</i>	Western Marbled Velvet Gecko			245					1					1	1		1	1	
Diplodactylidae	<i>Rhynchoedura ornata</i>	Western Beaked Gecko			3										1	1		1		
Diplodactylidae	<i>Strophurus elderi</i>	Jewelled Gecko			3				1		1		1	1	1	1		1		
Diplodactylidae	<i>Strophurus jeanae</i>	Southern Phasmid Gecko														1				
Diplodactylidae	<i>Strophurus wellingtonae</i>	Western-shield Spiny-tailed Gecko									1									
Gekkonidae	<i>Gehyra pilbara</i>	Pilbara Dtella			3				1		1					1			1	
Gekkonidae	<i>Gehyra punctata</i>	Spotted Rock Dtella			3				1	1				1	1	1		1	1	
Gekkonidae	<i>Gehyra variegata</i>	Variegated gehyra			3				1	1	1		1	1	1	1		1	1	

Family	Scientific name	Common name	Status		Databases <sup>1</sup>				Survey reports reviewed <sup>2</sup>											
			BC Act	EPBC	NM	PM	TPFa	BD	BA01	BA09a	BA09b	BL19	BT07	EC10	EC12	HO91	MO7	MWH16	OE11	BL20
Gekkonidae	<i>Heteronotia binoei</i>	Bynoe's Gecko			3				1	1	1			1	1	1		1	1	
Gekkonidae	<i>Heteronotia spelea</i>	Pilbara Cave Gecko			3									1	1			1	1	
Pygopodidae	<i>Delma butleri</i>	Spinifex Delma			2						1			1				1		
Pygopodidae	<i>Delma elegans</i>	Pilbara Delma			3				1					1	1			1	1	
Pygopodidae	<i>Delma fraseri</i>	Fraser's Delma													1					
Pygopodidae	<i>Delma nasuta</i>	Sharp-snouted Delma			3				1	1	1				1	1		1	1	
Pygopodidae	<i>Delma pax</i>	Peace Delma			3				1		1		1	1	1	1		1	1	
Pygopodidae	<i>Delma tinctoria</i>	Black-necked Delma			3										1	1		1	1	
Pygopodidae	<i>Lialis burtonis</i>	Burton's Snake-lizard			3				1		1				1	1		1		
Pygopodidae	<i>Pygopus nigriceps</i>	Western Hooded Scaly-foot			21										1			1		
Agamidae	<i>Ctenophorus caudicinctus</i>	Western Ring-tailed Dragon			6				1	1	1	1	1	1	1	1		1	1	
Agamidae	<i>Ctenophorus isolepis</i>	Yellowy Military Dragon			5					1					1	1		1		
Agamidae	<i>Ctenophorus nuchalis</i>	Central Netted Dragon			3										1	1		1		
Agamidae	<i>Ctenophorus reticulatus</i>	Western Netted Dragon			1						1			1						
Agamidae	<i>Ctenophorus scutulatus</i>	Lozenge-marked Dragon												1						
Agamidae	<i>Diporiphora valens</i>	Southern Pilbara Tree Dragon													1	1				
Agamidae	<i>Gowidon longirostris</i>	Long-nosed Dragon			3				1	1	1			1	1	1		1	1	
Agamidae	<i>Lophognathus gilberti</i>	Top End Ta-Ta Dragon									1									
Agamidae	<i>Pogona minor</i>	Dwarf Bearded Dragon			6						1				1	1				
Scincidae	<i>Carlia munda</i>	Striped Rainbow Skink			3				1	1	1		1		1	1		1	1	
Scincidae	<i>Carlia triacantha</i>	Desert Rainbow Skink			2										1			1		
Scincidae	<i>Cryptoblepharus buchananii</i>	Buchanban's Snake-eyed Skink							1						1	1				
Scincidae	<i>Cryptoblepharus ustulatus</i>	Russet Snake-eyed Skink								1					1			1	1	
Scincidae	<i>Ctenotus duricola</i>	Eastern Pilbara Lined Ctenotus			3								1	1	1	1		1	1	
Scincidae	<i>Ctenotus grandis</i>	Grand ctenotus			5									1	1	1		1	1	
Scincidae	<i>Ctenotus hanloni</i>	Nimble Ctenotus			1															
Scincidae	<i>Ctenotus helena</i>	Dusky Ctenotus			3										1	1				
Scincidae	<i>Ctenotus inornatus</i>	Bar-shouldered Ctenotus			3													1		
Scincidae	<i>Ctenotus leonhardii</i>	Common Desert Ctenotus			2													1		
Scincidae	<i>Ctenotus nigrilineatus</i>	Pin-striped Firesnout Ctenotus	P1															1		
Scincidae	<i>Ctenotus pantherinus</i>	Leopard Ctenotus			7					1	1			1	1	1		1	1	
Scincidae	<i>Ctenotus piankai</i>	Coarse Sands Ctenotus			1						1				1					

Family	Scientific name	Common name	Status		Databases <sup>1</sup>				Survey reports reviewed <sup>2</sup>											
			BC Act	EPBC	NM	PM	TPFa	BD	BA01	BA09a	BA09b	BL19	BT07	EC10	EC12	HO91	MO7	MWH16	OE11	BL20
Scincidae	<i>Ctenotus rubicundus</i>	Ruddy Ctenotus			3				1	1				1	1			1	1	
Scincidae	<i>Ctenotus rutilans</i>	Rusty-shouldered Ctenotus			2													1		
Scincidae	<i>Ctenotus saxatilis</i>	Rock Ctenotus			3				1	1	1		1	1	1	1			1	
Scincidae	<i>Ctenotus schomburgkii</i>	Barred Wedge-snouted Ctenotus												1	1					
Scincidae	<i>Ctenotus serventyi</i>	North-western Sandy-loam Ctenotus														1				
Scincidae	<i>Ctenotus uber</i>	Western Spotted Ctenotus			1															
Scincidae	<i>Ctenotus uber johnstonei</i>	Western Spotted Ctenotus	P2																	1
Scincidae	<i>Cyclodomorphus melanops</i>	Spinifex Slender Blue-tongue			6				1		1		1		1	1		1	1	
Scincidae	<i>Egernia epcisolus</i>	Eastern Pilbara Spiny-tailed Skink			3									1	1	1		1		
Scincidae	<i>Egernia formosa</i>	Goldfields Crevice-skink			2				1	1			1		1	1		1	1	
Scincidae	<i>Eremiascincus richardsonii</i>	Broad-banded Sand Swimmer									1						1			
Scincidae	<i>Lerista bipes</i>	Western Two-toed Slider			3					1				1	1	1		1	1	
Scincidae	<i>Lerista clara</i>	Sharp-blazed Three-toed Slider																	1	
Scincidae	<i>Lerista jacksoni</i>	Jackson's Three-toed Slider			3										1			1	1	
Scincidae	<i>Lerista muelleri</i>	Mueller's Three-toed Slider			3				1	1	1		1	1	1	1		1		
Scincidae	<i>Lerista timida</i>	Dwarf Three-toed Slider			1															
Scincidae	<i>Lerista verhmens</i>	Powerful Three-toed Slider			3										1					
Scincidae	<i>Liopholis striata</i>	Night Skink															1			
Scincidae	<i>Menetia greyii</i>	Common Dwarf Skink			41										1	1		1	1	
Scincidae	<i>Menetia surda</i>	Western Dwarf Skink			9				1											
Scincidae	<i>Morethia ruficauda</i>	Fire-tailed Skink			11				1	1	1		1	1	1	1		1	1	
Scincidae	<i>Notoscincus ornatus</i>	Ornate Soil-crevice Skink			95				1				1		1	1		1	1	
Scincidae	<i>Proablepharus reginae</i>	Spinifex Snake-eyed Skink			23				1						1	1				1
Scincidae	<i>Tiliqua multifasciata</i>	Central Blue-tongue			3						1				1	1		1		
Varanidae	<i>Varanus acanthurus</i>	Spiny-tailed Goanna			3				1	1	1			1	1	1		1	1	
Varanidae	<i>Varanus breviceuda</i>	Short-tailed Pygmy Goanna			2										1	1		1		
Varanidae	<i>Varanus caudolineatus</i>	Stripe-tailed Monitor			1											1				
Varanidae	<i>Varanus eremius</i>	Pygmy Desert Goanna			2								1	1	1	1		1		
Varanidae	<i>Varanus giganteus</i>	Perentie			3				1	1	1			1	1	1		1	1	
Varanidae	<i>Varanus gouldii</i>	Bungarra or Sand Goanna			1					1					1	1				
Varanidae	<i>Varanus panoptes</i>	Yellow-spotted Monitor			2					1	1				1	1		1		

Family	Scientific name	Common name	Status		Databases <sup>1</sup>				Survey reports reviewed <sup>2</sup>											
			BC Act	EPBC	NM	PM	TPFa	BD	BA01	BA09a	BA09b	BL19	BT07	EC10	EC12	HO91	MO7	MWH16	OE11	BL20
Varanidae	<i>Varanus pilbarensis</i>	Northern Pilbara Rock Goanna			2										1	1		1	1	
Varanidae	<i>Varanus tristis</i>	Racehorse Goanna			2					1	1		1		1	1		1	1	
Typhlopidae	<i>Anilius ammodytes</i>	Pilbara Blind Snake								1				1	1			1	1	
Typhlopidae	<i>Anilius diversus</i>	Northern Blind Snake														1				
Typhlopidae	<i>Anilius ganei</i>	Gane's Blind Snake	P1																	1
Typhlopidae	<i>Anilius grypus</i>	Northern Beaked Blind Snake									1			1	1	1		1	1	
Typhlopidae	<i>Anilius hamatus</i>	Northern Hook-snouted Blind Snake														1		1		
Typhlopidae	<i>Indotyphlops braminus</i>	Brahminy Blind Snake				1														
Pythonidae	<i>Antaresia perthensis</i>	Pygmy Python			3				1					1	1	1		1		
Pythonidae	<i>Antaresia stimsoni</i>	Stimson's Python								1					1	1			1	
Pythonidae	<i>Aspidites melanocephalus</i>	Black-headed Python								1						1				
Pythonidae	<i>Liasis olivaceus barroni</i>	Pilbara Olive Python	VU	VU	16	3	2			1	1				1	1		1	1	
Elapidae	<i>Acanthophis pyrrhus</i>	Desert Death Adder			2											1		1		
Elapidae	<i>Acanthophis wellsi</i>	Pilbara Death Adder			8					1	1				1			1		
Elapidae	<i>Brachyuropis approximans</i>	North-western Shovel-nosed Snake			2										1	1		1		
Elapidae	<i>Demansia psammophis</i>	Yellow-faced Whipsnake			5										1	1		1		
Elapidae	<i>Demansia rufescens</i>	Rufous Whipsnake			3				1						1			1	1	
Elapidae	<i>Furina ornata</i>	Moon Snake			3						1			1	1	1		1		
Elapidae	<i>Parasuta monachus</i>	Monk Snake			7							1			1			1		
Elapidae	<i>Pseudechis australis</i>	Mulga Snake			19							1			1	1		1		
Elapidae	<i>Pseudonaja mengdeni</i>	Western Brown Snake			335						1			1	1	1				
Elapidae	<i>Pseudonaja modesta</i>	Ringed Brown Snake			54					1					1	1		1		
Elapidae	<i>Suta fasciata</i>	Rosen's Snake			3										1			1		
Elapidae	<i>Suta punctata</i>	Spotted Snake														1				
Elapidae	<i>Vermicella snelli</i>	Pilbara Bandy Bandy			3								1					1	1	
<b>Amphibians</b>																				
Pelodyadidae	<i>Cyclorana australis</i>	Giant Frog													1				1	
Pelodyadidae	<i>Cyclorana maini</i>	Sheep Frog			3						1			1	1	1		1		
Pelodyadidae	<i>Litoria rubella</i>	Little Red Tree Frog			30				1	1			1	1	1	1		1	1	
Limnodynastidae	<i>Neobatrachus aquilonius</i>	Northern Burrowing Frog									1									
Limnodynastidae	<i>Neobatrachus sutor</i>	Shoemaker Frog			7															
Limnodynastidae	<i>Notaden nichollsi</i>	Desert Spadefoot			77										1					
Limnodynastidae	<i>Platyplectrum spenceri</i>	Centralian Burrowing Frog			180					1				1	1	1		1		



Family	Scientific name	Common name	Status		Databases <sup>1</sup>				Survey reports reviewed <sup>2</sup>												
			BC Act	EPBC	NM	PM	TPFa	BD	BA01	BA09a	BA09b	BL19	BT07	EC10	EC12	HO91	MO7	MWH16	OE11	BL20	
Myobatrachidae	<i>Uperoleia glandulosa</i>	Glandular Toadlet								1	1				1	1					
Myobatrachidae	<i>Uperoleia russelli</i>	Northwest Toadlet			2				1	1			1	1		1			1		
Myobatrachidae	<i>Uperoleia saxatilis</i>	Pilbara Toadlet			3										1			1			
<b>Fish</b>																					
Terapontidae	<i>Leiopotherapon unicolor</i>	Spangled grunter			3				1	1									1		
Melanotaeniidae	<i>Melanotaenia australis</i>	Western rainbowfish			3				1	1	1								1		
Clupeidae	<i>Nematalosa erebi</i>	Bony bream			22				1												
Plotosidae	<i>Neosilurus hyrtlii</i>	Hurtl's catfish			41				1										1		

**Footnotes:**

**1 = Databases reviewed for the desktop**

NM	DBCAs (2021) NatureMap database
PM	AWE (2021) Protected Matters Search Tool
BD	Birdlife Australia (2021) Birdata
TPFa	DBCAs Threatened and Priority Fauna Database

**2 = Survey reports reviewed for the desktop**

BA01	Bamford Consulting Ecologists. (2001). Panorama Project Area: Baseline Fauna Study as Part of the Sulphur Springs Feasibility Study. Unpublished report prepared for Astron Environmental on behalf of Outokumpu Mining Australia Pty Ltd.
BA09a	Bamford Consulting Ecologists. (2009a). Fauna Assessment of the Abydos DSO Project. Unpublished report prepared for Atlas Iron Limited.
BA09b	Bamford Consulting Ecologists. (2009b). Fauna Assessment of the BC Iron Nullagine Iron Ore project. Unpublished report prepared for Astron Environmental Services on behalf of BC Iron.
BL19	Biologic (2019) Warrawoona Gold Project: Habitat assessment and targeted vertebrate fauna survey.
BT07	Biota (2007) Panorama Project: Mine site and haul road corridor targeted fauna survey.
EC10	ecologia Environment. (2010). Mount Webber Iron Ore Project: Vertebrate Fauna Assessment. Unpublished report prepared for Giralda Resources NL.
EC12	ecologia Environment. (2012). North Star Project: Level 2 Terrestrial Vertebrate Fauna Assessment. Unpublished report prepared for Fortescue Metals Group.
HO91	How, R. A., Dell, J., & Cooper, N. K. (1991b). Vertebrate fauna of the Abydos-Woodstock Reserve, northeast Pilbara. Records of the Western Australian Museum, 37(Suppl.), 78-125.
MO7	Molhar. (2007). Field Survey for Conservation Significant Bats Near Sulphur Springs, Pilbara. Unpublished report prepared for CBH Resources Limited.
MWH16	MWH, Australia. (2016). Corunna Downs Project: Terrestrial Vertebrate Fauna Survey. Unpublished report prepared for Atlas Iron Limited.
OE11	Outback Ecology. (2011). Abydos DSO Project Terrestrial Vertebrate Fauna Baseline Survey. Unpublished report prepared for Atlas Iron Limited.
BL20	Biologic (2020) McPhee Creek Consolidated Terrestrial Fauna Report. McPhee Creek Project Report to Roy Hill and Atlas Iron Limited.

\* Introduced

**Appendix VII Fauna desktop results: Conservation significant vertebrate fauna**

Appendix VII – Fauna desktop results: Conservation significant vertebrate fauna

Family	Scientific name	Common name	Status		Databases <sup>1</sup>				Survey reports reviewed <sup>2</sup>											
			BC Act	EPBC Act	NM	PM	TPFa	BD	BA01	BA09a	BA09b	BL19	BT07	EC10	EC12	HO91	MO7	MWH16	OE11	BL20
<b>Birds</b>																				
Phasianidae	<i>Coturnix pectoralis</i>	Stubble Quail		MA																1
Cuculidae	<i>Chalcites basalis</i>	Horsfield's Bronze-Cuckoo		MA	3	3		29	1	1			1		1				1	
Cuculidae	<i>Chalcites osculans</i>	Black-eared Cuckoo		MA							1								1	
Eurostopodidae	<i>Eurostopodus argus</i>	Spotted Nightjar		MA	3			5	1	1	1			1	1	1		1	1	
Apodidae	<i>Apus pacificus</i>	Fork-tailed Swift	MI	MI, MA		6									1	1				
Rallidae	<i>Zapornia tabuensis</i>	Spotless Crake		MA	141			2												
Rallidae	<i>Porphyrio porphyrio</i>	Purple Swamphen		MA	22			1												
Recurvirostridae	<i>Himantopus leucocephalus</i>	Pied Stilt		MA	3			21											1	
Charadriidae	<i>Charadrius ruficapillus</i>	Red-capped Plover		MA	3			9												
Charadriidae	<i>Charadrius veredus</i>	Oriental Plover	MI	MI, MA	3	6	2	2											1	
Rostratulidae	<i>Rostratula australis</i>	Australian Painted-snipe	EN	EN		6														
Scolopacidae	<i>Numenius madagascariensis</i>	Eastern Curlew	CR	CR, MI, MA		3														
Scolopacidae	<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	MI	MI, MA	3	6	4	4												
Scolopacidae	<i>Calidris ferruginea</i>	Curlew Sandpiper	CR	CR, MI, MA		8														
Scolopacidae	<i>Calidris melanotos</i>	Pectoral Sandpiper	MI	MI, MA		6														
Scolopacidae	<i>Actitis hypoleucos</i>	Common Sandpiper	MI	MI, MA	3	6	4	9											1	
Scolopacidae	<i>Tringa nebularia</i>	Common Greenshank	MI	MI, MA	3		1	2											1	
Scolopacidae	<i>Tringa glareola</i>	Wood Sandpiper	MI	MI, MA	3		6	11											1	
Glareolidae	<i>Stiltia isabella</i>	Australian Pratincole		MA	1			1											1	
Glareolidae	<i>Glareola maldivarum</i>	Oriental Pratincole	MI	MI, MA		6														
Pelicanidae	<i>Pelecanus conspicillatus</i>	Australian Pelican		MA	167			48	1										1	
Ardeidae	<i>Nycticorax caledonicus</i>	Nankeen Night-Heron		MA	98			16	1				1						1	
Ardeidae	<i>Bubulcus ibis</i>	Cattle Egret		MA		3														
Ardeidae	<i>Ardea alba</i>	Great Egret		MA		3		38	1										1	
Ardeidae	<i>Ardea alba modesta</i>	Eastern Great Egret		MA	3															
Ardeidae	<i>Ardea intermedia</i>	Intermediate Egret		MA	3			7												
Ardeidae	<i>Egretta garzetta</i>	Little Egret		MA	3			12												
Threskiornithidae	<i>Threskiornis spinicollis</i>	Straw-necked Ibis		MA	3			32	1										1	
Threskiornithidae	<i>Plegadis falcinellus</i>	Glossy Ibis	MI	MI, MA	2		1	2												
Pandionidae	<i>Pandion haliaetus</i>	Osprey	MI	MI	2	6	2	2												1
Accipitridae	<i>Circus approximans</i>	Swamp Harrier		MA	3			2												

