



Clearing Permit Supporting Information – Orelia South Proposed Haul Road

Date: 12 October 2021

Company: Northern Star Resources Limited

Tenement: L36/246, M36/474, M36/541, M36/473, M36/462, M36/35, M36/527
and M36/504

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1. Purpose

Northern Star Resources Limited (Northern Star) seeks to apply for a purpose permit to clear native vegetation on tenements L36/246, M36/474, M36/541, M36/473, M36/462, M36/35, M36/527 and M36/504. This document supports the application as required by Part V of the *Environmental Protection Act 1986*.

Northern Star is proposing to construct and operate a haul road that links the Orelia Mine to Thunderbox Processing Plant (Proposed Road). The ~55km long proposed road will be constructed for primarily for ore haulage and private access for Northern Star personnel travelling between the Bronzewing and Thunderbox mines. Approximately 40km of existing road (namely the Mt McClure Road) will form part of the haulage route; however, will not require additional clearing to support its operation.

The maximum proposed area to be cleared is 362ha, however clearing is not expected to reach its full extent. Northern Star is seeking approval to clear the 362ha with an approved envelope of 1231ha (i.e. primarily the L36/246 footprint). A Mining Proposal (REG ID 100546) has been submitted for the proposed road and is currently under assessment.

2. Location and Ownership

The proposed clearing activities are located ~40km south-east of Leinster and ~320km north of Kalgoorlie (refer to Figure 1). The activities intersect the Weebo and Yandal Pastoral Leases. The northern extent of the proposed clearing is located 40km south-west of the Orelia Mine, whilst the southern extent is located immediately north of the Thunderbox Mine.

The registered tenement holder is Northern Star (Thunderbox) Pty Ltd, with the exception of L36/246 which is held by Northern Star (MKO) Pty Ltd. Both tenement holders are subsidiaries of Northern Star Resources Ltd (please refer to company structure outlined in Appendix 1).

The proposed road intersects the Darlot/Wutha Native Title Claim Registration Area. As such, Northern Star have engaged this Group in a heritage survey and Land Access negotiations.

3. Project Description and Map

The proposed road will be constructed for primarily for ore haulage between the Orelia and Thunderbox mines. The road is required to be constructed to improve safety and operational aspects including:

- Reducing haulage distance by 17km, therefore reduce driver fatigue;
- Increasing road train payload capacity from 107 tonnes to 210 tonnes; and,
- Avoiding public roads, thereby reducing potential interactions with public traffic.

The proposed road will be approximately 55km long and ~30m wide. Additional areas have been allocated for topsoil stockpiles, gravel borrow pits, road construction turn around bays and turkey nests. Figure 2 displays the indicative centreline of the proposed road.

The proposed road will be gravelled to road train specification. Road drainage will comprise side drainage (table drains), turn outs and at grade floodways across water courses, so as not to interrupt flow paths (see Section 5 for surface water assessment information).

The southern extent of the proposed clearing area splits into two paths, both of follow existing cleared roads/tracks. This split is to provide options for road placement, which will be decided in the future based on operational and safety considerations. It is planned for only one path to be cleared for the proposed road.