Family	Scientific name	Common name	Status		Databases <sup>1</sup>				Survey reports reviewed <sup>2</sup>											
			BC Act	EPBC Act	NM	PM	TPFa	BD	BA01	BA09a	BA09b	BL19	BT07	EC10	EC12	HO91	MO7	MWH16	OE11	BL20
Accipitridae	<i>Accipiter fasciatus</i>	Brown Goshawk		MA	29			12	1	1			1	1		1		1	1	
Accipitridae	<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle		MA	3	3		2												
Accipitridae	<i>Haliastur sphenurus</i>	Whistling Kite		MA	3			65	1	1	1				1			1		
Meropidae	<i>Merops ornatus</i>	Rainbow Bee-eater		MA	3	3		93	1	1	1		1	1	1	1		1	1	
Alcedinidae	<i>Todiramphus sanctus</i>	Sacred Kingfisher		MA	3			42	1	1	1				1	1			1	
Falconidae	<i>Falco cenchroides</i>	Nankeen Kestrel		MA	3			38	1	1	1	1		1	1	1		1	1	
Falconidae	<i>Falco hypoleucos</i>	Grey Falcon	VU		2	3	1								1					
Falconidae	<i>Falco peregrinus</i>	Peregrine Falcon	OS		3		1	3								1		1		
Psittaculidae	<i>Pezoporus occidentalis</i>	Night Parrot	CR	EN		3														
Campephagidae	<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike		MA	4			105	1	1	1		1	1	1	1		1	1	
Monarchidae	<i>Grallina cyanoleuca</i>	Magpie-lark		MA	3			154	1	1	1		1		1	1		1	1	
Motacillidae	<i>Anthus novaeseelandiae</i>	Australasian Pipit		MA	18			21		1	1				1	1		1		
Motacillidae	<i>Motacilla flava</i>	Yellow Wagtail	MI	MI, MA		6		1												
Motacillidae	<i>Motacilla cinerea</i>	Grey Wagtail	MI	MI, MA		6														
Hirundinidae	<i>Hirundo neoxena</i>	Welcome Swallow		MA	3			3												
Hirundinidae	<i>Hirundo rustica</i>	Barn Swallow	MI	MI, MA		6														
<b>Mammals</b>																				
Dasyuridae	<i>Dasyercus blythi</i>	Brush-tailed Mulgara, Ampurta	P4		2		3						1			1				
Dasyuridae	<i>Dasyurus hallucatus</i>	Northern Quoll	EN	EN	3	3	20		2	1	1	2	1	2	1	1		1	1	
Dasyuridae	<i>Sminthopsis longicaudata</i>	Long-tailed Dunnart	P4		3		5								1					
Thylacomyidae	<i>Macrotis lagotis</i>	Bilby, Dalgyte	VU	VU	247	3	70									1				1
Phalangeridae	<i>Trichosurus vulpecula arnhemensis</i>	Northern Brushtail Possum	VU																	1
Macropodidae	<i>Lagorchestes conspicillatus leichardti</i>	Spectacled Hare-wallaby	P4		3				2				1			1		1		
Muridae	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	P4		65		9		2	1	1	1	1	2	1	1		1		
Rhinonycteridae	<i>Rhinonycteris aurantia (Pilbara)</i>	Pilbara Leaf-nosed Bat	VU	VU	6	3	20		2	1		2	1	2	1		1	1	1	
Megadermatidae	<i>Macroderma gigas</i>	Ghost Bat	VU	VU	45	3	68		2	1		2	1		1	1	1	1	1	
<b>Reptiles</b>																				
Scincidae	<i>Ctenotus nigrilineatus</i>	Pin-striped Firesnout Ctenotus	P1													1				
Scincidae	<i>Ctenotus uber johnstonei</i>	Western Spotted Ctenotus	P2																	1
Typhlopidae	<i>Anilius ganei</i>	Gane's Blind Snake	P1																	1
Pythonidae	<i>Liasis olivaceus barroni</i>	Pilbara Olive Python	VU	VU	16	3	2			1	1				1	1		1	1	

Footnotes:

**1 = Databases reviewed for the desktop**

NM	DBCA (2021) NatureMap database
PM	AWE (2021) Protected Matters Search Tool
BD	Birdlife Australia (2021) Birdata
TPFa	DBCA Threatened and Priority Fauna Database

**2 = Survey reports reviewed for the desktop**

BA01	Bamford Consulting Ecologists. (2001). <i>Panorama Project Area: Baseline Fauna Study as Part of the Sulphur Springs Feasibility Study</i> . Unpublished report prepared for Astron Environmental on behalf of Outokumpu Mining Australia Pty Ltd.
BA09a	Bamford Consulting Ecologists. (2009a). <i>Fauna Assessment of the Abydos DSO Project</i> . Unpublished report prepared for Atlas Iron Limited.
BA09b	Bamford Consulting Ecologists. (2009b). <i>Fauna Assessment of the BC Iron Nullagine Iron Ore project</i> . Unpublished report prepared for Astron Environmental Services on behalf of BC Iron.
BL19	Biologic (2019) <i>Warrawoona Gold Project: Habitat assessment and targeted vertebrate fauna survey</i> .
BT07	Biota (2007) <i>Panorama Project: Mine site and haul road corridor targeted fauna survey</i> .
EC10	ecologia Environment. (2010). <i>Mount Webber Iron Ore Project: Vertebrate Fauna Assesment</i> . Unpublished report prepared for Giralia Resources NL.
EC12	ecologia Environment. (2012). <i>North Star Project: Level 2 Terrestrial Vertebrate Fauna Assessment</i> . Unpublished report prepared for Fortescue Metals Group.
HO91	How, R. A., Dell, J., & Cooper, N. K. (1991b). <i>Vertebrate fauna of the Abydos-Woodstock Reserve, northeast Pilbara</i> . <i>Records of the Western Australian Museum</i> , 37(Suppl.), 78-125.
MO7	Molhar. (2007). <i>Field Survey for Conservation Significant Bats Near Sulphur Springs, Pilbara</i> . Unpublished report prepared for CBH Resources Limited.
MWH16	MWH, Australia. (2016). <i>Corunna Downs Project: Terrestrial Vertebrate Fauna Survey</i> . Unpublished report prepared for Atlas Iron Limited.
OE11	Outback Ecology. (2011). <i>Abydos DSO Project Terrestrial Vertebrate Fauna Baseline Survey</i> . Unpublished report prepared for Atlas Iron Limited.
BL20	Biologic (2020) <i>McPhee Creek Consolidated Terrestrial Fauna Report</i> . <i>McPhee Creek Project Report to Roy Hill and Atlas Iron Limited</i> .

## Appendix VIII Flora relevé locations

## Appendix VIII – Flora relevé sites

Site name	Type	Survey date	Vegetation Code	Latitude	Longitude
R005	Releve	28/09/2020	F	-21.1599	119.8585
R006	Releve	28/09/2020	G	-21.1616	119.8596
R008	Releve	28/09/2020	A	-21.2431	119.8938
R009	Releve	28/09/2020	E	-21.2472	119.8968
R010	Releve	28/09/2020	A	-21.2303	119.8947
R011	Releve	28/09/2020	I	-21.1417	119.8668
R012	Releve	29/09/2020	C	-21.3009	119.9099
R013	Releve	29/09/2020	A	-21.3014	119.9121
R014	Releve	29/09/2020	A	-21.3257	119.9182
R015	Releve	29/09/2020	A	-21.3308	119.9174
R016	Releve	29/09/2020	F	-21.3313	119.9174
R017	Releve	29/09/2020	D	-21.335	119.9176
R018	Releve	29/09/2020	D	-21.3388	119.9172
R037	Releve	1/10/2020	C	-21.2635	119.9158
R080	Releve	29/09/2020	A	-21.3341	119.9174
R101	Releve	26/09/2020	A	-21.0658	119.8804
R102	Releve	26/09/2020	F	-21.066	119.8781
R103	Releve	26/09/2020	B	-21.0674	119.878
R104	Releve	27/09/2020	A	-21.0683	119.8803
R105	Releve	27/09/2020	B	-21.0678	119.8794
R106	Releve	27/09/2020	A	-21.0707	119.8805
R107	Releve	27/09/2020	A	-21.0761	119.8824
R108	Releve	27/09/2020	A	-21.0775	119.8823
R109	Releve	27/09/2020	A	-21.0831	119.8839
R110	Releve	27/09/2020	B	-21.0861	119.8856
R111	Releve	27/09/2020	B	-21.0891	119.8873
R112	Releve	27/09/2020	I	-21.1012	119.8936
R113	Releve	27/09/2020	B	-21.0678	119.8917
R114	Releve	27/09/2020	A	-21.0632	119.8932
R117	Releve	27/09/2020	C	-21.1113	119.8846
R118	Releve	27/09/2020	A	-21.1155	119.8813
R119	Releve	27/09/2020	A	-21.1185	119.8791
R120	Releve	27/09/2020	A	-21.1253	119.8761
R204	Releve	28/09/2020	X	-21.13	119.8742
R205	Releve	28/09/2020	I	-21.1419	119.8672



Site name	Type	Survey date	Vegetation Code	Latitude	Longitude
R206	Releve	28/09/2020	A	-21.1448	119.8652
R207	Releve	28/09/2020	A	-21.1477	119.8633
R208	Releve	28/09/2020	C	-21.1482	119.8621
R209	Releve	28/09/2020	C	-21.1491	119.8604
R300	Releve	29/09/2020	A	-21.2958	119.9055
R301	Releve	29/09/2020	A	-21.2773	119.9119
R302	Releve	29/09/2020	A	-21.2726	119.9184
R303	Releve	29/09/2020	A	-21.269	119.9192
R304	Releve	29/09/2020	C	-21.2645	119.9144
R305	Releve	29/09/2020	A	-21.2644	119.9139
R306	Releve	29/09/2020	I	-21.2608	119.9097
R307	Releve	29/09/2020	E	-21.2487	119.91
R308	Releve	29/09/2020	E	-21.2449	119.9043
R309	Releve	29/09/2020	A	-21.2425	119.9004
R310	Releve	29/09/2020	A	-21.23	119.8868
R311	Releve	29/09/2020	A	-21.2286	119.8853
R312	Releve	29/09/2020	E	-21.2248	119.8814
R313	Releve	29/09/2020	A	-21.2216	119.8781
R314	Releve	29/09/2020	C	-21.2149	119.8723
R328	Releve	1/10/2020	C	-21.2637	119.9192
R329	Releve	1/10/2020	A	-21.2139	119.8711
R330	Releve	1/10/2020	A	-21.2056	119.8607
R331	Releve	2/10/2020	H	-21.3385	119.9154
R332	Releve	2/10/2020	A	-21.165	119.856
R333	Releve	2/10/2020	A	-21.1752	119.8568
R334	Releve	2/10/2020	A	-21.2942	119.9043

## Appendix IX      Fauna habitat sites

**Appendix IX Fauna habitat sites in the pipeline corridor and adjacent (within 500 m)**

Site name	Area	In pipeline corridor	Date	Broad fauna habitat	Field notes on habitat	Field notes dominant stratum	Slope	Soil type	Soil colour	Rock outcropping	Outcrop description	Leaf litter	Fire history	Notes on disturbance	Latitude	Longitude
FH001	Moolyella Bore	Yes	25/09/2020	Sand plain	Sparsely wooded triodia grassland. 60% cover of triodia low shrub diversity. Some small eucs > 2m	Spinifex	negligible	Sand	Orange Brown	No		Dead triodia 20%	Long Unburnt		-21.0675	119.8917
FH002	Moolyella Bore	Adjacent (within 500 m)	25/09/2020	Stony plain	Mixed shrubs over dense low triodia. 60% cover triodia.	Triodia	negligible	Loam	Orange Brown	No		20% cover 3cm depth	Long Unburnt		-21.0668	119.8953
FH003	Moolyella Bore	Adjacent (within 500 m)	25/09/2020	Stony plain	Open triodia grassland, few small shrubs	Triodia 30% cover	negligible	Loam	Brown	No		5% cover 2cm depth	Long Unburnt	Rubbish and lots of signs of cattle	-21.0628	119.8949
FH004	Pipeline Route	Adjacent (within 500 m)	25/09/2020	Stony plain	Mixed acacia and grevillea tall shrubs in triodia grassland	Triodia	5-10 degrees	Loam	Orange Brown	No		20% cover 2cm depth	Long Unburnt	Cattle present	-21.1319	119.8748
FH005	Pipeline Route	Yes	25/09/2020	Stony plain	Spare shrubs and triodia on foot of stony breakaway	Triodia grevillea acacia	5-10 degrees	Stones	Orange Brown	Yes	Surface rock up to 1-2 meter boulders	5% <1cm	Long Unburnt	Cattle present	-21.1395	119.868
FH006	Pipeline Route	Yes	25/09/2020	Low stony hills	Rocky triodia with sparse shrub	Triodia	5-10 degrees	Rock	Orange Brown	Yes	Some granite boulders	5% 1cm	Long Unburnt	Cattle	-21.1401	119.8689
FH007	Pipeline Route	Yes	25/09/2020	Low stony hills	Sparse bouldery hill top triodia and shrub	Shrub	5-10 degrees	Rock	Orange Brown	Yes	Near boulder pile	20% cm	Within 5 years	Recent patchy fire has burnt out much of the triodia	-21.2059	119.8612
FH008	Pipeline Route	Adjacent (within 500 m)	25/09/2020	Granite outcrop	Big rock pile	Granite	20-40 degrees	Rock	Pale Yellow	Yes	Big granite pile	None	Within 5 years		-21.2057	119.8621
FH009	Narri Bore	Adjacent (within 500 m)	25/09/2020	Major drainage	Red gum lines river	Red gum	negligible	Sand	Orange Brown	No		15% up to 10cm	Long Unburnt	Cattle	-21.2628	119.9181
FH010	Pipeline Route	Adjacent (within 500 m)	25/09/2020	Major drainage	Red gum lined drainage with triodia and granite protrusions	Red gum	negligible	Sand	Brown	Yes	Granite boulders	5% 1cm	Long Unburnt		-21.3028	119.9074
FH011	Pipeline Route	Adjacent (within 500 m)	25/09/2020	Sand plain	Triodia	Triodia	negligible	Sand	Dark Orange	No		5% 1cm	Long Unburnt	Low disturbance	-21.2937	119.9046
FH012	Pipeline Route	Yes	25/09/2020	Medium drainage - Sandy	Triodia lined drainage	Triodia	negligible	Gravel	Orange	No		None	Long Unburnt		-21.2315	119.8882
FH013	Pipeline Route	Yes	25/09/2020	Major drainage	Melaleuca and mixed trees in creek	Melaleuca	negligible	Gravel	Orange Brown	No		5% dense Mattâ€™s in trees	Long Unburnt		-21.2158	119.8714
FH016	Moolyella Bore	Adjacent (within 500 m)	25/09/2020	Sand plain	Spinifex grassland with low acacia shrubs and sparse taller trees (3-4m)	Spinifex (40%)	negligible	Sand	Orange Brown	No		10% cover 1 cm depth	Long Unburnt	Lots of cattle damage	-21.0662	119.8803
FH017	Pipeline Route	Yes	25/09/2020	Stony plain	Spinifex grassland with occasional medium shrubs	Spinifex 50% cover	negligible	Clay-Loam	Orange Brown	No		2% 1cm	Long Unburnt		-21.0709	119.8811
FH018	Pipeline Route	Yes	25/09/2020	Stony plain	Spinifex grassland with occasional medium shrubs	Spinifex 60% cover	negligible	Clay-Loam	Orange Brown	No		5% 2cm	Long Unburnt		-21.0739	119.882
FH019	Pipeline Route	Adjacent (within 500 m)	26/09/2020	Sand plain	Spinifex grassland with occasional low shrub and few coolabah trees	Spinifex 30% cover	negligible	Sand	Orange Brown	No		10% 2cm	Long Unburnt	Heavy cattle grazing	-21.0736	119.8846
FH020	Pipeline Route	Yes	26/09/2020	Stony plain	Spinifex grassland with few medium shrubs	Spinifex 20%	negligible	Clay-Loam	Orange Brown	No		5% 1cm	Long Unburnt	Cattle	-21.0763	119.8826
FH021	Pipeline Route	Yes	26/09/2020	Stony plain	Spinifex grassland with low shrubs and patches of medium acacias	Spinifex 40%	negligible	Stones	Orange	No		5% very sparse	Long Unburnt		-21.0799	119.8831
FH022	Pipeline Route	Yes	26/09/2020	Sand plain	Spinifex grassland with patches of medium shrubs	Spinifex 20%	negligible	Sand	Orange Brown	No		5% 2cm	Long Unburnt	Lots of cattle tracks	-21.0817	119.8836
FH023	Pipeline Route	Yes	26/09/2020	Sand plain	Dense triodia sparse shrub	Triodia 60%	negligible	Sand	Dark Orange	No		10% 1cm	Long Unburnt		-21.0883	119.8872
FH024	Pipeline Route	Yes	26/09/2020	Low stony hills	Small Rocky breakaway with Spinifex and sparse tall wirey acacia. Localised high point	Spinifex 40%	10-20 degrees	Rock	Orange Brown	Yes	Quartz breakaway	10% 3cm	Long Unburnt		-21.1008	119.8935
FH025	Pipeline Route	Yes	26/09/2020	Stony plain	Spinifex grassland with sparse tall shrubs	Spinifex	5-10 degrees	Loam	Orange Brown	No		10% 2cm	Long Unburnt		-21.103	119.8942

**Appendix IX Fauna habitat sites in the pipeline corridor and adjacent (within 500 m)**

Site name	Area	In pipeline corridor	Date	Broad fauna habitat	Field notes on habitat	Field notes dominant stratum	Slope	Soil type	Soil colour	Rock outcropping	Outcrop description	Leaf litter	Fire history	Notes on disturbance	Latitude	Longitude
FH026	Pipeline Route	Yes	26/09/2020	Disturbed	Eroded drainage line near old tin works. Spinifex and sparse shrub	Triodia	5-10 degrees	Clay	Orange Brown	No		10% 1cm	Disturbances other than fire	Old tin mine. Large spoil heaps	-21.1066	119.8907
FH027	Pipeline Route	Yes	26/09/2020	Stony plain	Spinifex grassland with sparse acacia shrubs and small areas with rocks	Spinifex 70%	negligible	Loam	Brown	No	Some small areas with rock piles - but not really outcrops	15% 2cm	Long Unburnt		-21.1097	119.8873
FH028	Pipeline Route	Adjacent (within 500 m)	26/09/2020	Disturbed	Mix of riparian associated veg - melaleuca and sedges as well as euc and acacias over Spinifex. Some standing water.	Spinifex	negligible	Sand	Brown	No		1% 1cm	Disturbances other than fire		-21.1113	119.8844
FH029	Pipeline Route	Adjacent (within 500 m)	26/09/2020	Disturbed	Mostly sedges with some areas of reeds. Surrounded by medium acacia shrubs over spinifex	Sedge - cypress? Photo	negligible	Sand	Orange Brown	No		5% 1cm	Disturbances other than fire	Lots of cattle	-21.1103	119.8841
FH030	Pipeline Route	Yes	26/09/2020	Stony plain	Open spinifex with some medium shrubs. Some small boulders	Spinifex 15%	5-10 degrees	Loam	Brown	No		5% 1cm	Long Unburnt		-21.1128	119.8826
FH031	Pipeline Route	Yes	26/09/2020	Stony plain	Sparse stony spinifex with mixed shrub	Triodia	5-10 degrees	Clay-Loam	Orange Brown	Yes	Exposed Granite. quartz gravel	Negligible	Long Unburnt	High disturbance from cattle	-21.116	119.8802
FH032	Pipeline Route	Yes	26/09/2020	Stony plain	Spinifex grassland with tall shrub overstorey and some large rocky areas	Spinifex 50% cover	5-10 degrees	Clay-Loam	Orange Brown	Yes	Small areas with low rocky outcrop	5% 2cm	Long Unburnt		-21.1206	119.8788
FH033	Pipeline Route	Yes	26/09/2020	Stony plain	Spinifex grassland with areas of acacia and hakea shrubs	Low Spinifex 40%	5-10 degrees	Loam	Orange Brown	No		5% 2cm	Long Unburnt		-21.128	119.8754
FH034	Pipeline Route	Yes	26/09/2020	Disturbed	Farm dam mixed acacia and triodia	Triodia	5-10 degrees	Clay-Loam	Orange Brown	No		5% 1cm	Disturbances other than fire	Lots of cattle	-21.1305	119.8743
FH035	Pipeline Route	Yes	26/09/2020	Stony plain	Spinifex grassland with patches of medium shrubs	Spinifex 55% cover	5-10 degrees	Loam	Orange Brown	No		5% 2cm	Long Unburnt		-21.1344	119.871
FH036	Pipeline Route	Yes	26/09/2020	Disturbed	Farm dam mixed acacia and triodia	Triodia	5-10 degrees	Clay-Loam	Orange Brown	No			Disturbances other than fire		-21.1376	119.8694
FH037	Pipeline Route	Adjacent (within 500 m)	26/09/2020	Low stony hills	Single rounded hill surrounded by stony plain. Rocky terrain with spinifex and sparse thin acacia	Spinifex 30%	10-20 degrees	Loam	Orange Brown	No	Minor rocky outcrop (but micro habitat)	2% 2cm	Long Unburnt		-21.1413	119.8666
FH046	Narri Bore	Adjacent (within 500 m)	26/09/2020	Major drainage	Red gums with open understorey of grasses and Spinifex and few shrubs	Red gum	negligible	Sand	Yellow			15% 2cm	Long Unburnt		-21.2692	119.9212
FH061	Pipeline Route	Yes	27/09/2020	Medium drainage - Rocky	Red gum lined creek triodia mixed grasses and acacia shrubs	Red gum	5-10 degrees	Gravel	Grey	Yes	Slate on surrounding slopes	30% 1-2cm	Long Unburnt		-21.3415	119.9138
FH062	Pipeline Route	Yes	27/09/2020	Medium drainage - Rocky	Red gum lined drainage mixed grasses Forbes. Triodia	Red gum	5-10 degrees	Gravel	Grey	Yes	Slate	10% 1-2cm	Long Unburnt		-21.3405	119.9152
FH063	Pipeline Route	Yes	27/09/2020	Hill crest / hill slope	Triodia 30% rocky scree slope	Triodia	40-50 degrees	Rock	Dark Orange	Yes	Shale scree slope	15% 1cm	Long Unburnt		-21.3406	119.9153
FH064	Pipeline Route	Yes	27/09/2020	Major drainage	Pretty trashed red gum and melaleuca river bed	Red gum	negligible	Sand	Brown	No		5% 1-2cm	Long Unburnt	Badly damaged by cattle	-21.1489	119.8591
FH065	Pipeline Route	Yes	27/09/2020	Stony plain	Triodia with mixed acacia	Triodia 60%	negligible	Loam	Orange	No		20% 2-3 cm dead triodia	Long Unburnt	Some grazing	-21.1468	119.8639
FH085	Pipeline Route	Yes	28/09/2020	Stony plain	Triodia and mixed shrub	Triodia 50%	negligible	Loam	Orange	Yes	Granite	10% 2-3 cm dead triodia	Long Unburnt		-21.2959	119.9054
FH086	Pipeline Route	Yes	28/09/2020	Stony plain	Triodia mixed shrub	Triodia 40%	negligible	Loam	Orange	No		15% dead triodia 2-3 cm	Long Unburnt		-21.2978	119.9072