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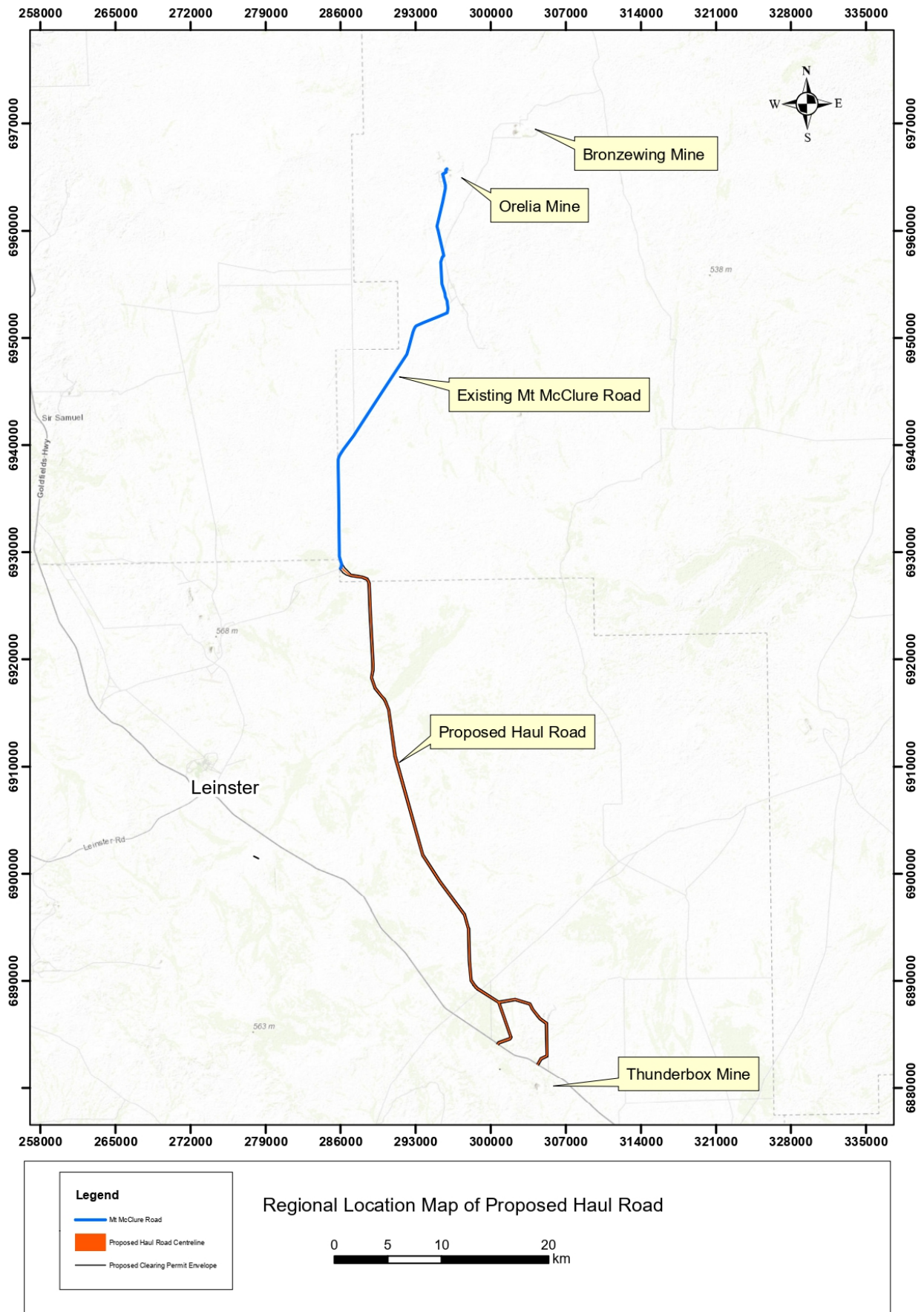