**Appendix IX Fauna habitat sites in the pipeline corridor and adjacent (within 500 m)**

Site name	Area	In pipeline corridor	Date	Broad fauna habitat	Field notes on habitat	Field notes dominant stratum	Slope	Soil type	Soil colour	Rock outcropping	Outcrop description	Leaf litter	Fire history	Notes on disturbance	Latitude	Longitude
FH087	Pipeline Route	Adjacent (within 500 m)	28/09/2020	Major drainage	Drainage line with standing water. Reeds sedges all eaten back by cattle. Mixed acacia shrub red gums.	Red gums sedges rushes	negligible	Sand	Brown	Yes	Granite	5% 1-2cm	Long Unburnt	Cattle	-21.3009	119.9099
FH088	Pipeline Route	Yes	29/09/2020	Stony plain	Bare stony plain. Acacia grevillia triodia	Triodia 10%	5-10 degrees	Stones	Orange	Yes	Granite bedrock	Nil	Within 5 years	Cattle	-21.301	119.9112
FH089	Pipeline Route	Yes	29/09/2020	Stony plain	Scorched plain mostly acacia shrub cover.	Acacia shrub 5%	negligible	Clay-Loam	Orange	Yes	Granite bedrock	5% 1-2cm	Within 5 years	Cattle	-21.3047	119.9161
FH090	Pipeline Route	Yes	29/09/2020	Stony plain	Triodia mixed acacia	Triodia 50%	negligible	Loam	Orange	Yes	Some surface granite	Nil	Long Unburnt		-21.3168	119.9172
FH091	Pipeline Route	Yes	29/09/2020	Stony plain	Triodia grevillia acacia	Triodia 50%	negligible	Stones	Orange	Yes	Large granites	10% 2 cm dead tri	Long Unburnt		-21.3246	119.9173
FH092	Pipeline Route	Yes	29/09/2020	Sand plain	Minor drainage depositing loam grevillia triodia	Triodia	5-10 degrees	Sand	Orange Brown				Long Unburnt		-21.3286	119.9175
FH093	Pipeline Route	Yes	29/09/2020	Medium drainage - Rocky	Drainage. Mixed shrub some eucalypts	Triodia 60%	5-10 degrees	Gravel	Orange Brown	No		5% 1-2cm	Long Unburnt		-21.3313	119.9174
FH094	Pipeline Route	Yes	29/09/2020	Stony plain	Shale and sedimentary bedrock. Triodia and mixed shrubs. Grevillia	Triodia 30%	10-20 degrees	Stones	Very Dark Brown	Yes	On sedimentary bedrock	Nil	Long Unburnt		-21.3337	119.9174
FH095	Pipeline Route	Yes	29/09/2020	Medium drainage - Rocky	Mixed shrubs eucs. Mixed grasses. Triodia	Eucs 5%	5-10 degrees	Gravel	Grey	No		60% 1-2cm	Long Unburnt		-21.335	119.9176
FH096	Pipeline Route	Yes	29/09/2020	Medium drainage - Rocky	River gum, mixed shrub grass triodia	River gum 20%	5-10 degrees	Loam	Brown	Yes	Exposed sedimentary bedrock	25% 1-2cm	Long Unburnt		-21.3388	119.9172
FH097	Pipeline Route	Yes	29/09/2020	Hill crest / hill slope	Shale and triodia	Triodia 35%	20-40 degrees	Rock	Brown	Yes	Sedimentary bedrock	Nil	Long Unburnt		-21.3387	119.917
FH098	Pipeline Route	Yes	29/09/2020	Stony plain	Spinifex tussock grassland with patches of medium mixed acacia shrubs.	Spinifex 30% cover	negligible	Clay-Loam	Orange Brown	No		10% 1cm	Long Unburnt	Lots of signs of cattle	-21.1603	119.855
FH099	Pipeline Route	Yes	29/09/2020	Stony plain	Spinifex tussock grassland with patches of medium mixed acacia spp. and grevillia sp. shrubs	Spinifex 30% cover	negligible	Clay-Loam	Orange Brown	Yes	Low granite outcrop at the eastern boundary of pipeline (see photo)	5% 1cm	Long Unburnt	Cattle tracks	-21.168	119.8557
FH100	Pipeline Route	Yes	29/09/2020	Stony plain	Spinifex tussock grassland with patches of medium mixed acacia spp and grevillia sp. shrubs	Spinifex 40% cover	negligible	Clay-Loam	Orange Brown	No		5% 1cm	Long Unburnt		-21.1776	119.8568
FH101	Pipeline Route	Yes	29/09/2020	Stony plain	Large Spinifex tussock grassland with patches of medium mixed acacia shrubs	Spinifex 50% cover	negligible	Clay-Loam	Orange Brown	Yes	Some scattered areas with rocky piles/low granite outcrop	2% 1cm	Long Unburnt		-21.1852	119.8572
FH102	Pipeline Route	Yes	29/09/2020	Stony plain	Open Spinifex tussock grassland with scattered of medium mixed acacia spp and grevillia sp. shrubs, senna	Spinifex 10%	negligible	Clay-Loam	Orange Brown	Yes	Some scattered small areas with exposed rock/rock piles	10% 2cm	Within 5 years		-21.1948	119.8549
FH103	Pipeline Route	Yes	29/09/2020	Stony plain	Spinifex tussock grassland with emergent medium mixed acacia spp shrubs. Substantial areas of granite rock piles	Spinifex 25% cover	5-10 degrees	Clay-Loam	Orange Brown	Yes	Substantial areas of granite rock piles	5% 1cm	Within 5 years		-21.2024	119.8586
FH104	Pipeline Route	Yes	29/09/2020	Stony plain	Open low Spinifex grassland with regenerating mixed acacia shrubs. One euc?	Spinifex 5%	5-10 degrees	Clay-Loam	Brown	Yes	Areas of rock piles	2% 1cm	Within 5 years	Cattle tracks	-21.2088	119.8639
FH105	Pipeline Route	Yes	29/09/2020	Stony plain	Open Spinifex tussock grassland with emergent acacia inaequalitra shrubs. And occasional Grevillia pyr	Spinifex 15%	negligible	Clay-Loam	Orange Brown	No		5% 1cm	Long Unburnt		-21.2213	119.8775
FH106	Narri Bore	Adjacent (within 500 m)	30/09/2020	Major drainage	Spring fed section of drainage line. Good water quality sedges triodia acacia eucs	Sedges	5-10 degrees	Sand	Orange Brown	Yes	Granite bedrock	Na	Long Unburnt	Cattle	-21.2518	119.9143

**Appendix IX Fauna habitat sites in the pipeline corridor and adjacent (within 500 m)**

Site name	Area	In pipeline corridor	Date	Broad fauna habitat	Field notes on habitat	Field notes dominant stratum	Slope	Soil type	Soil colour	Rock outcropping	Outcrop description	Leaf litter	Fire history	Notes on disturbance	Latitude	Longitude
FH113	Narri Bore	Adjacent (within 500 m)	26/09/2020	Major drainage	Red gum with sedge understory. Standing water	Red gum 40% canopy cover sedge 30% ground cover	negligible	Sand	Pale Yellow	Yes	Granite boulder edge to drainage	30% 2-3cm	Long Unburnt	Grazing and cattle	-21.2607	119.9162
FH124	Pipeline Route	Adjacent (within 500 m)	27/09/2020	Stony plain	Spinifex grassland with patches of medium acacia shrubs. Some small areas with rock exposed.	Spinifex 35%	negligible	Loam	Orange Brown	No		5% 1cm	Long Unburnt	Lots of signs of cattle grazing	-21.15	119.8589
FH125	Pipeline Route	Adjacent (within 500 m)	27/09/2020	Minor drainage	acacia lined drainage mixed grasses	acacia 25%	5-10 degrees	Sand	Orange Brown	No		25% 5 cm	Long Unburnt	Cattle	-21.16	119.8584
FH129	Pipeline Route	Adjacent (within 500 m)	28/09/2020	Stony plain	triodia and mixed acacia	triodia 50%	negligible	Loam	Orange	No		nill	Long Unburnt		-21.2412	119.8931
FH130	Pipeline Route	Adjacent (within 500 m)	28/09/2020	Stony plain	triodia with grevillia hakea	triodia 40%	negligible	Loam	Dark Orange	No		10% 1cm	Long Unburnt		-21.2424	119.894
FH131	Pipeline Route	Adjacent (within 500 m)	28/09/2020	Medium drainage - Sandy	creek line mixed shrubs triodia	triodia	negligible	Sand	Brown			5% 5cm	Long Unburnt	Some evidence of cattle	-21.2471	119.8972

## Appendix X      Acoustic Recorder (SM4) and camera detail



**Acoustic Recorder (SM4) in the pipeline corridor and adjacent (within 500 m)**

Site Name	Bat Call (2021)	Target Species	Location	Date Deployed	Recorded PlnB or NP	Number of Nights deployed	Habitat	Vegetation	Site Notes	Eastings	Northing	Zone (GDA 94)
SM4 0043 200925	Bat Call Site 1	Night Parrot	Pipeline Route	25/09/2020	No	2	Major drainage	Eucalyptus camaldulensis and Melaleuca argentea over Acacia trachycarpa and Triodia longiceps on major drainage	Triodia lined drainage. Long unburnt	799795.765	7649491.29	50
SM4 0043 200927	Bat Call Site 2	Bats	Pipeline Route	27/09/2020	No	2	Major drainage	Eucalyptus camaldulensis and Melaleuca argentea over Acacia trachycarpa and Triodia longiceps on major drainage	Eucalyptus and melaleuca river bed. Poor condition from cattle	796933.305	7658708.93	50
SM4 0043 200929	Bat Call Site 3	Bats	Pipeline Route	29/09/2020	No	1	Granite outcrop	Grevillea wickhamii over Triodia epactia surrounding granite outcrops	On low small granite outcrop/rock pile surrounded by large Triodia	796704.032	7654670.52	50
SM4 4031 200925	Bat Call Site 4	Bats	Narri (Adjacent to Pipeline Route )	25/09/2020	PlnB recorded : 25-26th September: 4 and 5 calls. Earliest 19:02 and latest 02:47	2	Major drainage	Eucalyptus camaldulensis and Melaleuca argentea over Acacia trachycarpa and Triodia longiceps on major drainage	Eucalyptus and melaleuca river bed. Poor condition from cattle.Pool in creek with Eucalypts over sedge understory (FH113) located 320 metres to the NE	802846.909	7645956.27	50
SM4 4031 200927	Bat Call Site 5	Bats	Pipeline Route	27/09/2020	PlnB recorded : - 28th September : 1 call. 20:24	2	Medium drainage - Rocky	Corymbia hamersleyana over Acacia eriopoda and Triodia wiseana on rocky medium drainage	Corymbia lined creek triodia mixed grasses and acacia shrubs. Long Unburnt. Far from pools (close to Warrawoona Gold Project)	802239.314	7637247.70	50
SM4 4031 200929	Bat Call Site 6	Bats	Pipeline Route	29/09/2020	PlnB recorded : - 29th September : 2 calls at 21:36	1	Disturbed		Next to dam (artificial waterbody).	798552.573	7660699.28	50
SM4 5295 200925	Bat Call Site 7	Bats	Pipeline Route	25/09/2020	No	2	Major Drainage	Eucalyptus camaldulensis and Melaleuca argentea over Acacia trachycarpa and Triodia longiceps on major drainage	Triodia lined drainage. Long unburnt	799794.486	7649490.91	50
SM4 5295 200927	Bat Call Site 8	Bats	Pipeline Route	27/09/2020	No	2	Stony plain	Acacia inaequilatera shrubland over Triodia epactia and T. wiseana on stony plain	Long unburnt Triodia	797453.251	7658924.95	50
SM4 5295 200929	Bat Call Site 9	Bats	Pipeline Route	29/09/2020	No	1	Granite outcrop	Grevillea wickhamii over Triodia epactia surrounding granite outcrops	On low small granite outcrop/rock pile surrounded by large Triodia	796704.032	7654670.52	50
SM4 5458 200925	Bat Call Site 10	Bats	Adjacent to Pipeline Route	25/09/2020	PlnB recorded : 25-26th September : 3 and 3 calls. Earliest 19:14 and latest 00:02	2	Major drainage	Eucalyptus camaldulensis and Melaleuca argentea over Acacia trachycarpa and Triodia longiceps on major drainage	On Drainage Line, Corymbia lined drainage with triodia and granite pertusion. Long unburnt . SM4 located in section of dry creek line., 280 metres SW of pool in creek (FH87)	801693.339	7641579.86	50
SM4 5458 200927	Bat Call Site 11	Night Parrot	Pipeline Route	27/09/2020	No	2	Medium drainage - Rocky	Corymbia hamersleyana over Acacia eriopoda and Triodia wiseana on rocky medium drainage	Corymbia lined creek triodia mixed grasses and acacia shrubs. Long Unburnt	802379.432	7637368.31	50
SM4 5458 200929	Bat Call Site 12	Night Parrot	Pipeline Route	29/09/2020	PlnB recorded : - 29th September : 6 calls. Earliest 19:33 and latest 00:15	1	Disturbed		Next to dam (artificial waterbody)	798036.791	7659917.64	50

**Cameras in the pipeline corridor and adjacent (within 500 m)**

MDC Number	Location	Date Deployed	Date Retrieved	Survey Nights	Habitat	Vegetation	Description	Easting	Northing	Zone (GDA 94)
MDC 5	Pipeline Route	25/09/2020	30/09/2020	5	Major drainage	Eucalyptus camaldulensis and Melaleuca argentea over Acacia trachycarpa and Triodia longiceps on major drainage	Triodia lined drainage. Long unburnt	799754	7649462	50
MDC 6	Pipeline Route	25/09/2020	30/09/2020	5	Sand Plain	Acacia stellaticeps over Triodia epactia and T. longiceps on sand plain	Spinifex dominated sandplain	801366	7642577	50
MDC 7	Pipeline Route	25/09/2020	30/09/2020	5	Disturbed		Low stony hill in disturbed area (mining) Rocky triodia with sparse shrub	797971	7659671	50
MDC8	Pipeline Route	25/09/2020	30/09/2020	5	Disturbed		Low stony hill in disturbed area (mining), Sparse shrubs and triodia on foot of stony breakaway	797919	7659712	50
MDC 9	Pipeline Route	25/09/2020	30/09/2020	5	Major drainage	Eucalyptus camaldulensis and Melaleuca argentea over Acacia trachycarpa and Triodia longiceps on major drainage	On Drainage Line, ( 400 m adjacent to study area), Corymbia lined drainage with triodia and granite pertrusion. Long unburnt	801693	7641579	50
MDC 10	Adjacent to Pipeline Route	25/09/2020	30/09/2020	5	Granite outcrop		Hill top of granite boulder pile . Burnt within 5 years. Much of Triodia is burnt. MDC located adjacent to study area in the outcrop	797047	7652377	50
MDC 11	Adjacent to Pipeline Route	25/09/2020	30/09/2020	5	Major drainage	Eucalyptus camaldulensis and Melaleuca argentea over Acacia trachycarpa and Triodia longiceps on major drainage	On Drainage Line, ( 400 m adjacent to study area), Corymbia lined drainage with triodia and granite pertrusion. Long unburnt	801605	7641563	50
MDC 12	Pipeline Route	25/09/2020	30/09/2020	5	Major drainage	Eucalyptus camaldulensis and Melaleuca argentea over Acacia trachycarpa and Triodia longiceps on major drainage	Triodia lined drainage. Long unburnt	799721	7649446	50
MDC 17	Narri (Adjacent to Pipeline Route )	25/09/2020	30/09/2020	5	Major drainage	Eucalyptus camaldulensis and Melaleuca argentea over Acacia trachycarpa and Triodia longiceps on major drainage	Narri (260 metres to the N of study area), proximal to standing water	802856	7645919	50
MDC 22	Pipeline Route	25/09/2020	30/09/2020	5	Disturbed		Drainage , stony plain, mining disturbance, Triodia with medium shrubs acacias. Near dam (artificial) .	798606	7660567	50
MDC 24	Pipeline Route	25/09/2020	30/09/2020	5	Disturbed	Disturbed	Melaleuca and mixed trees in creek Long unburnt. Disturbed from mining	797877	7659685	50
MDC 26	Pipeline Route	25/09/2020	30/09/2020	5	Disturbed		Drainage , stony plain, mining disturbance, Triodia with medium shrubs acacias. Near dam (artificial) .	798559	7660609	50

MDC Number	Location	Date Deployed	Date Retrieved	Survey Nights	Habitat	Vegetation	Description	Easting	Northing	Zone (GDA 94)
MDC 28	Narri (Adjacent to Pipeline Route )	25/09/2020	30/09/2020	5	Major drainage	Eucalyptus camaldulensis and Melaleuca argentea over Acacia trachycarpa and Triodia longiceps on major drainage	Narri (270 metres to the N of study area), proximal to standing water	802913	7645935	50
MDC 29	Narri (Adjacent to Pipeline Route )	25/09/2020	30/09/2020	5	Major drainage	Eucalyptus camaldulensis and Melaleuca argentea over Acacia trachycarpa and Triodia longiceps on major drainage	Narri (300 metres to the NE of study area), proximal to standing water	802844	7645956	50
MDC 30	Pipeline Route	27/09/2020	30/09/2020	5	Medium drainage line - rocky	Corymbia hamersleyana over Acacia eriopoda and Triodia wiseana on rocky medium drainage	Corymbia lined creek triodia mixed grasses and acacia shrubs. Long Unburnt	802271	7637257	50
MDC 32	Pipeline Route	25/09/2020	30/09/2020	5	Major drainage	Eucalyptus camaldulensis and Melaleuca argentea over Acacia trachycarpa and Triodia longiceps on major drainage	Melaleuca and mixed trees in creek. Long unburnt	798055	7651261	50
MDC 34	Pipeline Route	25/09/2020	30/09/2020	5	Sand Plain	Acacia stellaticeps over Triodia epactia and T. longiceps on sand plain	Triodia dominated sandplain	801375	7642563	50
MDC 35	Pipeline Route	25/09/2020	30/09/2020	5	Granite outcrop		Burnt within 5 years. Much of Triodia is burnt. MDC located adjacent to study area in the granite outcrop	797139	7652403	50
MDC 36	Pipeline Route	25/09/2020	30/09/2020	5	Disturbed		Drainage , stony plain, mining disturbanceTriodia with medium shrubs acacias. Nea dam (artificial) .	798636	7660601	50
MDC 37	Pipeline Route	27/09/2020	30/09/2020	5	Medium drainage line - rocky	Corymbia hamersleyana over Acacia eriopoda and Triodia wiseana on rocky medium drainage	Corymbia lined creek triodia mixed grasses and acacia shrubs. Long Unburnt	802379	7637367	50
MDC 39	Pipeline Route	25/09/2020	30/09/2020	5	Major drainage	Eucalyptus camaldulensis and Melaleuca argentea over Acacia trachycarpa and Triodia longiceps on major drainage	Melaleuca and mixed trees in creek. Long unburnt	798082	7651273	50

## Appendix XI      Flora taxa per vegetation type

### Appendix XI – Flora taxa recorded during the survey from each broad vegetation type

Family	Taxon	Status	Broad vegetation type code <sup>1</sup>											
			A	B	C	D	E	F	G	H	I	X		
Aizoaceae	<i>Trianthema pilosum</i>		1											
Amaranthaceae	* <i>Aerva javanica</i>	weed										1		
Amaranthaceae	<i>Gomphrena cunninghamii</i>											1		
Amaranthaceae	<i>Ptilotus auriculifolius</i>		1											
Amaranthaceae	<i>Ptilotus axillaris</i>		2											
Apocynaceae	* <i>Calotropis procera</i>	weed			7									2
Asteraceae	<i>Olearia stuartii</i>		1	1										
Asteraceae	<i>Pentalepis trichodesmoides subsp. trichodesmoides</i>		2			1								
Asteraceae	<i>Pluchea ferdinandi - muelleri</i>		5	2	3		2	1						
Asteraceae	<i>Pluchea rubelliflora</i>				2		1							
Asteraceae	<i>Pluchea tetranthera</i>		1	2				1						
Boraginaceae	<i>Heliotropium chrysocarpum</i>		2											
Boraginaceae	<i>Heliotropium cunninghamii</i>		1	1										
Boraginaceae	<i>Trichodesma zeylanicum var. zeylanicum</i>					1							1	
Caryophyllaceae	<i>Polycarpaea corymbosa</i>		1											
Caryophyllaceae	<i>Polycarpaea holtzei</i>		1										1	
Chenopodiaceae	<i>Salsola australis</i>		2											
Chenopodiaceae	<i>Sclerolaena hostilis</i>		1	2				1						
Cleomaceae	<i>Arivela viscosa</i>		11	3	2		1	1	1	1	1	2		
Convolvulaceae	<i>Bonamia erecta</i>		1	1									1	
Convolvulaceae	<i>Bonamia pilbarensis</i>		1											
Convolvulaceae	<i>Ipomoea muelleri</i>						1							
Cucurbitaceae	<i>Citrullus colocynthis</i>				1									1
Cucurbitaceae	<i>Cucumis variabilis</i>		3				1				1			
Cyperaceae	<i>Bulbostylis barbata</i>		8					2	1			3		
Cyperaceae	<i>Cyperus vaginatus</i>				7		4							1
Cyperaceae	<i>Fimbristylis dichotoma</i>		1					1						
Cyperaceae	<i>Schoenoplectus subulatus</i>				2									
Euphorbiaceae	<i>Adriana tomentosa var. tomentosa</i>					2								
Euphorbiaceae	<i>Euphorbia australis var. subtomentosa</i>		6		2		1							
Euphorbiaceae	<i>Euphorbia careyi</i>					2					1			
Euphorbiaceae	<i>Euphorbia trigonosperma</i>				1									
Fabaceae	? <i>Indigofera sp.</i>					2								
Fabaceae	<i>Acacia ?ligulata</i>												1	
Fabaceae	<i>Acacia acradenia</i>												1	
Fabaceae	<i>Acacia ampliceps</i>	Facultative phreatophyte			4		3							

Family	Taxon	Status	Broad vegetation type code <sup>1</sup>											
			A	B	C	D	E	F	G	H	I	X		
Fabaceae	<i>Acacia ampliceps</i> x <i>sclerosperma</i> subsp. <i>sclerosperma</i>	Facultative phreatophyte					1							
Fabaceae	<i>Acacia ancistrocarpa</i>		8	2									1	
Fabaceae	<i>Acacia bivenosa</i>		9			1	1	1					2	
Fabaceae	<i>Acacia colei</i> var. <i>colei</i>					1								
Fabaceae	<i>Acacia coriacea</i> subsp. <i>pendens</i>					1								
Fabaceae	<i>Acacia eriopoda</i>		3	1		2		1	2				1	
Fabaceae	<i>Acacia inaequilatera</i>		26	3	1			3	1				4	1
Fabaceae	<i>Acacia maitlandii</i>		2											
Fabaceae	<i>Acacia orthocarpa</i>												2	
Fabaceae	<i>Acacia pyrifolia</i> var. <i>morrisonii</i>		5		1	1	2						1	1
Fabaceae	<i>Acacia sclerosperma</i> subsp. <i>sclerosperma</i>		1	1			1							
Fabaceae	<i>Acacia sclerosperma</i> subsp. <i>sclerosperma</i>							1						
Fabaceae	<i>Acacia stellaticeps</i>		2	2				1						
Fabaceae	<i>Acacia synchronicia</i>		2											
Fabaceae	<i>Acacia trachycarpa</i>		5		6		4							1
Fabaceae	<i>Cajanus pubescens</i>		1				2	1						
Fabaceae	<i>Crotalaria cunninghamii</i>		1		2		3							
Fabaceae	<i>Cullen leucanthum</i>						1							
Fabaceae	<i>Dichrostachys spicata</i>		2		5		2							1
Fabaceae	<i>Erythrina vespertilio</i>				1									
Fabaceae	<i>Indigofera monophylla</i>		3	2		1		1			1	1		
Fabaceae	<i>Petalostylis labicheoides</i>					3								
Fabaceae	<i>Rhynchosia minima</i>		1										1	
Fabaceae	<i>Senna artemisioides</i> subsp. <i>oligophylla</i>												1	
Fabaceae	<i>Senna glutinosa</i> subsp. <i>glutinosa</i>		2										4	
Fabaceae	<i>Senna notabilis</i>		3		1		1		1					
Fabaceae	<i>Senna venusta</i>						1							
Fabaceae	<i>Tephrosia</i> sp. B. Kimberley Flora (C.A. Gardner 7300)												2	
Fabaceae	<i>Tephrosia</i> sp. Bungaroo Creek (M.E. Trudgen 11601)		1											
Fabaceae	<i>Tephrosia supina</i>		4				1		1					
Fabaceae	<i>Tephrosia uniovolata</i>		1											
Goodeniaceae	<i>Dampiera candidans</i>												1	
Goodeniaceae	<i>Goodenia lamprosperma</i>		1											
Goodeniaceae	<i>Goodenia microptera</i>		1											
Goodeniaceae	<i>Goodenia stobbsiana</i>		1										1	
Lauraceae	<i>Cassytha capillaris</i>				2								1	
Malvaceae	<i>Corchorus parviflorus</i>		17	1	1	2	1	1	1				3	
Malvaceae	<i>Corchorus</i> sp.		2	1									1	

Family	Taxon	Status	Broad vegetation type code <sup>1</sup>										
			A	B	C	D	E	F	G	H	I	X	
Malvaceae	<i>Gossypium australe</i>		3	1	1	1					1		
Malvaceae	<i>Hibiscus austrinus</i> var. <i>austrinus</i>						3						
Malvaceae	<i>Sida clementii</i>		2	1			1						
Malvaceae	<i>Sida rohlenae</i> subsp. <i>rohlenae</i>		1										
Malvaceae	<i>Triumfetta propinqua</i>		4	1			1		1				
Molluginaceae	<i>Trigastrotheca molluginea</i> F.Muell.		9	2			1		2		1		
Myrtaceae	<i>Corymbia ferriticola</i>					2							
Myrtaceae	<i>Corymbia hamersleyana</i>		2			2		1	1		1		
Myrtaceae	<i>Eucalyptus camaldulensis</i>	Obligate phreatophyte			7	1							
Myrtaceae	<i>Eucalyptus victrix</i>	Facultative phreatophyte			1	2							
Myrtaceae	<i>Melaleuca argentea</i>	Obligate phreatophyte			4								1
Myrtaceae	<i>Melaleuca glomerata</i>	Facultative phreatophyte			1								
Papaveraceae	* <i>Argemone ochroleuca</i> subsp. <i>ochroleuca</i>	weed			1								
Pedaliaceae	<i>Josephinia</i> sp. Mt Edgar Station (N.T. Burbidge 1194)		3										
Plantaginaceae	<i>Stemodia</i> ? <i>grossa</i>		1		1		1						
Poaceae	* <i>Cenchrus ciliaris</i>	weed	5		5	1	4						1
Poaceae	* <i>Chloris barbata</i>	weed			2								
Poaceae	? <i>Aristida</i> sp.		1										
Poaceae	<i>Chrysopogon fallax</i>		2	1		1	1	1	1				
Poaceae	<i>Cymbopogon ambiguus</i>					2		1		1	1		
Poaceae	<i>Cynodon dactylon</i>												2
Poaceae	<i>Eragrostis crateriformis</i>	P3	1										
Poaceae	<i>Eragrostis cumingii</i>		2				1						
Poaceae	<i>Eragrostis eriopoda</i>		4	2									
Poaceae	<i>Eriachne mucronata</i>									1	2		
Poaceae	<i>Eriachne pulchella</i> subsp. <i>dominii</i>		4	1									
Poaceae	<i>Sporobolus actinocladius</i>				1								
Poaceae	<i>Sporobolus australasicus</i>		11	4				1	2				
Poaceae	<i>Triodia epactia</i>		18	3				1	2		4		
Poaceae	<i>Triodia longiceps</i>		8	3	5		4	2	1				1
Poaceae	<i>Triodia wiseana</i>		14			2		2	1	1	1		
Proteaceae	<i>Grevillea pyramidalis</i> subsp. <i>leucadendron</i>		14	1	1	2	1	1			1		
Proteaceae	<i>Grevillea wickhamii</i> subsp. <i>hispidula</i>		10	1					1		3		
Proteaceae	<i>Hakea lorea</i> subsp. <i>lorea</i>		7	1			2						
Rubiaceae	<i>Dolichocarpa crouchiana</i>		1										
Sapindaceae	<i>Atalaya hemiglauca</i>	Facultative phreatophyte	3		2	1		1			1	1	

Family	Taxon	Status	Broad vegetation type code <sup>1</sup>										
			A	B	C	D	E	F	G	H	I	X	
Scrophulariaceae	<i>Eremophila latrobei</i> subsp. <i>glabra</i>											2	
Solanaceae	<i>Solanum</i> ? <i>horridum</i>			1								1	
Solanaceae	<i>Solanum</i> ? <i>phlomoides</i>				1								
Solanaceae	<i>Solanum diversiflorum</i>		3	1									
Zygophyllaceae	<i>Tribulus suberosus</i>										1		

**Footnotes:**

**1 = Vegetation codes and broad vegetation types:**

- A *Acacia inaequilatera* over *Triodia epactia* and *T. wiseana* on stony plain
- B *Acacia stellaticeps* over *Triodia epactia* and *T. longiceps* on sand plain
- C *Eucalyptus camaldulensis* and *Melaleuca argentea* over *Acacia trachycarpa* and *Triodia longiceps* on major drainage
- D *Corymbia hamersleyana* over *Acacia eriopoda* and *Triodia wiseana* on rocky medium drainage
- E *Acacia trachycarpa* over *Triodia longiceps* and *Cyperus vaginatus* on sandy medium drainage
- F Mixed *Acacia* shrubland over *Triodia* species on minor drainage
- G *Acacia eriopoda* over *Triodia* spp. surrounding granite outcrops
- H *Indigofera monophylla* and other mixed shrubs over *Triodia wiseana* on hill crests and slopes
- I *Senna glutinosa* and *Acacia orthocarpa* over *Triodia epactia* on low stony hills
- X Disturbed areas with variety of vegetation



## Appendix XII    Site Fauna Records

## Appendix XII – Vertebrate fauna species recorded during the survey

Family	Scientific name	Common name	Record type		
			Opp	MDC	SM4
<b>Birds</b>					
Casuariidae	<i>Dromaius novaehollandiae</i>	Emu	1		
Anatidae	<i>Malacorhynchus membranaceus</i>	Pink-eared Duck	2		
Anatidae	<i>Anas superciliosa</i>	Pacific Black Duck	2		
Anatidae	<i>Anas gracilis</i>	Grey Teal	3		
Columbidae	<i>Geophaps plumifera</i>	Spinifex Pigeon	33	5	
Columbidae	<i>Ocyphaps lophotes</i>	Crested Pigeon	11	2	
Columbidae	<i>Geopelia cuneata</i>	Diamond Dove	11	4	
Columbidae	<i>Geopelia placida</i>	Peaceful Dove	2		
Cuculidae	<i>Centropus phasianinus</i>	Pheasant Coucal	1		
Cuculidae	<i>Chalcites basalis</i>	Horsfield's Bronze-Cuckoo	2		
Eurostopodidae	<i>Eurostopodus argus</i>	Spotted Nightjar	2		
Aegothelidae	<i>Aegotheles cristatus</i>	Australian Owlet-nightjar	1		
Recurvirostridae	<i>Himantopus leucocephalus</i>	Pied Stilt	1		
Charadriidae	<i>Elsemyornis melanops</i>	Black-fronted dotterel	10		
Charadriidae	<i>Vanellus miles</i>	Masked Lapwing	2		
Scolopacidae	<b><i>Actitis hypoleucos</i></b>	<b>Common Sandpiper</b> <small>BCA: MI, EPBC: MI</small>	1		
Turnicidae	<i>Turnix velox</i>	Little Button-quail	2		
Pelicanidae	<i>Pelecanus conspicillatus</i>	Australian Pelican	1		
Ardeidae	<i>Nycticorax caledonicus</i>	Nankeen Night-Heron	1		
Ardeidae	<i>Ardea pacifica</i>	White-necked Heron	3		
Ardeidae	<i>Egretta novaehollandiae</i>	White-faced Heron	2		
Accipitridae	<i>Aquila audax</i>	Wedge-tailed Eagle	3		
Accipitridae	<i>Circus assimilis</i>	Spotted Harrier	3		
Accipitridae	<i>Haliastur sphenurus</i>	Whistling Kite	6		
Strigidae	<i>Ninox boobook ocellata</i>	Western Boobook	1		
Meropidae	<i>Merops ornatus</i>	Rainbow Bee-eater	7		
Alcedinidae	<i>Todiramphus sanctus</i>	Sacred Kingfisher	3		
Alcedinidae	<i>Todiramphus pyrrhopygius</i>	Red-backed Kingfisher	2		
Alcedinidae	<i>Dacelo leachii</i>	Blue-winged Kookaburra	3		

Family	Scientific name	Common name	Record type		
			Opp	MDC	SM4
Falconidae	<i>Falco cenchroides</i>	Nankeen Kestrel	1		
Falconidae	<i>Falco berigora</i>	Brown Falcon	3		
Cacatuidae	<i>Nymphicus hollandicus</i>	Cockatiel	19		
Cacatuidae	<i>Eolophus roseicapilla</i>	Galah	23		
Cacatuidae	<i>Cacatua sanguinea</i>	Little Corella	12		
Psittaculidae	<i>Melopsittacus undulatus</i>	Budgerigar	4		
Ptilonorhynchidae	<i>Ptilonorhynchus guttatus</i>	Western bowerbird	1		
Maluridae	<i>Malurus lamberti</i>	Variegated Fairy-wren	4	2	
Maluridae	<i>Malurus leucopterus</i>	White-winged Fairy-wren	6		
Meliphagidae	<i>Lichmera indistincta</i>	Brown Honeyeater	7		
Meliphagidae	<i>Gavicalis virescens</i>	Singing Honeyeater	19		
Meliphagidae	<i>Ptilotula keartlandi</i>	Grey-headed Honeyeater	4	1	
Meliphagidae	<i>Ptilotula penicillata</i>	White-plumed Honeyeater	13	2	
Meliphagidae	<i>Manorina flavigula</i>	Yellow-throated Miner	11		
Pardalotidae	<i>Pardalotus rubricatus</i>	Red-browed Pardalote	6		
Acanthizidae	<i>Smicronis brevirostris</i>	Weebill	1		
Pomatostomidae	<i>Pomatostomus temporalis</i>	Grey-crowned Babbler	4		
Campephagidae	<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike	11		
Oreoicidae	<i>Oreoica gutturalis</i>	Crested Bellbird	1		
Artamidae	<i>Gymnorhina tibicen</i>	Australian Magpie	1		
Artamidae	<i>Cracticus nigrogularis</i>	Pied Butcherbird	6		
Artamidae	<i>Artamus cinereus</i>	Black-faced Woodswallow	8		
Rhipiduridae	<i>Rhipidura leucophrys</i>	Willie Wagtail	2	2	
Corvidae	<i>Corvus orru</i>	Torresian Crow	14	4	
Corvidae	<i>Corvus coronoides</i>	Australian raven	2		
Monarchidae	<i>Grallina cyanoleuca</i>	Magpie-lark	14	4	
Estrildidae	<i>Emblema pictum</i>	Painted Finch	35	4	
Estrildidae	<i>Taeniopygia guttata</i>	Zebra Finch	29	3	
Motacillidae	<i>Anthus novaeseelandiae</i>	Australasian Pipit	2		
Alaudidae	<i>Mirafra javanica</i>	Horsfield's Bushlark	2		
Locustellidae	<i>Cincloramphus mathewsi</i>	Rufous Songlark	1		
Locustellidae	<i>Poodytes carteri</i>	Spinifexbird	1		

Family	Scientific name	Common name	Record type		
			Opp	MDC	SM4
Hirundinidae	<i>Cheramoeca leucosterna</i>	White-backed Swallow	1		
Hirundinidae	<i>Petrochelidon ariel</i>	Fairy Martin	5		
Phylloscopidae	<i>Sericercus borealis</i>	Arctic Warbler	1		
<b>Mammals</b>					
Macropodidae	<i>Osphranter robustus</i>	Euro	3	3	
Macropodidae	<i>Osphranter rufus</i>	Red Kangaroo, Marlu	2		
Rhinonycteridae	<b><i>Rhinonictis aurantia</i></b> <b>(Pilbara)</b>	<b>Pilbara Leaf-nosed Bat</b> <sup>BCA: VU,</sup> <sup>EPBC: VU</sup>			1
Emballonuridae	<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tailed Bat			9
Emballonuridae	<i>Taphozous georgianus</i>	Common Sheath-tailed Bat			9
Molossidae	<i>Chaerephon jobensis</i>	Greater Northern Free-tailed Bat			9
Vespertilionidae	<i>Chalinolobus gouldii</i>	Gould's Wattled Bat			9
Vespertilionidae	<i>Nyctophilus geoffroyi</i>	Lesser Long-eared Bat			3
Vespertilionidae	<i>Scotorepens greyii</i>	Little Broad-nosed Bat			9
Vespertilionidae	<i>Vespadelus finlaysoni</i>	Finlayson's Cave Bat			9
Canidae	<i>Canis familiaris dingo</i>	Dingo	4		
Bovidae	<i>*Bos taurus</i>	European Cattle		1	
<b>Reptiles</b>					
Diplodactylidae	<i>Oedura fimbria</i>	Western Marbled Velvet Gecko	1		
Diplodactylidae	<i>Diplodactylus savagei</i>	Southern Pilbara Beak-faced Gecko	1		
Gekkonidae	<i>Gehyra punctata</i>	Spotted Rock Dtella	3		
Gekkonidae	<i>Gehyra variegata</i>	Variiegated gehyra	3		
Agamidae	<i>Ctenophorus caudicinctus</i>	Western Ring-tailed Dragon	6	2	
Agamidae	<i>Ctenophorus isolepis</i>	Central Military Dragon	5	1	
Agamidae	<i>Ctenophorus nuchalis</i>	Central Netted Dragon		1	
Agamidae	<i>Ctenophorus reticulatus</i>	Western Netted Dragon	1		
Agamidae	<i>Diporiphora pindan</i>	Pindan Dragon	1		
Agamidae	<i>Gowidon longirostris</i>	Long-nosed Dragon		2	
Agamidae	<i>Pogona minor</i>	Western Bearded Dragon	1		
Scincidae	<i>Ctenotus grandis</i>	Ctenotus grandis	1		
Scincidae	<i>Ctenotus pantherinus</i>	Leopard ctenotus		1	
Varanidae	<i>Varanus giganteus</i>	Perentie	1		
Varanidae	<i>Varanus pilbarensis</i>	Northern Pilbara Rock Goanna	1		

Family	Scientific name	Common name	Record type		
			Opp	MDC	SM4
Elapidae	<i>Demansia psammophis</i>	Yellow-faced whipsnake	1		
<b>Amphibians</b>					
Pelodyadidae	<i>Litoria rubella</i>	Little Red Tree Frog	1		

## Appendix XIII SM4 Analysis (Bat Call 2021)

## **Moolyella Pipeline, Pilbara WA,**

# **Acoustic Survey of Bat and Night Parrot Activity, September 2020.**

Prepared for Rapallo Environmental

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## Document Revision History

Issue	Date	Revision History
A	9 March 2021	Initial draft for Rapallo review
1	8 April 2021	First formal issue



## Summary

Bat and Night Parrot (*Pezoporus occidentalis*) presence is reported for twelve sites for the Moolyella Pipeline, in the Pilbara, WA. Rapallo carried out an echolocation-based survey in September 2020. Nine sites were surveyed for all bats present including Ghost bat social and ultrasonic calls. Three were surveyed using acoustic detectors set to record Night Parrot and Ghost bat social calls. Bat Call WA has reviewed the recordings made and provided species lists for the bats present.