Figure 1: Regional Location Map of Orelia South Proposed Haul Road

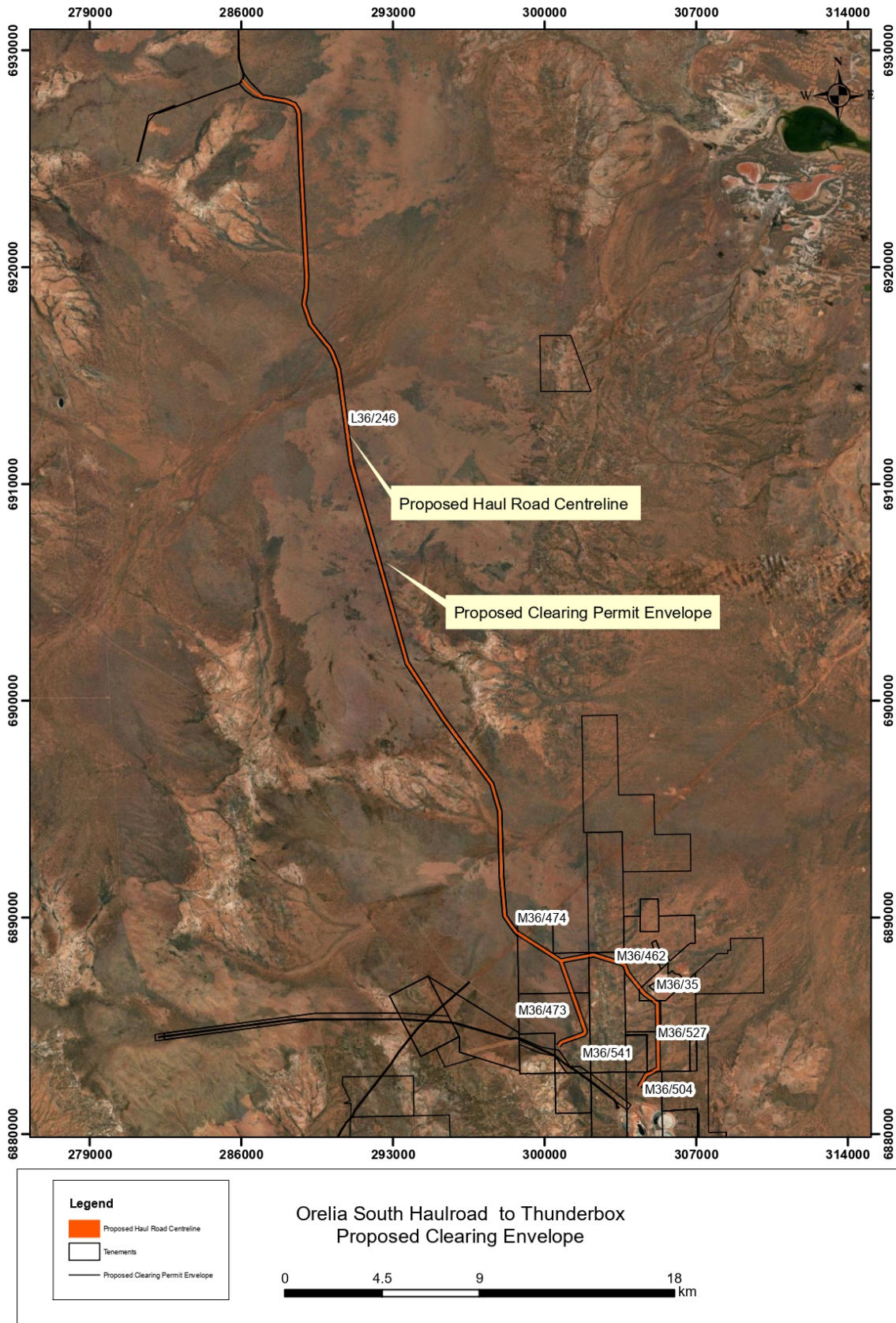


Figure 2: Orelia South Haul Road to Thunderbox Proposed Clearing Envelope

4. Heritage

Northern Star engaged with the Darlot/Wutha Traditional Owners regarding the proposed road. As detailed in Section 2, the proposed road intersects the Darlot/Wutha Native Title Claim Registration Area. As such, Northern Star conducted a Darlot/Wutha heritage survey in March 2021. The Darlot/Wutha heritage survey report is attached in Appendix 2.

5. Surface Water Management

A surface water assessment was undertaken, comprising of flood modelling and a final surface water assessment report (Appendix 3). A summary of the assessment findings are outlined below.

The longitudinal road grades are minimal, and the road would overall appear to be flat (gently undulating locally). Drainage considerations include a gravel pavement, surface cross fall (camber), side drains and scour protection, and regular turn-outs to lead water from side drains out into the surrounds. The road route crosses two very large drainage channels and seven small to medium drainage channels. The drainage channels are undefined as they cross the road, with potential flood extents ~3km wide for the larger drainage channels.

Floodways are commonly used with low traffic volumes. Gravel floodways at natural surface level are proposed to ensure water in natural water course flows unimpeded following crossing the road surface. The durations of flooding are low, flow depths are shallow, velocities are low and impact on the road are low. The road may require grading / graveling following a significant flow event if surface damage occurs.

The risk of erosion and sedimentation increases as a result of vegetation and topsoil removal. The disturbance and runoff caused by roads is proposed to be controlled by side table drains and drain turn outs. Erosion and downstream water quality (washed off sediment) risk is less in very flat terrain where stream powers are very low, and sediment does not migrate.

6. Flora and Fauna Management

Information regarding fauna and flora located within the L36/246 footprint is detailed in Appendix 4 (Botanica Flora/Vegetation and Fauna Assessment). Table 1 outlines the Assessment against the ten native vegetation clearing principles (Schedule 5 of the EP Act).

In most cases, the proposed clearing activities are unlikely to be at variance with these principles. Clearing may be in variance to principle (f), relating to activities with an environment associated with a watercourse or wetland. As detailed in Section 5, to minimise the impact to water courses and riparian vegetation, the proposed road will have a minimal grade and be overall flat, meaning surface water flows will be able to flow relatively unimpeded.

Based on the desktop assessment and field observations, Priority flora were deemed to be unlikely to occur within the proposed clearing footprint for the following reasons:

1. The full length of the relatively narrow tenement was traversed, increasing the likelihood of encountering Priority Flora species.

2. Botanica have previously assessed and identified local populations of majority of the Priority taxa listed and are familiar with the preferred habitat and habitat requirements; none of which were present; and,
3. Habitats present within the survey area differ to known habitats in the local region (absence of hillslopes, banded ironstone ridges, lateritic hill slopes, granite outcrops, quartz/ calcrete plains and River Red gum creeklines).

Table 1: Assessment against native vegetation clearing principles

Letter	Principle	Assessment	Outcome
Native vegetation should not be cleared if it:			
(a)	comprises a high level of biological diversity.	Vegetation identified within the survey area is not considered to be of high biological diversity and is well represented outside of the survey area. The survey area does not occur within any mapped Priority Ecological Communities (PECs), Threatened Ecological Communities (TECs) or associated buffer zones and does not contain any Banded Ironstone Formations.	Clearing is unlikely to be at variance with this principle
(b)	comprises the whole or part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to WA.	No significant fauna were observed within the survey area. No significant fauna habitat was observed within the survey area.	Clearing is unlikely to be at variance with this principle
(c)	includes, or is necessary for the continued existence of rare flora.	No Threatened Flora taxa, pursuant to the BC Act and the EPBC Act were identified within the survey area.	Clearing is unlikely to be at variance with this principle
(d)	comprises the whole or part of or is necessary for the maintenance of a threatened ecological community (TEC).	No TEC listed under the EPBC Act or by the BC Act occur within the survey area or the Eastern Murchison subregion.	Clearing is unlikely to be at variance with this principle
(e)	is significant as a remnant of native vegetation in an area that has been extensively cleared.	All vegetation associations retain >98% of their original pre-European vegetation extent.	Clearing is unlikely to be at variance with this principle
(f)	is growing, in, or in association with, an environment associated with a watercourse or wetland	Several minor ephemeral drainage lines intersect the survey area. One vegetation type was associated with these ephemeral drainage lines; DD-AOW1 which accounts for 53.6 ha (4.4%) of the total survey area.	Clearing may be at variance with this principle

(g)	Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.	The survey area and surrounding region has not been extensively cleared. Clearing within the survey area is not considered likely to lead to land degradation issues such as salinity, water logging or acidic soils.	Clearing is unlikely to be at variance with this principle
(h)	Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.	The closest significant environmental feature is Wanjarri Nature Reserve, located approximately 30 km north of the survey area. Disturbances within the survey area are unlikely to impact this area.	Clearing is unlikely to be at variance with this principle
(i)	Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.	No surface water bodies are located within the survey area. Clearing in ephemeral drainage lines is unlikely to result in significant impacts to water quality.	Clearing is unlikely to be at variance with this principle
(j)	Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence of flooding.	Rainfall in the Eastern Murchison subregion has an average rainfall of 200mm. Rainfall events are unlikely to result in localised flooding. Clearing within the survey area is not likely to increase the incidence or intensity of flooding within the survey area or surrounds.	Clearing is unlikely to be at variance with this principle

7. Environmental Management and Rehabilitation

The following management controls will be incorporated into the planning, development and operation of the proposed road, where reasonable and practicable:

Construction Clearing

- Road design aims to minimise, as much as reasonable and practical, the area requiring vegetation removal.
- Utilisation of existing cleared areas / roads in preference to clearing undisturbed vegetation. For example, use of 40km of the existing Mt McClure Road, gravel pit disturbance on M36/474 and roads on M36/473, M36/462 and M36/527.
- Avoid large trees and stands of dense vegetation.
- The movement of machines and other vehicles will be restricted to the limits of the area to be cleared.



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- During site works, areas requiring clearing will be clearly marked and access to other areas restricted to prevent accidental clearing of areas to be retained. A spotter will be present in front of the clearing dozer.
- The centreline will be cleared progressively and inspected for compliance; prior to clearing the full extent of the proposed road corridor.
- Utilisation of GPS directed clearing equipment.
- Training and inductions provided to contractors and personnel involved with clearing as to key environmental controls and importance of maintain compliance with clearing permit.

Weeds

- Adhere to internal disturbance application permit condition and biodiversity management plan controls.
- No weed affected soil, mulch, fill or other material will be brought into the area to be cleared.
- Earth-moving equipment will be washed down to ensure they are free from soil and vegetation prior to and leaving the area to be cleared.

Saline Water

- Dribble bars used in preference to water sprays on water carts to minimise over spray of potentially saline water onto adjacent vegetation

Sediment

- Adequately designed and constructed floodways & drains to allow for unimpeded flows and reduce likelihood of concentration of water in floodways.
- Road construction & maintenance methods to minimise movement of suspended solids
- Disturbed areas covered with topsoil and ripped and seeded with appropriate vegetation cover.
- Topsoil and vegetation not stored within floodways.