Eight species of echolocating bats were confirmed present including the Pilbara leaf-nosed bat (*Rhinonicteris aurantia*) (PLNb) that is listed as vulnerable under both state and commonwealth legislation. PLNb presence was detected at five sites. All call times were consistent with foraging visits and none indicated nearby diurnal roosting sites. This result is consistent with the known population and dispersal of PLNb in the district.

No Ghost bats (*Macroderma gigas*) or Night Parrot calls were detected.

## Habitats

The sites for the survey were chosen by Rapallo. Details of the sites are presented in Table 1. The bat sites included each type of habitat present in the study area including an incised gully, drainage lines, spinifex plains, dams and the Narri Spring woodland. The locations are shown in relation to local features in Figure 1.

## Timing, Moon Phase and Weather

The echolocation survey was conducted between 25<sup>th</sup> to 29<sup>th</sup> September 2020.

The sampling evenings were hot and dry with minimum overnight temperatures around 20°C. No rain fell during the survey. The moon was between first quarter and full.

## Survey Team

Sites were chosen and detectors placed by Rapallo ecologists. Bob Bullen of Bat Call WA completed analysis of audio and echolocation recordings.

## Sampling

The bat survey consisted of completing a total of fifteen overnight ultrasonic bat sound recordings, beginning at twilight, at nine locations within the survey area. A total of five acoustic survey nights were completed at three sites for Night Parrot. The recordings were “continuous” (Hyder *et al.* 2010) made using ultrasonic SM4BAT-FS and acoustic SM4A SongMeter (both by Wildlife Acoustics Inc., USA) detectors. The audio settings used followed the manufacturer’s recommendations contained in the user manuals.

For the ultrasonic recordings, once reformatted as .wav files, COOL EDIT 2000 (now available as AUDITION from Adobe Systems Inc.) was used to display each sequence for identification. Calls were identified manually. Only good quality call sequences were used. Details of calls analysed are provided in Table 2 as recommended by Australasian Bat Society (ABS 2006). Reference data for the species identified are available in Bullen and McKenzie 2002, McKenzie and Bullen 2003 and McKenzie and Bullen 2009.

For the acoustic recordings, each was reviewed both manually and using an automatic scan technique for Night Parrot calls. Candidate calls were compared with the author’s confirmed reference calls from two Western Australian arid zone locations.

## Survey Limitations

The sites surveyed were accessible on foot and the detectors, using omnidirectional microphones, were set on the ground with the microphone vertical. Species are unlikely to be under-represented as a result.

Bat species density away from cave or adit entrances is impossible to estimate from echolocation records. Bat activity is therefore substituted as an approximate guide to the relative numbers of each species using the study area.

### **Results of bat fauna survey**

An assemblage of eight echolocating bat species was confirmed as present at the study sites including the PLNb, Table 4. Species activity levels were low to high, which is expected for the study area habitat and the times of year.

#### *PGB detections*

No PGB were detected during the survey

#### *PLNb detections*

PLNb presence was detected at five sites. All call times were consistent with foraging visits and none indicated nearby diurnal roosting sites. This result is consistent with the known population and dispersal of PLNb in the district. Known diurnal roosts are at the Klondyke Queen and Bow Bells historical underground mines.

#### *Common bat species detections*

Five common species, *Chaerephon jobensis*, *Chalinolobus gouldii*, *Scotorepens greyi*, *Taphozous hilli* and *Vespadelus finlaysoni* dominated bat presence in the area.

Taxonomy presented herein is after Reardon *et al.* (2014) and Jackson and Groves (2015).

### **Results of Night Parrot survey.**

No Night Parrot calls were detected.

## References

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- Reardon, T.B., McKenzie, N.L., Cooper, S.J., Appleton, B. Carthew, S. and Adams, M. (2014). A molecular and morphological investigation of species boundaries and phylogenetic relationships in Australian free-tailed bats *Mormopterus* (Chiroptera: Molossidae). *Australian Journal of Zoology*, available on-line 23 April 2014.

**Table 1: Microbat site specific details.** Coordinates are Zone 50K

	<b>Date</b>	<b>Recording Time &amp; SM unit</b>	<b>Habitat</b>	<b>Easting</b>	<b>Northing</b>
Site 1 (SM4-0043-200925)	25-26 Sept 20	Two overnight recordings using SM4BAT-FS-0043 recording at 384 kbps	Minor drainage line	799796	7649491
Site 2 (SM4-0043-200927)	27-28 Sept 20	Two overnight recordings using SM4BAT-FS-0043 recording at 384 kbps	Major drainage line	796933	7658709
Site 3 (SM4-0043-200929)	29 Sept 20	One overnight recording using SM4BAT-FS-0043 recording at 384 kbps	Stony Plain	796704	7654671
Site 4 (SM4-4031-200925)	25-26 Sept 20	Two overnight recordings using SM4BAT-FS 4031 recording at 384 kbps	Woodland at Narri Spring	802847	7645956
Site 5 (SM4-4031-200927)	27-28 Sept 20	Two overnight recordings using SM4BAT-FS-4031 recording at 384 kbps	Minor drainage line	802239	7637248
Site 6 (SM4-4031-200929)	29 Sept 20	One overnight recording using SM4BAT-FS-4031 recording at 384 kbps	Next to dam	798553	7660699
Site 10 (SM4-5458-200925)	25-26 Sept 20	Two overnight recordings using SM4BAT-FS-5458 recording at 384 kbps	Drainage line	801693	7641580
Site 11 (SM4-5458-200927)	27-28 Sept 20	Two overnight recordings using SM4BAT-FS-5458 recording at 384 kbps	Drainage line / incised gully	802379	7637368
Site 12 (SM4-5458-200929)	29 Sept 20	One overnight recording using SM4BAT-FS-5458 recording at 384 kbps	Next to dam	798037	7659918

**Table 2: Night Parrot site specific details.**

	<b>Date</b>	<b>Recording Time &amp; SM2 unit</b>	<b>Habitat</b>	<b>Easting</b>	<b>Northing</b>
Site 7 (SM4-5295-200925)	25-26 Sept 20	Two overnight recordings using SM4A-5295 recording at 44 kbps	Long unburnt Triodia lined drainage line	799794	7949491
Site 8 (SM4-5295-200927)	27-28 Sept 20	Two overnight recordings using SM4A-5295 recording at 44 kbps	Thin woodland over long unburnt Triodia on stony plain	797453	7658925
Site 9 (SM4-5295-200929)	29 Sept 20	One overnight recording using SM4A-5295 recording at 44 kbps	Low granite outcrop on large Stony Plain	796704	7654671

Note 1: Coordinates are Zone 50K

**Table 3: Summary of Echolocation call characteristics for microbat species present.**

Genus species Authority	Common name	Typical $F_{peak}$ kHz Note 1	Ave. $Q$ Note 1	Typical Duration msec	Typical Call Shape
<i>Chaerephon jobensis</i> (Miller 1902)	Northern free-tailed bat	22	5	8 - 15	Shallow FM
<i>Chalinolobus gouldii</i> (Grey 1841)	Gould's wattled bat	32	10	7 - 11	FM
<i>Nyctophilus geoffroyi</i> Leach 1821	Lesser long-eared bat	48	3	5	Steep FM
<i>Rhinonictoris aurantia</i> (Gray 1845)	Pilbara leaf-nosed bat	120	30	5 - 8	CF
<i>Saccolaimus flaviventris</i> (Peters 1867)	Yellow-bellied sheath-tailed bat	18	9	12 - 21	CF - FM
<i>Scotorepens greyii</i> (Gray 1843)	Little broad-nosed bat	38	10	7 - 13	FM
<i>Taphozous hilli</i> Thomas 1915	Hills sheath-tailed bat	26	14	9 - 18	CF- shallow FM
<i>Vespadelus finlaysoni</i> (Kitchener, Jones and Caputi 1987)	Inland cave bat	55	14	4 - 8	FM

Note 1:  $F_{peak}$  and  $Q$  are defined in McKenzie and Bullen 2003, 2009.

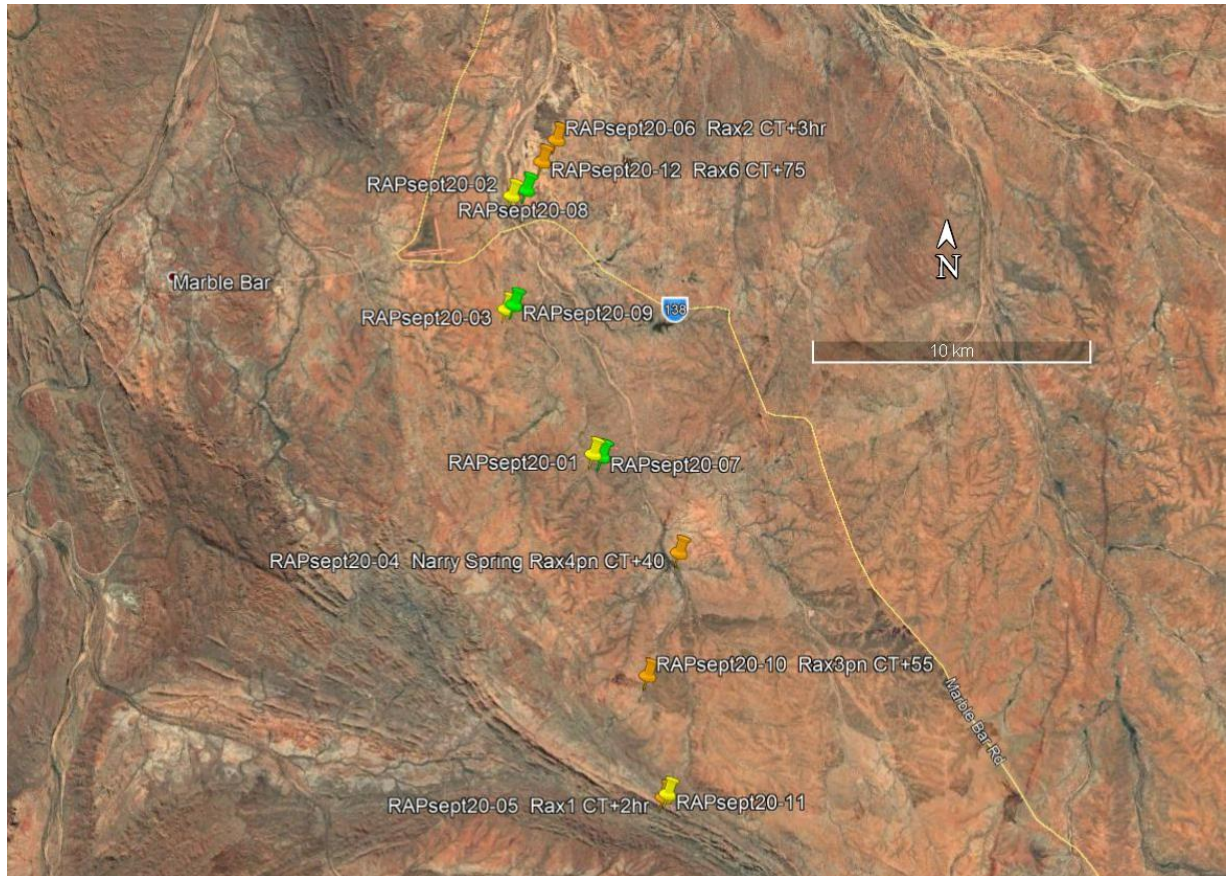
Note 2: Taxonomy follows Jackson and Groves (2015). *O. lumsdenae* was recently *Mormopterus beccarii*.

**Table 4: Survey microbat lists presented by site.**

Site	<i>Chaerephon jobensis</i>	<i>Chalinolobus gouldii</i>	<i>Nyctophilus geoffroyi</i>	<i>Rhinonictotis aurantia</i>	<i>Saccolaimus flaviventris</i>	<i>Scotorepens greyii</i>	<i>Taphozous spp</i>	<i>Vespadelus finlaysoni</i>
Site 1 (SM4-0043-200925)	Yes	Yes				Yes	Yes	Yes
Site 2 (SM4-0043-200927)	Yes	Yes			Yes	Yes		Yes
Site 3 (SM4-0043-200929)		Yes				Yes		Yes
Site 4 (SM4-4031-200925)	Yes	Yes	Yes	Yes	Yes		Yes	Yes
Site 5 (SM4-4031-200927)		Yes		Yes		Yes	Yes	Yes
Site 6 (SM4-4031-200929)	Yes	Yes		Yes	Yes	Yes	Yes	Yes
Site 10 (SM4-5458-200925)	Yes	Yes		Yes	Yes	Yes		Yes
Site 11 (SM4-5458-200927)	Yes	Yes				Yes		Yes
Site 12 (SM4-5458-200929)	Yes	Yes		Yes		Yes	Yes	Yes

Note: Both *Taphozous* species were detected. The majority of calls were *T. hilli*. *T georgianus* calls were also present at some sites

**Figure 1. Survey sites in relation to features in the study area. Yellow pins denote sites where microbat calls were recorded but no PLNb or PGb were detected. Orange pins denote sites where PLNb were recorded. Green pins denote sites where acoustic detectors were placed to record Night Parrot and Ghost bat social calls.**



## Appendix XIV Summary of flora relevé data



## Appendix XIV – Summary of relevé data

Site name	Scientific name	Status	Height (m)	Cover (%)
R005	<i>Acacia bivenosa</i>		2	2
	<i>Acacia eriopoda</i>		4	30
	<i>Acacia inaequilatera</i>		3	5
	<i>Arivela viscosa</i>		0.25	0.01
	<i>Bulbostylis barbata</i>		0.01	0.1
	<i>Fimbristylis dichotoma</i>		0.25	0.1
	<i>Pluchea tetranthera</i>		0.5	0.1
	<i>Sporobolus australasicus</i>		0.01	0.01
	<i>Triodia epactia</i>		0.6	20
	<i>Triodia longiceps</i>		0.7	2

Site name	Scientific name	Status	Height (m)	Cover (%)
R006	<i>Acacia eriopoda</i>		3.5	10
	<i>Arivela viscosa</i>		0.3	0.1
	<i>Bulbostylis barbata</i>		0.12	0.1
	<i>Grevillea wickhamii</i> subsp. <i>hispidula</i>		3	3
	<i>Sporobolus australasicus</i>		0.15	0.1
	<i>Trigastrotheca molluginea</i> F.Muell.		0.15	0.01
	<i>Triodia epactia</i>		0.4	25

Site name	Scientific name	Status	Height (m)	Cover (%)
R008	<i>Acacia inaequilatera</i>		3	3
	<i>Bonamia pilbarensis</i>		0.03	0.01
	<i>Corchorus parviflorus</i>		0.06	0.01
	<i>Corchorus</i> sp.		0.5	0.1
	<i>Grevillea pyramidalis</i> subsp. <i>leucadendron</i>		3	2
	<i>Hakea lorea</i> subsp. <i>lorea</i>		2	0.01
	<i>Triodia epactia</i>		0.6	35

Site name	Scientific name	Status	Height (m)	Cover (%)
R009	<i>Acacia ampliceps</i>	Facultative phreatophyte	1	0.1
	<i>Acacia bivenosa</i>		1.8	1
	<i>Acacia sclerosperma</i> subsp. <i>sclerosperma</i>		2.5	2
	<i>Acacia trachycarpa</i>		1.2	2
	<i>Corchorus parviflorus</i>		0.8	1
	<i>Cucumis variabilis</i>		Cl	0.01
	<i>Cullen leucanthum</i>		2	1
	<i>Cyperus vaginatus</i>		1	3
	<i>Dichrostachys spicata</i>		2	0.1
	<i>Grevillea pyramidalis</i> subsp. <i>leucadendron</i>		3	2
	<i>Hibiscus austrinus</i> var. <i>austrinus</i>		0.6	0.01
	<i>Ipomoea muelleri</i>		0.02	0.01

	<i>Pluchea ferdinandi - muelleri</i>		0.7	1
	<i>Pluchea rubelliflora</i>		0.2	0.01
	<i>Sida clementii</i>		0.8	0.1
	<i>Triodia longiceps</i>		0.6	10

Site name	Scientific name	Status	Height (m)	Cover (%)
R010	<i>Acacia bivenosa</i>		2	1
	<i>Acacia inaequilatera</i>		3.5	2
	<i>Corchorus parviflorus</i>		0.6	1
	<i>Grevillea pyramidalis subsp. leucadendron</i>		3	1
	<i>Grevillea wickhamii subsp. hispidula</i>		3	2
	<i>Triodia epactia</i>		0.4	30

Site name	Scientific name	Status	Height (m)	Cover (%)
R011	<i>Acacia ? Ligulata</i>		1.3	0.1
	<i>Acacia acradenia</i>		1.5	0.1
	<i>Acacia bivenosa</i>		2	2
	<i>Acacia inaequilatera</i>		2.5	5
	<i>Bulbostylis barbata</i>		0.05	1
	<i>Corchorus sp.</i>		0.6	0.01
	<i>Corymbia hamersleyana</i>		1.8	1
	<i>Eremophila latrobei subsp. glabra</i>		1.6	3
	<i>Eriachne mucronata</i>		0.3	0.1
	<i>Senna glutinosa subsp. glutinosa</i>		2.5	15
	<i>Tephrosia sp. B. Kimberley Flora (C.A. Gardner 7300)</i>		1.3	0.1
	<i>Triodia epactia</i>		0.7	0.01

Site name	Scientific name	Status	Height (m)	Cover (%)
R012	<i>*Calotropis procera</i>	weed	2	1
	<i>Acacia inaequilatera</i>		2	3
	<i>Corchorus parviflorus</i>		0.5	1
	<i>Cyperus vaginatus</i>		1	30
	<i>Dichrostachys spicata</i>		2.5	2
	<i>Eucalyptus camaldulensis subsp. ? refulgens</i>	Obligate phreatophyte	12	20
	<i>Eucalyptus victrix</i>	Facultative phreatophyte	10	10
	<i>Pluchea ferdinandi - muelleri</i>		0.6	2
	<i>Schoenoplectus subulatus</i>		1	5
	<i>Sporobolus actinocladius</i>		0.3	3

Site name	Scientific name	Status	Height (m)	Cover (%)
R013	<i>*Cenchrus ciliaris</i>	weed	0.1	6
	<i>Acacia inaequilatera</i>		2	10
	<i>Arivela viscosa</i>		0.3	3
	<i>Bulbostylis barbata</i>		0.12	4
	<i>Corchorus parviflorus</i>		0.25	3

	<i>Euphorbia australis</i> var. <i>subtomentosa</i>		0.15	5
	<i>Goodenia microptera</i>		0.2	0.1
	<i>Indigofera monophylla</i>		0.3	2
	<i>Senna notabilis</i>		0.4	1
	<i>Sida rohlenae</i> subsp. <i>rohlenae</i>		0.15	0.1
	<i>Solanum diversiflorum</i>		0.15	0.1
	<i>Trianthes pilosa</i>		0.05	0.1
	<i>Trigastrotheca molluginea</i> F.Muell.		0.15	15
	<i>Triodia epactia</i>		0.15	5
	<i>Triumfetta propinqua</i>		0.3	1

Site name	Scientific name	Status	Height (m)	Cover (%)
R014	<i>Acacia inaequilatera</i>		1.8	2
	<i>Acacia trachycarpa</i>		1.2	3
	<i>Cajanus pubescens</i>		1.2	0.1
	<i>Corchorus parviflorus</i>		0.5	3
	<i>Grevillea pyramidalis</i> subsp. <i>leucadendron</i>		3	10
	<i>Grevillea wickhamii</i> subsp. <i>hispidula</i>		3	10
	<i>Tephrosia supina</i>		0.5	0.01
	<i>Trigastrotheca molluginea</i> F.Muell.		0.15	0.1
	<i>Triodia epactia</i>		0.6	35
	<i>Triodia wiseana</i>		0.4	1

Site name	Scientific name	Status	Height (m)	Cover (%)
R015	<i>Acacia inaequilatera</i>		2.5	5
	<i>Corchorus parviflorus</i>		0.6	2
	<i>Grevillea pyramidalis</i> subsp. <i>leucadendron</i>		2.2	1
	<i>Grevillea wickhamii</i> subsp. <i>hispidula</i>		2	0.1
	<i>Pentalepis trichodesmoides</i> subsp. <i>trichodesmoides</i>		0.5	0.1
	<i>Salsola australis</i>		0.4	1
	<i>Triodia wiseana</i>		0.4	30

Site name	Scientific name	Status	Height (m)	Cover (%)
R016	<i>Acacia inaequilatera</i>		2	1
	<i>Cajanus pubescens</i>		1	10
	<i>Corchorus parviflorus</i>		1.1	3
	<i>Corymbia hamersleyana</i>		5	2
	<i>Cymbopogon ambiguus</i>		0.9	2
	<i>Grevillea pyramidalis</i> subsp. <i>leucadendron</i>		1	0.1
	<i>Indigofera monophylla</i>		0.8	1
	<i>Triodia wiseana</i>		0.5	25

Site name	Scientific name	Status	Height (m)	Cover (%)
R017	? <i>Indigofera</i> sp.		1.2	10
	<i>Acacia eriopoda</i>		2	2
	<i>Acacia pyrifolia</i> var. <i>morrisonii</i>		1.5	1
	<i>Adriana tomentosa</i> var. <i>tomentosa</i>		0.5	0.01
	<i>Corchorus parviflorus</i>		0.3	0.2
	<i>Corymbia hamersleyana</i>		7	15
	<i>Cymbopogon ambiguus</i>		0.25	15
	<i>Eucalyptus victrix</i>	Facultative phreatophyte	12	5
	<i>Euphorbia careyi</i>		0.2	0.1
	<i>Grevillea pyramidalis</i> subsp. <i>leucadendron</i>		2	0.1
	<i>Indigofera monophylla</i>		0.8	0.1
	<i>Petalostylis labicheoides</i>		1.6	3
	<i>Solanum</i> ? <i>phlomoides</i>		0.3	0.01
	<i>Triodia wiseana</i>		0.1	5

Site name	Scientific name	Status	Height (m)	Cover (%)
R018	* <i>Cenchrus ciliaris</i>	weed	0.15	3
	? <i>Indigofera</i> sp.		1.2	2
	<i>Acacia bivenosa</i>		1.5	0.1
	<i>Acacia colei</i> var. <i>colei</i>		2.5	0.1
	<i>Acacia eriopoda</i>		3	5
	<i>Adriana tomentosa</i> var. <i>tomentosa</i>		1.1	1
	<i>Atalaya hemiglauca</i>	Facultative phreatophyte	6	0.2
	<i>Chrysopogon fallax</i>		0.8	5
	<i>Corchorus parviflorus</i>		0.5	1
	<i>Corymbia ferritcola</i>		12	0.1
	<i>Corymbia hamersleyana</i>		10	15
	<i>Cymbopogon ambiguus</i>		0.9	1
	<i>Eucalyptus camaldulensis</i> subsp. ? <i>refulgens</i>	Obligate phreatophyte	12	1
	<i>Euphorbia careyi</i>		0.2	0.1
	<i>Gossypium australe</i>		0.3	0.01
	<i>Grevillea pyramidalis</i> subsp. <i>leucadendron</i>		1.8	0.01
	<i>Pentalepis trichodesmoides</i> subsp. <i>trichodesmoides</i>		0.9	1
	<i>Petalostylis labicheoides</i>		2	5
	<i>Trichodesma zeylanicum</i> var. <i>zeylanicum</i>		0.8	0.01
	<i>Triodia wiseana</i>		0.4	5

Site name	Scientific name	Status	Height (m)	Cover (%)
R037	* <i>Cenchrus ciliaris</i>	weed	0.2	8
	* <i>Chloris barbata</i>	weed	0.05	10
	<i>Acacia ampliceps</i>	Facultative phreatophyte	7	2
	<i>Cassipoupa capillaris</i>		Cl	5
	<i>Cyperus vaginatus</i>		1	25
	<i>Eucalyptus camaldulensis</i> subsp. ? <i>refulgens</i>	Obligate phreatophyte	14	20

	<i>Euphorbia trigonosperma</i>		0.2	0.01
	<i>Grevillea pyramidalis subsp. leucadendron</i>		2	2
	<i>Schoenoplectus subulatus</i>		0.8	0.1
	<i>Triodia longiceps</i>		0.4	10

Site name	Scientific name	Status	Height (m)	Cover (%)
R080	<i>Acacia inaequilatera</i>		1.5	0.1
	<i>Corchorus parviflorus</i>		0.4	1
	<i>Grevillea pyramidalis subsp. leucadendron</i>		1.2	0.2
	<i>Triodia wiseana</i>		0.4	30

Site name	Scientific name	Status	Height (m)	Cover (%)
R101	<i>Acacia bivenosa</i>		1.5	1
	<i>Acacia eriopoda</i>		3	4
	<i>Acacia inaequilatera</i>		4	4
	<i>Acacia stellaticeps</i>		0.8	2
	<i>Bulbostylis barbata</i>		0.05	x
	<i>Hakea lorea subsp. lorea</i>		1	x
	<i>Pluchea ferdinandi - muelleri</i>		1	x
	<i>Pluchea tetranthera</i>		0.7	x
	<i>Sporobolus australasicus</i>		0.1	x
	<i>Triodia longiceps</i>		0.5	40
	<i>Triodia wiseana</i>		0.4	

Site name	Scientific name	Status	Height (m)	Cover (%)
R102	<i>Acacia inaequilatera</i>		2.5	x
	<i>Acacia slerosperma subsp. sclerosperma</i>		1.7	1
	<i>Acacia stellaticeps</i>		1.1	3
	<i>Atalaya hemiglauca</i>	Facultative phreatophyte	2.5	8
	<i>Bulbostylis barbata</i>		0.05	x
	<i>Chrysopogon fallax</i>		0.3	x
	<i>Pluchea ferdinandi - muelleri</i>		1	x
	<i>Sclerolaena hostilis</i>		0.5	x
	<i>Triodia longiceps</i>		0.7	30

Site name	Scientific name	Status	Height (m)	Cover (%)
R103	<i>Acacia stellaticeps</i>		1	30
	<i>Sporobolus australasicus</i>		0.05	0.01
	<i>Triodia epactia</i>		0.3	5
	<i>Triodia longiceps</i>		0.7	5

Site name	Scientific name	Status	Height (m)	Cover (%)
R104	<i>Acacia ancistrocarpa</i>		3.5	3
	<i>Acacia bivenosa</i>		1.8	1
	<i>Acacia inaequilatera</i>		2.5	3
	<i>Acacia trachycarpa</i>		3	2
	<i>Arivela viscosa</i>		0.3	x
	<i>Bulbostylis barbata</i>		0.05	x
	<i>Corchorus sp.</i>		0.3	x
	<i>Eragrostis cumingii</i>		0.1	x
	<i>Grevillea wickhamii subsp. hispidula</i>		4	1
	<i>Senna glutinosa subsp. glutinosa</i>		0.5	x
	<i>Trigastrotheca molluginea F.Muell.</i>		0.3	x
	<i>Triodia epactia</i>		0.5	35

Site name	Scientific name	Status	Height (m)	Cover (%)
R105	<i>Acacia stellaticeps</i>		1	25
	<i>Arivela viscosa</i>		0.2	x
	<i>Sclerolaena hostilis</i>		0.9	x
	<i>Sporobolus australasicus</i>		0.05	x
	<i>Triodia epactia</i>		0.3	1
	<i>Triodia longiceps</i>		0.9	25

Site name	Scientific name	Status	Height (m)	Cover (%)
R106	<i>Acacia bivenosa</i>		1.3	5
	<i>Acacia inaequilatera</i>		4	2
	<i>Acacia stellaticeps</i>		0.6	0.5
	<i>Eragrostis eriopoda</i>		0.6	0.1
	<i>Grevillea pyramidalis subsp. leucadendron</i>		2	0.2
	<i>Hakea lorea subsp. lorea</i>		1.4	0.1
	<i>Heliotropium chrysocarpum</i>		0.5	0.1
	<i>Pluchea ferdinandi - muelleri</i>		1	0.5
	<i>Senna glutinosa subsp. glutinosa</i>		1.1	0.1
	<i>Triodia longiceps</i>		0.7	1
	<i>Triodia wiseana</i>		0.5	35

Site name	Scientific name	Status	Height (m)	Cover (%)
R107	<i>Arivela viscosa</i>		0.1	0.01
	<i>Eragrostis crateriformis</i>	P3	0.2	0.01
	<i>Sclerolaena hostilis</i>		0.5	0.1
	<i>Sporobolus australasicus</i>		0.05	0.1
	<i>Triodia longiceps</i>		0.8	20

Site name	Scientific name	Status	Height (m)	Cover (%)
R108	<i>Acacia bivenosa</i>		2	3
	<i>Acacia inaequilatera</i>		4	1
	<i>Pluchea ferdinandi - muelleri</i>		1	0.1
	<i>Sporobolus australasicus</i>		0.1	0.1
	<i>Triodia longiceps</i>		0.7	30

Site name	Scientific name	Status	Height (m)	Cover (%)
R109	<i>Acacia bivenosa</i>		2.5	5
	<i>Grevillea pyramidalis subsp. leucadendron</i>		2.5	1
	<i>Heliotropium chrysocarpum</i>		0.4	0.1
	<i>Indigofera monophylla</i>		0.7	0.1
	<i>Rhynchosia minima</i>			0.1
	<i>Triodia epactia</i>		1	35
	<i>Triodia wiseana</i>		0.5	1
	<i>Triumfetta propinqua</i>		0.6	0.1

Site name	Scientific name	Status	Height (m)	Cover (%)
R110	<i>Acacia ancistrocarpa</i>		2.2	5
	<i>Acacia inaequilatera</i>		2.5	5
	<i>Arivela viscosa</i>		0.3	0.01
	<i>Corchorus sp.</i>		0.7	0.1
	<i>Eragrostis eriopoda</i>		0.3	0.02
	<i>Eriachne pulchella subsp. dominii</i>		0.1	0.1
	<i>Gossypium australe</i>		0.9	0.1
	<i>Grevillea pyramidalis subsp. leucadendron</i>		2.1	1
	<i>Indigofera monophylla</i>		0.5	0.1
	<i>Olearia stuartii</i>		0.4	0.01
	<i>Pluchea ferdinandi - muelleri</i>		1	0.1
	<i>Pluchea tetranthera</i>		1	0.1
	<i>Sida clementii</i>		1	0.01
	<i>Sporobolus australasicus</i>		0.05	0.01
	<i>Trigastrotheca molluginea F. Muell.</i>		0.2	0.01
	<i>Triodia epactia</i>		0.4	40
	<i>Triumfetta propinqua</i>		0.8	0.1

Site name	Scientific name	Status	Height (m)	Cover (%)
R111	<i>Acacia ancistrocarpa</i>		2.5	1
	<i>Acacia eriopoda</i>		3.5	1
	<i>Acacia inaequilatera</i>		2.5	3
	<i>Acacia stellaticeps</i>		0.7	8
	<i>Arivela viscosa</i>		0.3	0.01
	<i>Bonamia erecta</i>		0.2	0.01
	<i>Chrysopogon fallax</i>		0.5	0.1
	<i>Corchorus parviflorus</i>		0.8	0.5

	<i>Eragrostis eriopoda</i>		0.3	0.1
	<i>Grevillea wickhamii</i> subsp. <i>hispidula</i>		3	2
	<i>Hakea lorea</i> subsp. <i>lorea</i>		3	1
	<i>Heliotropium cunninghamii</i>		0.2	0.1
	<i>Indigofera monophylla</i>		0.4	0.4
	<i>Pluchea tetranthera</i>		0.5	0.1
	<i>Solanum ? horridum</i>		0.2	0.01
	<i>Solanum diversiflorum</i>		0.2	0.01
	<i>Trigastrotheca molluginea</i> F.Muell.		0.2	0.01
	<i>Triodia epactia</i>		0.4	35

Site name	Scientific name	Status	Height (m)	Cover (%)
R112	<i>Acacia ancistrocarpa</i>		0.1	0.1
	<i>Acacia eriopoda</i>			0.5
	<i>Acacia inaequilatera</i>		0.8	0.5
	<i>Acacia orthocarpa</i>		3.5	10
	<i>Bonamia erecta</i>		1.8	0.01
	<i>Bulbostylis barbata</i>		0.3	0.1
	<i>Cassutha capillaris</i>		0.4	0.1
	<i>Corchorus parviflorus</i>		1.5	0.1
	<i>Dampiera candidans</i>		1.8	0.01
	<i>Goodenia stobbsiana</i>		0.25	0.01
	<i>Grevillea wickhamii</i> subsp. <i>hispidula</i>			0.5
	<i>Senna glutinosa</i> subsp. <i>glutinosa</i>		0.7	0.1
	<i>Triodia epactia</i>		0.4	30

Site name	Scientific name	Status	Height (m)	Cover (%)
R113	<i>Acacia inaequilatera</i>		1.2	2
	<i>Acacia sclerosperma</i> subsp. <i>sclerosperma</i>		1.6	0.5
	<i>Pluchea ferdinandi - muelleri</i>		1	0.5
	<i>Sclerolaena hostilis</i>		0.4	0.5
	<i>Sporobolus australasicus</i>		0.1	0.1
	<i>Triodia longiceps</i>		0.7	50

Site name	Scientific name	Status	Height (m)	Cover (%)
R114	<i>Acacia bivenosa</i>		2.5	5
	<i>Acacia inaequilatera</i>		3	5
	<i>Acacia sclerosperma</i> subsp. <i>sclerosperma</i>		1.8	2
	<i>Hakea lorea</i> subsp. <i>lorea</i>		2.5	0.2
	<i>Triodia wiseana</i>		0.5	40

Site name	Scientific name	Status	Height (m)	Cover (%)
R117	* <i>Calotropis procera</i>	weed	2.5	0.5
	<i>Acacia ampliceps</i>	Facultative phreatophyte	1	0.1
	<i>Acacia pyrifolia</i> var. <i>morrisonii</i>		1	0.1



	<i>Acacia trachycarpa</i>		1.6	6
	<i>Arivela viscosa</i>		0.1	0.01
	<i>Cyperus vaginatus</i>		1.1	5
	<i>Dichrostachys spicata</i>		2.5	0.5
	<i>Melaleuca argentea</i>	Obligate phreatophyte	4.5	1
	<i>Pluchea rubelliflora</i>		0.9	0.1
	<i>Triodia longiceps</i>		1.1	10

Site name	Scientific name	Status	Height (m)	Cover (%)
R118	<i>Acacia ancistrocarpa</i>		2.2	5
	<i>Acacia inaequilatera</i>		2	2
	<i>Arivela viscosa</i>		0.2	0.01
	<i>Bonamia erecta</i>		0.1	0.01
	<i>Bulbostylis barbata</i>		0.05	0.01
	<i>Eriachne pulchella subsp. dominii</i>		0.05	0.01
	<i>Grevillea wickhamii subsp. hispidula</i>		3	2
	<i>Polycarpaea holtzei</i>		0.01	0.01
	<i>Sporobolus australasicus</i>		0.1	0.01
	<i>Triodia epactia</i>		0.3	25

Site name	Scientific name	Status	Height (m)	Cover (%)
R119	<i>*Cenchrus ciliaris</i>	weed		
	<i>Acacia pyrifolia var. morrisonii</i>			
	<i>Arivela viscosa</i>			
	<i>Bulbostylis barbata</i>			
	<i>Chrysopogon fallax</i>			
	<i>Corchorus parviflorus</i>			
	<i>Dichrostachys spicata</i>			
	<i>Eragrostis cumingii</i>			
	<i>Euphorbia australis var. subtomentosa</i>			
	<i>Olearia stuartii</i>			
	<i>Pluchea ferdinandi - muelleri</i>			
	<i>Senna notabilis</i>			
	<i>Solanum diversiflorum</i>			
	<i>Sporobolus australasicus</i>			
	<i>Triodia longiceps</i>			

Site name	Scientific name	Status	Height (m)	Cover (%)
R120	<i>Acacia ancistrocarpa</i>			
	<i>Acacia inaequilatera</i>			
	<i>Arivela viscosa</i>			
	<i>Eriachne pulchella subsp. dominii</i>			
	<i>Sporobolus australasicus</i>			
	<i>Trigastrotheca molluginea F.Muell.</i>			
	<i>Triodia epactia</i>			

Site name	Scientific name	Status	Height (m)	Cover (%)
R204	<i>*Cenchrus ciliaris</i>	weed	0.05	5
	<i>Acacia inaequilatera</i>		4.5	1
	<i>Acacia pyrifolia var. morrisonii</i>		3	3
	<i>Acacia trachycarpa</i>		2.5	5
	<i>Atalaya hemiglauc</i>	Facultative phreatophyte	4.5	3
	<i>Cyperus vaginatus</i>		1	3
	<i>Dichrostachys spicata</i>		3.5	5
	<i>Melaleuca argentea</i>	Obligate phreatophyte	7	3
	<i>Triodia longiceps</i>		0.9	15

Site name	Scientific name	Status	Height (m)	Cover (%)
R205	<i>Acacia bivenosa</i>		1.1	1
	<i>Acacia inaequilatera</i>		2.5	1
	<i>Acacia orthocarpa</i>		3.5	5
	<i>Arivela viscosa</i>		0.3	0.02
	<i>Bulbostylis barbata</i>		0.1	0.05
	<i>Corchorus parviflorus</i>		0.8	0.5
	<i>Cymbopogon ambiguus</i>		0.3	0.1
	<i>Grevillea pyramidalis subsp. leucadendron</i>		3	1
	<i>Grevillea wickhamii subsp. hispidula</i>		3.5	2
	<i>Indigofera monophylla</i>		0.2	0.1
	<i>Polycarpaea holtzei</i>		0.01	0.05
	<i>Senna glutinosa subsp. glutinosa</i>		0.7	0.01
	<i>Solanum ? horridum</i>		0.1	0.01
	<i>Tephrosia sp. B. Kimberley Flora (C.A. Gardner 7300)</i>		1.2	0.1
	<i>Trichodesma zeylanicum var. zeylanicum</i>		1	0.01
	<i>Trigastrotheca molluginea F.Muell.</i>		0.1	0.02
	<i>Triodia epactia</i>		0.3	28

Site name	Scientific name	Status	Height (m)	Cover (%)
R206	<i>*Cenchrus ciliaris</i>	weed	0.1	0.2
	<i>Acacia synchronicia</i>		2.5	4
	<i>Dichrostachys spicata</i>		1	0.1
	<i>Sporobolus australasicus</i>		0.1	0.1
	<i>Triodia epactia</i>		0.2	5
	<i>Triodia longiceps</i>		0.4	3

Site name	Scientific name	Status	Height (m)	Cover (%)
R207	<i>*Cenchrus ciliaris</i>	weed	0.1	3
	<i>Acacia inaequilatera</i>		3.5	5
	<i>Acacia pyrifolia var. morrisonii</i>		2	1
	<i>Acacia synchronicia</i>		3.5	20
	<i>Acacia trachycarpa</i>		2.5	5
	<i>Arivela viscosa</i>		0.3	0.01

	<i>Atalaya hemiglauca</i>	Facultative phreatophyte	4.5	1
	<i>Chrysopogon fallax</i>		0.5	1
	<i>Euphorbia australis var. subtomentosa</i>		0.1	0.1
	<i>Gossypium australe</i>		1	0.1
	<i>Sporobolus australasicus</i>		0.05	0.1
	<i>Stemodia ? grossa</i>		0.2	0.01
	<i>Triodia longiceps</i>		0.9	20
	<i>Triodia wiseana</i>		0.5	10

Site name	Scientific name	Status	Height (m)	Cover (%)
R208	* <i>Calotropis procera</i>	weed	1.2	1
	<i>Acacia trachycarpa</i>		3	2
	<i>Cyperus vaginatus</i>		1	2
	<i>Erythrina vespertilio</i>		10	1
	<i>Eucalyptus camaldulensis subsp. ? refulgens</i>	Obligate phreatophyte	12	5
	<i>Melaleuca argentea</i>	Obligate phreatophyte	12	10

Site name	Scientific name	Status	Height (m)	Cover (%)
R209	* <i>Calotropis procera</i>	weed	3	5
	* <i>Cenchrus ciliaris</i>	weed	0.1	25
	<i>Acacia trachycarpa</i>		4	5
	<i>Arivela viscosa</i>		0.3	0.1
	<i>Atalaya hemiglauca</i>	Facultative phreatophyte	6	2
	<i>Citrullus colocynthis</i>		0.05	0.5
	<i>Crotalaria cunninghamii</i>		1.1	0.1
	<i>Dichrostachys spicata</i>		3	5
	<i>Eucalyptus camaldulensis subsp. ? refulgens</i>	Obligate phreatophyte	6	2
	<i>Euphorbia australis var. subtomentosa</i>		0.1	0.2

Site name	Scientific name	Status	Height (m)	Cover (%)
R300	? <i>Aristida sp.</i>		0.1	0.01
	<i>Acacia ancistrocarpa</i>		2.5	1
	<i>Acacia inaequilatera</i>		2.5	5
	<i>Bulbostylis barbata</i>		0.05	0.1
	<i>Corchorus parviflorus</i>		0.5	0.1
	<i>Cucumis variabilis</i>		Cl	0.1
	<i>Goodenia stobbsiana</i>		0.7	0.01
	<i>Gossypium australe</i>		0.7	0.01
	<i>Grevillea pyramidalis subsp. leucadendron</i>		2.5	1.5
	<i>Grevillea wickhamii subsp. hispidula</i>		3	1
	<i>Triodia epactia</i>		0.5	35