Rehabilitation

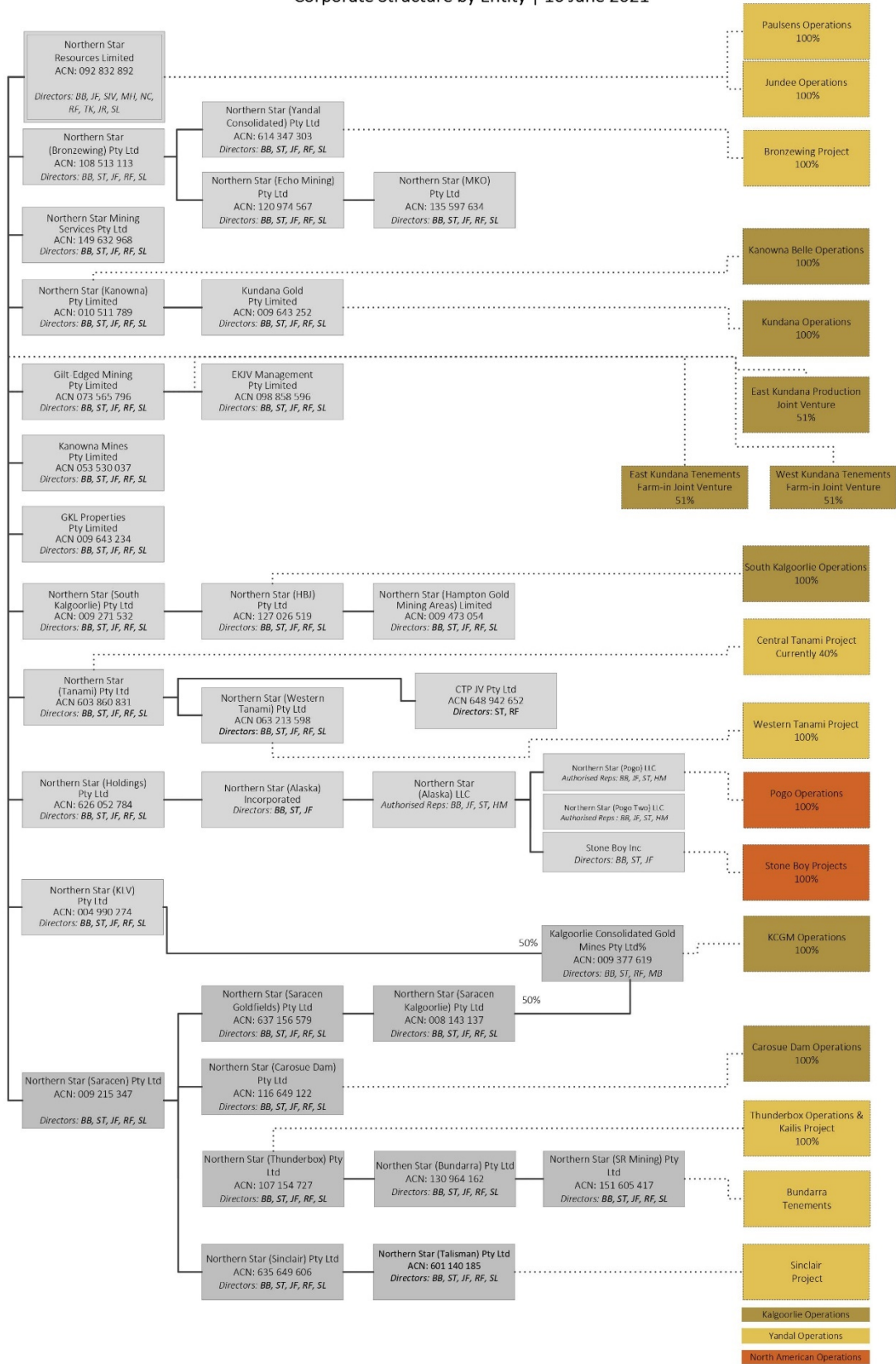
- Topsoil will be stripped and stockpiled for later re-use during rehabilitation activities.



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Appendix 1: Northern Star Resources Ltd Company Structure

Corporate Structure by Entity | 16 June 2021



- Kalgoorlie Operations
- Yandal Operations
- North American Operations



Appendix 2: Darlot/Wutha Heritage Survey Report



Neale Draper
& Associates

Archaeology

Anthropology

Native Title

Geographic Information
Systems (GIS)

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Cultural Heritage Assessment Report

Northern Star Resources
BW-TBX Haul Road Project
Darlot/ Wutha Cultural Heritage Survey.

By: Assoc. Prof. Neale Draper

Date: 6 April 2021

Client Name: Northern Star Resources Limited

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Northern Star Resources BW-TBX Haul Road Project

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The professional advice and opinions contained in this document are those of the consultants, Neale Draper & Associates Pty Ltd, and do not represent the opinions and policies of any third party.

The professional advice and opinions contained in this document do not constitute legal advice.

Spatial Data

Spatial data captured by Neale Draper & Associates Pty Ltd for any newly recorded features was acquired using an uncorrected GPS receiver.

Coordinate positions are presented using the MGA94 coordinate system.

Positions recorded using a Garmin GPS Receiver will be up to +/- 10m and typically +/- 3m.

Positions recorded using a Trimble TDC100 will be +/- 5m and typically < +/- 2.5m.

Executive Summary

Northern Star Resources Limited (NSR) has engaged the Darlot / Wutha native title claims and traditional Owner group and heritage consultants Neale Draper & Associates Pty Ltd (ND&A) to conduct a cultural heritage survey and assessment of the proposed haul road alignment between Bronzewing mine in the north (from Mt McClure Road south) and Thunderbox mine (to the Weebo - Wildara Road - see Map 1-1).

The haul road tenement L36/246 is 200m wide for most of its length, to provide some leeway for the final siting of a 30m wide haul road corridor within it.

The field survey work was conducted from 23 to 25 March, 2021.

The entire haul road alignment is located on flat, sandy, open mulga forest and spinifex country. The ecological zone traditionally is country that traditional owners travel through, hunting and collecting plant foods and other resources such as timber for manufacturing tools and weapons. We observed a maximum background density averaging about one stone artefact per 100 square metres (Map 3-1) related to these activities over thousands of years. We would expect that there may be scattered, scarred trees from artefact manufacture, and other isolated artefacts occurring at some locations along the alignment. Neither the specific, isolated artefacts nor their low density represents a significant Aboriginal Heritage site or objects. The entire haul road alignment has cultural heritage clearance for construction.

The only efficient manner for identifying and recording such heritage items as scarred (culturally modified) trees is to include a Traditional Owner representative (cultural heritage monitor) in the team that clears the initial path (line tagging) for the chosen haul road route. That engagement also provides a Traditional Owner Representative for the initial vegetation clearance along the final alignment, and to record (GPS, photos) any scarred trees, significant artefacts such as grindstones, etc. that may occur along the alignment, but which would not be reliably identified even through a lengthy pedestrian survey of the entire 200m-wide corridor.

If that traditional owner monitoring is included in the initial clearance operation of the chosen corridor, the traditional owners and heritage consultant confirm that the proposed construction of the haul road within the nominated corridor has full cultural heritage clearance. The terrain and environment through which the corridor passes does not have the capacity to contain any other kinds of Aboriginal heritage sites.

Highly significant cultural heritage sites such as mythological and ceremonial sites, traditional camp sites and water sources are concentrated within the breakaway and other higher, rocky areas that occur along the eastern side, but outside of the haul road alignment. The heritage survey team identified a major site complex of this kind, Wibboo Rock holes, on the second day of the survey, approximately 2km east of the haul road alignment. Because of the significance of this previously unregistered site complex, its bearing on the comparative, lower heritage significance of the adjacent mulga/ spinifex country, and the requirement of the WA Aboriginal Heritage Act to report site discoveries (albeit in this case outside the survey area, but identified while engaged in accessing the survey area), the Aboriginal survey team and heritage consultant recorded this site for registration with DPLH (Section 4 below)..

The site complex includes two sets of culturally modified rock holes, (full of water) with associated stone, glass, metal and ceramic artefacts, three rock shelter on the breakaway margin with potential archaeological deposits, and physical evidence of the use of the rock holes for watering horse teams and the access track from the breakaways down to the eastern plain used by Cobb and Co stage coaches travelling from Lawlers east to Darlot in the early 20th century (the coach route passed through the haul road alignment but has not left any physical reminder).