Site name	Scientific name	Status	Height (m)	Cover (%)
R301	<i>Acacia ancistrocarpa</i>		1.6	0.1
	<i>Acacia inaequilatera</i>		3	5

	<i>Corchorus parviflorus</i>		0.5	1
	<i>Grevillea pyramidalis subsp. leucadendron</i>		2.5	3.5
	<i>Sporobolus australasicus</i>		0.05	0.1
	<i>Triodia epactia</i>		0.5	35

Site name	Scientific name	Status	Height (m)	Cover (%)
R302	<i>Acacia ancistrocarpa</i>		2.5	0.5
	<i>Acacia inaequilatera</i>		2.5	3
	<i>Acacia trachycarpa</i>		2.5	1.5
	<i>Corchorus parviflorus</i>		1	0.1
	<i>Corymbia hamersleyana</i>		3	1
	<i>Hakea lorea subsp. lorea</i>		2	0.2
	<i>Triodia epactia</i>		0.4	15
	<i>Triodia wiseana</i>		0.3	20

Site name	Scientific name	Status	Height (m)	Cover (%)
R303	<i>Acacia inaequilatera</i>		2.5	5
	<i>Acacia trachycarpa</i>		1.2	0.1
	<i>Corchorus parviflorus</i>		0.5	0.2
	<i>Corymbia hamersleyana</i>		3	1
	<i>Pluchea ferdinandi - muelleri</i>		1	0.1
	<i>Triodia wiseana</i>		0.4	35

Site name	Scientific name	Status	Height (m)	Cover (%)
R304	* <i>Calotropis procera</i>	weed	1.8	0.1
	* <i>Cenchrus ciliaris</i>	weed	0.1	5
	<i>Acacia trachycarpa</i>		1.3	4
	<i>Cyperus vaginatus</i>		1	5
	<i>Dichrostachys spicata</i>		2.2	3
	<i>Eucalyptus camaldulensis subsp. ? refulgens</i>	Obligate phreatophyte	12	8
	<i>Melaleuca argentea</i>	Obligate phreatophyte	8	4
	<i>Pluchea ferdinandi - muelleri</i>		0.3	10
	<i>Triodia longiceps</i>		1.1	10

Site name	Scientific name	Status	Height (m)	Cover (%)
R305	* <i>Cenchrus ciliaris</i>	weed	0.1	5
	<i>Acacia pyrifolia var. morrisonii</i>		2	1
	<i>Atalaya hemiglauca</i>	Facultative phreatophyte	1.8	2
	<i>Corchorus parviflorus</i>		0.5	0.5
	<i>Euphorbia australis var. subtomentosa</i>		0.2	0.01
	<i>Grevillea pyramidalis subsp. leucadendron</i>		2.2	0.5
	<i>Triodia longiceps</i>		0.9	20
	<i>Triodia wiseana</i>		0.5	5

Site name	Scientific name	Status	Height (m)	Cover (%)
R306	<i>Acacia inaequilatera</i>		0.5	0.5
	<i>Acacia pyrifolia</i> var. <i>morrisonii</i>		2	2.5
	<i>Arivela viscosa</i>		0.3	0.01
	<i>Atalaya hemiglauca</i>	Facultative phreatophyte	2.5	1.5
	<i>Corchorus parviflorus</i>		0.7	0.1
	<i>Eremophila latrobei</i> subsp. <i>glabra</i>		1	0.5
	<i>Eriachne mucronata</i>		0.3	5
	<i>Grevillea wickhamii</i> subsp. <i>hispidula</i>		2.5	1
	<i>Rhynchosia minima</i>		Cl	0.1
	<i>Senna artemisioides</i> subsp. <i>oligophylla</i>		1.3	1
	<i>Senna glutinosa</i> subsp. <i>glutinosa</i>		1.8	1
	<i>Triodia epactia</i>		0.5	5
	<i>Triodia wiseana</i>		0.3	10

Site name	Scientific name	Status	Height (m)	Cover (%)
R307	* <i>Cenchrus ciliaris</i>	weed	0.1	3
	<i>Acacia ampliceps</i>	Facultative phreatophyte	1	0.1
	<i>Acacia pyrifolia</i> var. <i>morrisonii</i>		1.1	1
	<i>Acacia trachycarpa</i>		3	6
	<i>Crotalaria cunninghamii</i>		1.8	0.1
	<i>Cyperus vaginatus</i>		1	1
	<i>Stemodia</i> ? <i>grossa</i>		0.1	0.1
	<i>Triodia longiceps</i>		1	20

Site name	Scientific name	Status	Height (m)	Cover (%)
R308	* <i>Cenchrus ciliaris</i>	weed	0.1	5
	<i>Acacia ampliceps</i>	Facultative phreatophyte	4.5	1
	<i>Acacia pyrifolia</i> var. <i>morrisonii</i>		2	1
	<i>Acacia trachycarpa</i>		1.8	2
	<i>Cajanus pubescens</i>		1.8	0.5
	<i>Crotalaria cunninghamii</i>		2.5	1.5
	<i>Cyperus vaginatus</i>		1	0.1
	<i>Dichrostachys spicata</i>		2.5	5
	<i>Hakea lorea</i> subsp. <i>lorea</i>		3	1
	<i>Hibiscus austrinus</i> var. <i>austrinus</i>		0.7	0.1
	<i>Senna notabilis</i>		0.2	0.01
	<i>Triodia longiceps</i>		1	20

Site name	Scientific name	Status	Height (m)	Cover (%)
R309	<i>Acacia ancistrocarpa</i>		1.3	0.1
	<i>Acacia inaequilatera</i>		3	3
	<i>Acacia pyrifolia</i> var. <i>morrisonii</i>		2.2	0.1
	<i>Corchorus parviflorus</i>		0.9	0.1
	<i>Cucumis variabilis</i>		Cl	0.1

	<i>Grevillea pyramidalis</i> subsp. <i>leucadendron</i>		3	1
	<i>Hakea lorea</i> subsp. <i>lorea</i>		2.5	0.1
	<i>Tephrosia supina</i>		0.5	0.1
	<i>Triodia epactia</i>		0.4	35

Site name	Scientific name	Status	Height (m)	Cover (%)
R310	<i>Acacia eriopoda</i>		3	5
	<i>Acacia inaequilatera</i>		2	1
	<i>Chrysopogon fallax</i>		0.4	0.1
	<i>Corchorus parviflorus</i>		0.9	5
	<i>Corymbia hamersleyana</i>		6	1
	<i>Senna notabilis</i>		0.4	0.01
	<i>Sporobolus australasicus</i>		0.1	0.01
	<i>Tephrosia supina</i>		0.2	0.01
	<i>Trigastrotheca molluginea</i> F.Muell.		0.3	0.01
	<i>Triodia epactia</i>		0.3	0.1
	<i>Triodia longiceps</i>		0.9	10
	<i>Triodia wiseana</i>		0.5	10
	<i>Triumfetta propinqua</i>		0.5	0.1

Site name	Scientific name	Status	Height (m)	Cover (%)
R311	<i>Acacia inaequilatera</i>		1.8	1
	<i>Corchorus parviflorus</i>		0.7	15
	<i>Ptilotus axillaris</i>		0.01	0.01
	<i>Sida clementii</i>		0.9	0.01
	<i>Solanum diversiflorum</i>		0.3	0.01
	<i>Tephrosia</i> sp. Bungaroo Creek (M.E. Trudgen 11601)		0.3	0.2
	<i>Trigastrotheca molluginea</i> F.Muell.		0.3	0.01
	<i>Triodia wiseana</i>		0.5	15

Site name	Scientific name	Status	Height (m)	Cover (%)
R312	* <i>Cenchrus ciliaris</i>	weed	0.1	0.5
	<i>Acacia ampliceps</i> x <i>sclerosperma</i> subsp. <i>sclerosperma</i>	Facultative phreatophyte	2	0.5
	<i>Acacia trachycarpa</i>		3	10
	<i>Arivela viscosa</i>		0.4	0.01
	<i>Cajanus pubescens</i>		1	0.1
	<i>Chrysopogon fallax</i>		0.2	0.1
	<i>Crotalaria cunninghamii</i>		2.2	1
	<i>Cyperus vaginatus</i>		1	0.1
	<i>Eragrostis cumingii</i>		0.01	0.02
	<i>Euphorbia australis</i> var. <i>subtomentosa</i>		0.2	0.02
	<i>Hakea lorea</i> subsp. <i>lorea</i>		1.9	0.1
	<i>Pluchea ferdinandi</i> - <i>muelleri</i>		1	2
	<i>Senna venusta</i>		1.1	0.1

	<i>Tephrosia supina</i>		0.3	0.1
	<i>Trigastrotheca molluginea</i> F.Muell.		0.3	0.01
	<i>Triodia longiceps</i>		0.6	2
	<i>Triumfetta propinqua</i>		0.4	0.01

Site name	Scientific name	Status	Height (m)	Cover (%)
R313	<i>Acacia inaequilatera</i>		1.6	0.5
			1.8	2
	<i>Arivela viscosa</i>		0.3	0.1
	<i>Bulbostylis barbata</i>		0.05	0.05
	<i>Corchorus parviflorus</i>		0.4	3
	<i>Crotalaria cunninghamii</i>		1.3	0.01
	<i>Euphorbia australis</i> var. <i>subtomentosa</i>		0.2	0.01
	<i>Grevillea pyramidalis</i> subsp. <i>leucadendron</i>		3	1
	<i>Polycarpaea corymbosa</i>		0.1	0.01
	<i>Sporobolus australasicus</i>		0.1	0.01
	<i>Tephrosia supina</i>		0.3	0.01
	<i>Tephrosia uniovoluta</i>		0.2	0.01
	<i>Trigastrotheca molluginea</i> F.Muell.		0.2	0.01
	<i>Triodia epactia</i>		0.3	15
	<i>Triumfetta propinqua</i>		0.4	0.01

Site name	Scientific name	Status	Height (m)	Cover (%)
R314	* <i>Argemone mexicana</i>	weed	0.1	0.01
	* <i>Cenchrus ciliaris</i>	weed	0.1	5
	* <i>Chloris barbata</i>	weed	0.1	3
	<i>Acacia ampliceps</i>	Facultative phreatophyte	1.1	0.5
	<i>Acacia trachycarpa</i>		1.5	0.1
	<i>Atalaya hemiglaucata</i>	Facultative phreatophyte	2.1	0.1
	<i>Cassipourea capillaris</i>		Cl	0.1
	<i>Crotalaria cunninghamii</i>		1	0.1
	<i>Cyperus vaginatus</i>		6	2
	<i>Eucalyptus camaldulensis</i> subsp. ? <i>refulgens</i>	Obligate phreatophyte	10	10
	<i>Euphorbia australis</i> var. <i>subtomentosa</i>		0.3	0.01
	<i>Melaleuca argentea</i>	Obligate phreatophyte	10	10
	<i>Melaleuca glomerata</i>	Facultative phreatophyte	3.5	15
	<i>Senna notabilis</i>		0.3	0.1
	<i>Stemodia ? grossa</i>		0.1	0.01
	<i>Triodia longiceps</i>		1	10

Site name	Scientific name	Status	Height (m)	Cover (%)
R328	* <i>Calotropis procera</i>	weed	2.1	0.3
	* <i>Cenchrus ciliaris</i>	weed	0.1	20
	<i>Acacia ampliceps</i>	Facultative phreatophyte	1.1	0.1
	<i>Acacia trachycarpa</i>		3.5	1

	<i>Cyperus vaginatus</i>		1.2	8
	<i>Dichrostachys spicata</i>		1.2	0.4
	<i>Eucalyptus camaldulensis</i> subsp. ? <i>refulgens</i>	Obligate phreatophyte	11	25
	<i>Gossypium australe</i>		1	0.01
	<i>Pluchea ferdinandi</i> - <i>muelleri</i>		0.3	0.01
	<i>Pluchea rubelliflora</i>		0.5	0.01
	<i>Triodia longiceps</i>		1	10

Site name	Scientific name	Status	Height (m)	Cover (%)
R329	<i>Acacia bivenosa</i>		0.3	0.1
	<i>Acacia inaequilatera</i>		2.3	5
	<i>Acacia pyrifolia</i> var. <i>morrisonii</i>		1	1
	<i>Arivela viscosa</i>		0.3	0.1
	<i>Corchorus parviflorus</i>		0.3	5
	<i>Dolichocarpa crouchiana</i>		0.1	0.01
	<i>Grevillea pyramidalis</i> subsp. <i>leucadendron</i>		0.5	0.1
	<i>Heliotropium cunninghamii</i>		0.2	0.1
	<i>Ptilotus auriculifolius</i>		0.5	0.02
	<i>Ptilotus axillaris</i>		0.2	0.01
	<i>Senna notabilis</i>		0.5	0.1
	<i>Triodia wiseana</i>		0.3	15

Site name	Scientific name	Status	Height (m)	Cover (%)
R330	<i>Acacia eriopoda</i>		2.5	15
	<i>Acacia maitlandii</i>		2.5	0.2
	<i>Bulbostylis barbata</i>		0.05	0.1
	<i>Eriachne pulchella</i> subsp. <i>dominii</i>		0.1	0.1
	<i>Fimbristylis dichtoma</i>		0.1	0.1
	<i>Grevillea wickhamii</i> subsp. <i>hispidula</i>		2.5	0.5
	<i>Triodia epactia</i>		0.5	30

Site name	Scientific name	Status	Height (m)	Cover (%)
R331	* <i>Aerva javanica</i>	weed	0.8	0.2
	<i>Arivela viscosa</i>		0.3	0.1
	<i>Cucumis variabilis</i>		Cl	0.05
	<i>Cymbopogon ambiguus</i>		0.3	0.1
	<i>Eriachne mucronata</i>		0.3	1
	<i>Euphorbia careyi</i>		0.3	0.1
	<i>Gomphrena cunninghamii</i>		0.2	0.2
	<i>Gossypium australe</i>		0.6	0.1
	<i>Indigofera monophylla</i>		0.5	0.3
	<i>Tribulus suberosus</i>		0.6	0.5
	<i>Triodia wiseana</i>		0.4	25



Site name	Scientific name	Status	Height (m)	Cover (%)
R332	<i>Acacia ancistrocarpa</i>		1.8	2
	<i>Acacia bivenosa</i>		1.2	1
	<i>Acacia inaequilatera</i>		2	2
	<i>Arivela viscosa</i>		0.1	0.01
	<i>Eriachne pulchella</i> subsp. <i>dominii</i>		0.1	0.2
	<i>Grevillea wickhamii</i> subsp. <i>hispidula</i>		2.5	2
	<i>Hakea lorea</i> subsp. <i>lorea</i>		3	1
	<i>Trigastrotheca molluginea</i> F.Muell.		0.1	0.1
	<i>Triodia epactia</i>		0.5	30

Site name	Scientific name	Status	Height (m)	Cover (%)
R333	<i>Acacia eriopoda</i>		3.5	2
	<i>Acacia inaequilatera</i>		2.5	3
	<i>Acacia maitlandii</i>		2	1
	<i>Arivela viscosa</i>		0.1	0.1
	<i>Grevillea wickhamii</i> subsp. <i>hispidula</i>		3.5	1
	<i>Josephinia</i> sp. Mt Edgar Station (N.T. Burbidge 1194)		0.3	0.1
	<i>Sporobolus australasicus</i>		0.1	0.1
	<i>Trigastrotheca molluginea</i> F.Muell.		0.3	0.1
	<i>Triodia epactia</i>		0.5	30

Site name	Scientific name	Status	Height (m)	Cover (%)
R334	<i>Acacia inaequilatera</i>		2.1	4
	<i>Corchorus parviflorus</i>		0.5	1
	<i>Cucumis variabilis</i>		Cl	0.01
	<i>Eragrostis eriopoda</i>		0.2	0.02
	<i>Euphorbia australis</i> var. <i>subtomentosa</i>		0.3	0.01
	<i>Gossypium australe</i>		0.3	0.01
	<i>Grevillea wickhamii</i> subsp. <i>hispidula</i>		2.5	10
	<i>Indigofera monophylla</i>		0.5	1
	<i>Josephinia</i> sp. Mt Edgar Station (N.T. Burbidge 1194)		0.3	1
	<i>Tephrosia supina</i>		0.4	0.1
	<i>Trigastrotheca molluginea</i> F.Muell.		0.2	0.01
	<i>Triodia epactia</i>		0.5	40
	<i>Triumfetta propinqua</i>		0.4	0.01

## Assessment of the Ten Clearing Principles

### Potential Impact on a High Level of Biological Diversity

- a. *Native vegetation should not be cleared if it comprises a high level of biological diversity.*

#### Flora and Vegetation

The reconnaissance flora and vegetation survey of the Moolyella pipeline corridor recorded 115 flora taxa from 28 different families. These included 110 native taxa and six introduced taxa (weeds). The most well-represented families were Fabaceae (35 taxa), Poaceae (16 taxa), Malvaceae (7 taxa) and Myrtaceae (6 taxa) (Rapallo 2021).

The vegetation of the corridor comprises a variation of spinifex (*Triodia* spp.) grasslands, mostly on stony or sandy plains, with an overstorey of mixed shrubs and small trees dominated by *Acacia* species that define each vegetation type. Major, medium, and minor creek lines intersect the plains, with the major and medium creek lines supporting a variety of groundwater dependent flora species ) (Rapallo 2021).

The vegetation of the corridor is not highly diverse with a total of 9 vegetation types that are known and can be expected to occur outside of the corridor. The Pilbara bioregion is not known for a high level of biological diversity, in terms of flora and vegetation in comparison to other parts of Western Australia such as the northern sandplains region in the vicinity of Eneabba.

The proposal is not at variance with this principle.

### Potential Impact to any Significant Habitat for Indigenous Fauna

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

Fauna habitat loss as a direct result of land clearing is a primary impact on terrestrial fauna. Clearing for the pipeline will be low impact and restricted to a narrow corridor, potentially affecting 9 broad fauna habitats. All habitats are represented outside of the corridor, throughout the region and in conservation estate.

Of the 9 broad fauna habitats recorded within the corridor, the Major Drainage habitat and Sand Plain habitat are ranked as “High” significance for vertebrate fauna due to the potential to provide core habitat for species of conservation significance. The remainder are of “Moderate” significance, either due to the possibility of foraging/dispersal habitat, or habitats primarily supporting priority or migratory species (Rapallo 2021).

#### Sand Plain Habitat

The Sand Plain habitat was assessed as “High” significance due to the potential for Greater bilby and Brush-tailed mulgara breeding, foraging and dispersal habitat. The Greater bilby is listed as Vulnerable under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and *Biodiversity Conservation Act 2016* (BC Act). The Brush-tailed mulgara is listed as Priority 4 by the Department of

Biodiversity, Conservation and Attractions (DBCAs). Both species are rated as “Highly Likely” to occur on the corridor (Rapallo 2021).

There are Greater bilby records proximal to the corridor from 2014 in the DBCA threatened species database, however the database does not indicate type of record or source (DBCAs 2020). No evidence of Greater bilby was recorded during the current survey; nor was the species detected via targeted searches for the Warrawoona Gold Project (Biologic 2019).

Greater bilbies are recorded as having low site fidelity and high mobility (Southgate et al. 2007); males regularly move three to five kilometres between burrows on consecutive days; and have been recorded moving up to 15 km in a few weeks (Southgate & Possingham 1995).

Brush-tailed mulgara has been recorded from the Sandy Plain habitat of the Warrawoona Gold Project (Biologic 2019). Mulgara can use multiple burrow systems within a home-range and changing these frequently (Körtner et al. 2008).

Sand Plain habitat provides breeding, shelter, foraging, dispersal habitat for the Spectacled hare-wallaby (DBCAs Priority 4) and supporting habitat (dispersal and foraging habitat) for Grey falcon (Vulnerable under the BC Act and EPBC Act), Pilbara leaf-nosed bat, and Ghost bat (both listed as vulnerable under the EPBC Act and BC Act). Sand Plain habitat contains some suitable areas of habitat for the Night parrot listed as Endangered under the BC Act and EPBC Act. Night parrot was not recorded on the corridor via acoustic recorder (Rapallo 2021).

Local populations of Greater bilby and Brush-tailed mulgara may be temporarily impacted by clearing of any active burrows. Clearing activities will be managed to avoid burrows to minimise impacts to such species. Neither Greater bilby nor Brush-tailed mulgara would be restricted to the Sand Plain habitat of the corridor.