Abbreviations

Term	Meaning
AHA	Aboriginal Heritage Act (1972), Western Australia
DPLH	Department of Planning, Lands and Heritage, WA
GIS	Geographic Information Systems
GPS	Global Positioning System
HISF	Heritage Information Submission Form (WA DPLH)
ND&A	Neale Draper & Associates Pty. Ltd.
NSR	Northern Star Resources Limited
PAD	Potential Archaeological Deposit
WA	Western Australia

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1 Introduction

1.1 Project Description and survey Area

Northern Star Resources Limited (NSR) has engaged the Darlot / Wutha native title claims and traditional Owner group and heritage consultants Neale Draper & Associates Pty Ltd (ND&A) to conduct a cultural heritage survey and assessment of the proposed haul road alignment between Bronzewing mine in the north (from Mt McClure Road south) and Thunderbox mine (to the Weebo - Wildara Road - see Map 1-1). The project area is located east of Leinster in the Goldfields region of WA.

The haul road tenement L36/246 is 200m wide for most of its length, to provide some leeway for the final siting of a 30m wide haul road corridor within it.

The field survey work was conducted from 23 to 25 March, 2021.

1.2 Project Participation

The cultural heritage survey was conducted by the following field team (Figure 1-1):

Wutha/ Darlot: Wayne Smith, June Harrington Smith, Ron Harrington Smith, Ronella Pilot, Joshua Harrington Smith, Odiya Pilot, Gerard Ashwin, Clint Ashwin.

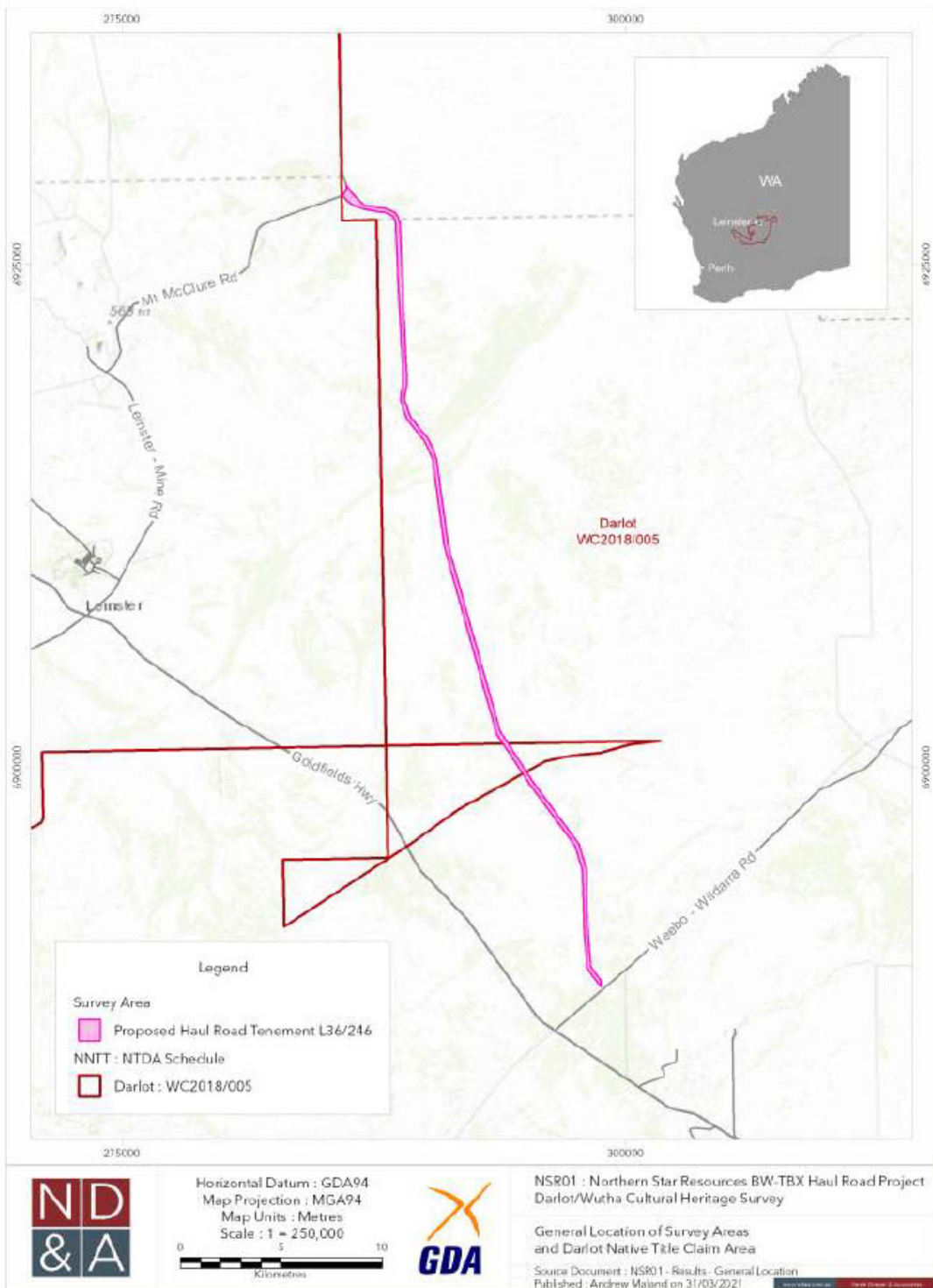
NRS: Abe Van Niekerk (Senior Environmental Adviser, first morning), William Moore (Senior Environmental Adviser), Lachlan Warner (environmental adviser). Bronzewing General Manager Bill Stirling also visited the field crew during the first morning of the survey. Chris Pyke (Project Manager) in Perth organised the survey approvals and logistics.