A total of 41.6 ha of the corridor (10 %) comprises Sand Plain habitat and a substantial amount is known to occur outside the corridor to the south of the Warrawoona Gold Project (Biologic 2019). The habitat type is widespread in the broader landscape, and not restricted to the corridor (Rapallo 2021; Biologic 2019). Fauna occurring in the region are therefore unlikely to be substantially impacted by the proposal, from a regional perspective.

### **Major Drainage Habitat**

The Major Drainage habitat provides a range of microhabitats and a stable source of food and water, within vast landscape of relatively resource-poor spinifex plains (How et al. 1991; Rapallo 2021). More specifically, nectivorous avifauna benefit from the flowering plants and hollow-nesting species make use of the large eucalypts that line the banks (Burbidge et al. 2010)). Mammal, reptile and amphibian fauna may also congregate around permanent water pools (How et al. 1991).

Due to the widespread availability of microhabitats, such as leaf litter accumulations, large trees, hollows, and semi-permanent/permanent water sources, the Major Drainage habitat provides foraging and dispersal habitat for Northern quoll, Pilbara leaf-nosed bat, Pilbara olive python, Peregrine falcon, Northern brushtail possum and potentially where there is sufficient moisture: Gane’s blind snake. Grey falcon may utilise the Major Drainage habitat for nesting and foraging (Rapallo 2021).

Until habitat preferences are further defined for Ghost bat it is assumed that the Major Drainage habitat is also utilised in some capacity by Ghost bat (Rapallo 2021).

- Northern quoll is listed as Endangered under the EPBC act and the BC Act
- Pilbara leaf-nosed bat is listed as Vulnerable under the EPBC Act and BC Act
- Ghost bat is listed as Vulnerable under the EPBC Act and BC Act
- Grey falcon is listed as Vulnerable under the BC Act
- Pilbara olive python is listed as Vulnerable under the EPBC Act and BC Act
- Peregrine Falcon is listed as Other Specially Protected Fauna under the BC Act
- Northern Brushtail Possum is listed as Vulnerable under the BC Act
- Gane's blind snake (DBCA Priority 1)

Migratory bird species can use drainage systems as conduits for movement throughout an otherwise arid landscape (Storr 1984, Bamford et al. 2008).

Migratory species assessed as "Possible infrequent visitors" on the corridor include:

- Oriental plover
- Common sandpiper
- Sharp-tailed sandpiper
- Common greenshank
- Wood sandpiper
- Osprey
- Glossy ibis

Local populations of Northern quoll, Pilbara leaf-nosed bat, Pilbara olive python, Peregrine falcon, Northern brushtail possum, Gane's blind snake and Grey Falcon are not anticipated to be impacted by the clearing of a narrow corridor of Major Drainage habitat beyond temporary displacement and direct short-term impact from machinery because this habitat does not contain critical or preferred breeding habitat for the majority of these species. Northern quoll, Pilbara olive python and Peregrine falcon breeding habitat is located within the Rocky breakaway habitat of the Warrawoona Gold Project and will not be impacted by the proposal. The Rocky breakaway habitat is extensive and predominately intact with only 0.8 ha of this habitat approved for clearance within the Warrawoona Gold Project (EPBC 2019/8584).

Both Gane's blind snake and the Northern Brushtail Possum have a patchy distribution and are infrequently recorded (Rapallo 2021).

The Pilbara leaf-nosed bat will potentially forage over most habitats within the corridor with Major Drainage containing most significant foraging habitats due to proximity of pools, however it is noted that the Pilbara leaf-nosed bat was also recorded foraging proximal to the artificial water bodies that occur on the corridor (Rapallo 2021). Pilbara leaf-nosed bat breeding habitat is located within the old workings proximal to the Warrawoona Gold project and will not be impacted by the proposal.

Ghost bat breeding habitat is located within the old workings proximal to the Warrawoona Gold project and will not be impacted by the proposal. Ghost bat will potentially forage over most habitats of the corridor (Rapallo 2021).

The Grey falcon uses Major Drainage habitats for breeding, however it is noted that this habitat is not restricted to the corridor and the species has not been recorded nesting on the corridor to date.

A total of 8.3 ha of the corridor (2%) comprises of Major Drainage habitat. The habitat type is widespread in the broader landscape, and the affected areas are contiguous with surrounding occurrences of Major

Drainage habitat (Rapallo 2021). Fauna occurring within this habitat type are therefore unlikely to be substantially impacted by the proposal.

Minor Drainage, Medium Drainage – rocky and Medium Drainage – sandy habitats provides potential dispersal and foraging habitat for Pilbara olive python, Ghost bat, Pilbara Leaf-nosed bat, Peregrine falcon, Grey Falcon, Oriental plover (Migratory BC/EPBC Act) and where there is sufficient moisture Gane's blind snake (Rapallo 2021).

Hillcrest/ Hillslope, provides supporting habitat (dispersal and foraging habitat) for Ghost bat, Pilbara Leaf-nosed bat and Long-tailed dunnart (DBCA Priority 4) and breeding, shelter, foraging, dispersal habitat for the Western Pebble-mound mouse (DBCA Priority 4). Hillcrest/ Hillslope contains potential habitat for *Ctenotus uber johnstonei* (DBCA Priority 2) (Rapallo 2021).

Low Stony Hills and Granite Outcrop habitats provide potential dispersal and foraging habitat for Ghost bat, Pilbara Leaf-nosed bat, Northern quoll (Rapallo 2021). The Granite Outcrop habitat provides potential *Ctenotus nigrilineatus* habitat (Rapallo 2021).

Stony Plain, the dominant habitat within the corridor (78%) provides breeding, shelter, foraging, dispersal habitat for the priority listed Western Pebble-mound mouse and Spectacled hare-wallaby and supporting habitat (dispersal and foraging habitat) for Grey falcon, Pilbara leaf-nosed bat, and Ghost bat. Stony Plain provides potential *Ctenotus nigrilineatus* habitat (Rapallo 2021). Stony Plain contains some suitable areas of habitat for the Night parrot listed as Endangered under the BC Act and EPBC Act. Night parrot was not recorded on the corridor via acoustic recorder) (Rapallo 2021).

Given the habitats are represented outside of the corridor, throughout the region and in conservation estate and primarily represent foraging and dispersal habitat of listed threatened species rather than breeding habitat of listed threatened species of high site fidelity; with management, clearing within the corridor is unlikely to be at variance to this clearing principal.

Management will include clearing protocols as per Warrawoona Gold Project Environmental Procedures and preclearance surveys (Greater bilby and Brush-tailed mulgara) as per the Calidus Significant Species Management Plan referred to in Ministerial Statement 1150.

#### **Potential Impact to any Rare Flora**

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

No threatened flora, listed under the EPBC Act or BC Act, have been recorded from the corridor (Rapallo 2021). None of the threatened flora species listed for the Pilbara are expected to occur within the corridor, due to a lack of suitable habitat and/or a distribution that does not overlap with the corridor.

*Eragrostis crateriformis* (DBCA Priority 3) was recorded from one location within the corridor from stony plain habitat (Rapallo 2021) and occurs throughout the Warrawoona Gold Project, recorded from minor drainage lines and sheet flow areas of red sandy clay (Woodman 2020). This ephemeral grass occurs over a range of approximately 1,370 km in Western Australia, from near Onslow in the west to near Balgo Hills in the Tanami Desert in the east. It also occurs in the Northern Territory. There are 51 records of this taxon in Western Australia, representing approximately 30 populations. Three of these populations occur in the DBCA managed Millstream-Chichester National Park and DBCA managed Ex Meentheena Station (Woodman 2020, ALA 2021, Western Australian Herbarium 2021, DBCA 2020b). *Eragrostis crateriformis* is not restricted to the habitats of the corridor and given this taxon is found regularly within the drainage

of the region it is highly likely that additional searching along the drainage that bisects the corridor would locate many more plants. Removal of individual plants will not alter the local or regional conservation status of this species should the pipeline corridor be unable to avoid individuals.

Although not recorded on the corridor, three additional species were assessed as “Highly Likely” to occur on the corridor. *Heliotropium murinum* (DBCA Priority 3), *Euphorbia clementii* (DBCA Priority 3), *Ptilotus mollis* (DBCA Priority 3) (Rapallo 2021).

*Heliotropium murinum* (DBCA Priority 3), grows on red sand, plains, or brown light clay or sand over ironstone. *Heliotropium murinum* and occurs within the Warrawoona Gold Project and has been recorded from other nearby localities (Woodman 2020, Rapallo 2021). The species occurs over a range of approximately 150 km from Woodstock Reserve in the west to DBCA managed Ex Meentheena Station in the east. There are 17 location records of this taxon in Western Australia representing approximately 12 populations (including the records from the Warrawoona Gold Project). One population occurs in the DBCA-managed Ex Meentheena Station (Woodman 2020, ALA 2021, Western Australian Herbarium 2021, DBCA 2020b). *Heliotropium murinum* is locally common with 890 plants recorded from 160 point locations within the Warrawoona Gold Project (Woodman 2020). *Heliotropium murinum* is not restricted to the habitats of the corridor, and removal of individual plants will not alter the local or regional conservation status of this species should the pipeline infrastructure be unable to avoid individuals.

*Euphorbia clementii* (DBCA Priority 3), grows on gravelly hillsides, stony grounds, and along drainage lines on red, orange sandy loams, or stony areas. The species occurs within the Warrawoona Gold Project and has been recorded from other nearby localities (Woodman 2020, Rapallo 2021). This taxon is endemic to Western Australia with the main range of its distribution extending over 190 km from Wodgina in the west to northeast of Marble Bar. There are 35 location records of *Euphorbia clementii* in Western Australia representing approximately 18 populations, none of which occur in DBCA-managed tenure (Woodman 2020, ALA 2021, Western Australian Herbarium 2021, DBCA 2020b).

*Euphorbia clementii* was recorded from a long unburnt stony undulating plain of red-brown sandy clay loam on the Warrawoona Gold Project. (Woodman 2020) found this habitat to be atypical for the species as this taxon is typically a fire-responder (and relatively short-lived) but may germinate in response to physical disturbance. Woodman (2020) hypothesised that the record on the Warrawoona Gold Project may have been transported, given the nearby historical disturbance evident in aerial photography and long unburnt nature of the vegetation. The taxon was not observed in more recently burnt areas of typical habitat (sandy or stony plains) (Woodman 2020). *Euphorbia clementii* was not recorded on the recently burnt areas or disturbed areas of the corridor where if present it would have been readily identifiable as it typically occurs in large numbers (Woodman 2020).

*Euphorbia clementii* is not restricted to the habitats of the corridor, and removal of individual plants will not alter the local or regional conservation status of this species should the pipeline infrastructure be unable to avoid individuals.

*Ptilotus mollis* (DBCA Priority 4) grows on stony hills and scree. The species occurs within the Warrawoona Gold Project on rocky hill tops and slopes of the main range (consisting of granite, chert and mafic schist) or smaller outcroppings of mafic schist immediately adjacent to the main range (to the south) and has been recorded from other nearby localities (Woodman 2020, Rapallo 2021). *Ptilotus mollis* is endemic to Western Australia occurring over a range of approximately 640 km from Cane River Conservation Park in the west (65 km south-west of Pannawonica) to near Karlamilyi National Park in the

east (270 km south-east of Marble Bar). There are 39 location records of this taxon in Western Australia, representing approximately 28 populations (including the records from the Warrawoona Gold Project). Three of these populations occur within DBCA conservation estate, Cane River Conservation Park and Karijini National Park (Woodman 2020, ALA 2021, Western Australian Herbarium 2021, DBCA 2020b). *Ptilotus mollis* is locally common (2534 plants have been recorded from 350 locations within the Warrawoona Gold Project) (Woodman 2020), and removal of individual plants will not alter the local or regional conservation status of this species should the pipeline infrastructure be unable to avoid individuals.

Four species were assessed as “Likely” to occur on the survey area *Josephinia* sp. Woodstock (A.A. Mitchell PRP 989) (DBCA Priority 1), *Bulbostylis burbidgeae* (DBCA Priority 4), *Heliotropium muticum* (DBCA Priority 3) and *Gomphrena leptophylla* (DBCA Priority 3) (Rapallo 2021).

*Josephinia* sp. Woodstock (DBCA Priority 1) grows on sheet flow or drainage lines, on red sandy (granitic) plains. This taxon is known from seven records across four localities (Ashburton, Chichester, Fortescue and Hamersley IBRA sub-regions) and is not currently known from any DBCA-managed conservation reserves (Woodman 2020, ALA 2021, Western Australian Herbarium 2021, DBCA 2020b). The species has been recorded from the Warrawoona Gold Project from a loamy minor drainage line and despite a comprehensive targeted survey of all potential habitat on the Warrawoona Gold Project, no additional locations have been recorded and the original plant recorded in 2019 could not be relocated despite intensive grid searching of the known location at 5 metre intervals (Woodman 2020). *Josephinia* sp. Woodstock, although rarely recorded is not restricted to the habitats of the corridor, and removal of individual plants would not alter the local or regional conservation status of this species should the pipeline infrastructure be unable to avoid individuals.

*Bulbostylis burbidgeae* (DBCA Priority 4) grows in granitic soils and has been recorded from granitic outcrops and cliff bases and could occur within the granite outcrops on the corridor. *Bulbostylis burbidgeae* is endemic to Western Australia occurring over a range of approximately 28409.58 square kilometres from South Hedland south to the Nanutarra/Fortescue, east to Nullagine and north to the DeGray River within the Chichester, Fortescue and Roebourne IBRA subregions. *Bulbostylis burbidgeae* is not currently known from any DBCA-managed conservation reserves (ALA 2021, Western Australian Herbarium 2021, DBCA 2020b). Field observations from Mt Webber indicate that this taxon only occurs in shady areas on massive granite outcrops (Woodman 2012) and the granite outcrop habitats of the corridor are too small to cast significant shade (Rapallo 2021).

*Bulbostylis burbidgeae* is not restricted to the habitats of the corridor, and removal of individual plants would not alter the local or regional conservation status of this species should the pipeline infrastructure be unable to avoid individuals.

*Heliotropium muticum* (DBCA - Priority 3) grows on flat terrain, low in the landscape, flood plains and sand plains. Soil types where this species has been recorded included (very gritty) skeletal red brown granitic soil, clay loams, and sand. The species is endemic to the Pilbara and occurs between Port Hedland/Wickham south to Coonarrie Creek and west to Marble Bar (ALA 2021, Western Australian Herbarium 2021, DBCA 2020b). *Heliotropium muticum* growth is triggered by fire with an estimated population of approximately 1,300 to 2,500 individuals at Pilgangoora (MMWC 2016) and 20 individuals located at North Star (Ecologia 2012). *Heliotropium muticum* is not restricted to the habitats of the corridor, and removal of individual plants would not alter the local or regional conservation status of this species should the pipeline infrastructure be unable to avoid individuals.



*Gomphrena leptophylla* (DBCA Priority 3) occurs on sand to sandy to clay-loam, granite or quartzite, on open flats, sandy creek beds, edges of salt marshes and pans, and on stony hillsides, with records in the Chichester, Fitzroy Trough, Roebourne, South Kimberley Interzone Ibra subregion extending into the Northern Territory and Queensland. (Western Australian Herbarium 2007, Woodman Environmental 2020, Atlas of Living Australia 2021), DBCA 2020b). *Gomphrena leptophylla* is not restricted to the habitats of the corridor, and removal of individual plants would not alter the local or regional conservation status of this species should the pipeline infrastructure be unable to avoid individuals.

No flora listed as threatened flora, under the EPBC Act or BC Act will be impacted by clearing for the corridor. Based on habitat, and local records, clearing within the corridor does have the potential to impact several priority taxa however none of these species are recognised as threatened, nor are restricted to the local area or the region. Given the narrow clearing parcel required for a pipeline and that much of the clearing involves upgrading existing tracks rather than the establishment of new tracks, clearing activities will not result in the complete loss of these taxa from the local area, and will not impact regional populations.

The proposal is not at variance with this principle.

#### **Potential Impact on any Threatened Ecological Communities**

- d. *Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a threatened ecological community.*

Search results of DBCA Threatened and Priority Ecological Community (TEC/PEC) database search (DBCA 2020b) indicates that no TECs are known to occur within or near the corridor.

Rapallo (2021) found no known locations of listed significant vegetation, as listed by the AWE (EPBC Act) or otherwise listed by the DBCA, occurring within 40 km of the corridor (DBCA 2020a; AWE 2020). Only two TECs are known from the *Pilbara* Region (TEC 46 -Themeda Grasslands and TEC 78 - Ethel Gorge Aquifer Stygobiont Community DBCA 2018c). Both TECs are associated with the Hamersley Range area, therefore it is highly unlikely that either of these TECs would occur within the corridor.

A review of the published TEC and PEC listings for Western Australia (DBCA 2020a); DBCA 2018c) against the descriptions of the vegetation types in (Rapallo 2021) identified no vegetation types in the corridor representing listed TECs or PECs as listed by DBCA or the AWE.

The proposal is not at variance with this principle.

#### **Potential Impact on any Native Vegetation Remnant in an Area that has been Extensively Cleared**

- e. *Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.*

Review of the DBCA State-Wide Vegetation Statistics data (DBCA 2018d) showed that both the Abydos Plain 93 and the George Ranges 82 vegetation system-associations still have 99% of their pre-European extent remaining (DBCA 2018d) and would be considered 'least concern' (DER 2014).



The corridor is located outside of the 'agricultural area' (Intensive Land Use zone) where remnant vegetation has been extensively cleared (DBCA 2018d). The corridor is not located within a significant remnant of native vegetation in an area which has been extensively cleared.

The proposal is not at variance with this principle.

#### **Potential Impact on any Watercourse and/or Wetland**

- f. Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.*

The corridor crosses Brockman and Chinaman Creeks five times, all tributaries of the Talga River. The pipeline corridor design will pass flows across the roadway by means of floodways, culverts or a combination of both to reduce risk of crossing flooding and minimise the time the corridor will be out of commission during a flood event. The presence of these floodways / culverts will ensure that there are minimal impacts to the upstream and downstream flow regimes of these drainage lines.

If channel capacities are exceeded, short-term ponding may occur over the corridor with potential scour and road degradation. During a large rainfall event, the background mobilisation of natural sediments in the catchments is expected to be significant, and any increase in sediment loads from the erosion of the corridor would likely be minor in comparison.

With management clearing within the corridor is unlikely to alter the hydrological and ecological values of the Brockman and Chinaman Creeks tributaries and ultimately the Talga River.

The proposal is at variance with this principle.

#### **Potential to Cause Appreciable Land Degradation**

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

Because the topography of the corridor is generally flat for much of its length and given much of the involves upgrade to existing tracks, significant land degradation is unlikely to occur. The Macroy, Talga, and Granitic land systems are not particularly prone to degradation or erosion. The River land system susceptibility to erosion is high or very high if vegetative cover is removed (Van Vreeswyk et al. 2004). This is apparent from the disturbance observed in the Major Drainage habitats of the corridor from cattle grazing. It is considered that this impact can be managed through appropriate engineering controls and progressive rehabilitation, and appreciable land degradation from clearing for a pipeline is unlikely to occur if such measures are undertaken.

There is potential for clearing to result in the establishment and or spread of weeds. Given the extent to which weeds have established in the Pilbara, especially along drainage lines, existing weeds within the corridor and the current pastoral land use, eradication of existing weeds within the corridor is not a feasible option. Effort will be focussed on preventing the establishment of previously unrecorded weeds and reducing the spread of existing weeds as per Warrawoona Gold Project Environmental Procedures.

With management, the proposal is unlikely to be at variance with this principle.

#### **Potential Impact on Adjacent or Nearby Conservation Areas**

- h. Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.*

The corridor is located on Eginbah Pastoral lease and unallocated crown land. No conservation areas are located in the immediate vicinity of the corridor.

The proposal is not at variance with this principle.

#### **Potential Deterioration in Water Quality**

- i. Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.*

There are pools adjacent to the corridor all impacted by cattle grazing. Provided that clearing within creek lines is managed and minimised via the Warrawoona Gold Project Environmental Procedures, clearing of vegetation for a pipeline will not impact the quality of surface or underground water greater than the impacts currently experienced from cattle grazing .

There is a low potential for minor impacts to the quality of surface water as a result of sedimentation or the release of hydrocarbons during pipeline construction. However, the likelihood of this occurring and the significance of this impact can be managed utilising the controls and management measures in place via the Warrawoona Gold Project Environmental Procedures.

The proposal is not at variance with this principle.

#### **Potential to Cause or Exacerbate Flooding**

- j. Native vegetation should not be cleared if clearing of the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding.*

The Brockman and Chinaman Creeks flow intermittently following periods of intense rainfall. Clearing within the corridor would not be expected to cause or increase the frequency or intensity of flooding.

The proposal is not at variance with this principle.

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