ND&A: Assoc. Prof. Neale Draper (anthropologist/ archaeologist). Andrew Maland provided GIS mapping services for the field survey and this report.



Figure 1-1: NSR Haul Road cultural heritage survey field team (photo: N. Draper).

Northern Star Resources BW-TBX Haul Road Project



Map 1-1: NSR haul road cultural heritage survey: Location.

1.3 Survey Methodology

The field survey work was conducted from 23 to 25 March, 2021. The haul road alignment does not have any existing tracks, so the survey area was viewed and accessed via an existing network of station vehicle and fence line tracks, with some additional pedestrian inspections from those access tracks. The survey team inspected the northern part of the haul road alignment on 23/03/2021 and the southern part was completed on 24/03/2021.

This process, assisted by a series of field maps incorporating satellite photography and accurate GPS location allowed the TO representatives and heritage consultant to inspect the landscape and vegetation along the entire haul road alignment, and to inspect more closely a cross-section of that environment and any specific locations of potential cultural significance or archaeological potential.

The nominated routes passes entirely through sandy open mulga woodland and spinifex, and is aligned to avoid the breakaways and granite/ sandy gibber areas close by (Map 3-1 below).

While following station access tracks near the breakaways near the eastern margin of the haul road alignment on the second day, the Darlot/ Wutha participants identified that a very significant cultural heritage place, Wibboo Rock Holes, is located there, two kilometres east of the alignment. This important site has not been recorded and reported to DPLH previously, so a "Report of findings" is required under Section 15 of the *WA Aboriginal Heritage Act 1972*. The Traditional Owners want the site to be recorded and protected, particularly now that there will be a haul road constructed 2km away. The nature and location of the Wibboo Rock Holes site complex also provides the explanation why the haul road alignment contains only the scattered, isolated artefacts (and probably some scarred trees) from traditional hunting and collecting activities with a separate base camp that has a water supply. Water is the key resource lacking in the sandy mulga/ spinifex country, with no significant stream channels or water holes transecting the survey area.

Following overnight discussion of these factors, the Darlot/Wutha survey team and the heritage consultant travelled along the access tracks already identified to inspect and record Wibboo Rock Holes for registration with DPLH on 25/03/2021. The site description is contained in this report, with the clear acknowledgement that it is located 2km to the east of the haul road alignment (Map 3-1) and a HIS Form (site record) will be provided to NSR and submitted to DPLH.

1.4 Survey Clearance Definitions

The following definitions are used in relation to cultural heritage field survey results.

'Cleared': If a project area is designated as 'Cleared', the proposed works may proceed without impacting upon significant Aboriginal archaeological sites. Heritage clearance has been approved by the Aboriginal group involved with the field survey.

'Not Cleared': If a project area is designated as 'Not Cleared', the project area or specific location/s within the project area (e.g. drill holes, access tracks, corridors) contain significant Aboriginal archaeological site(s) that may be impacted by the proposed activities. Since the proposed impacts would breach section 17 of the AHA, the project area or specific location/s within the project area is 'Not Cleared' for the proposed development. Heritage clearance has not been approved by the Aboriginal group involved with the field survey.

'Not Cleared, Pending Further Survey': If the project area is designated at 'Not Cleared, Pending Further Survey' this indicates that this section the survey area was not surveyed during this particular trip and any proposed works in these areas may impact upon possible Aboriginal archaeological sites that are yet to be identified.

2 Aboriginal Heritage Protection Legislation

2.1 Aboriginal Heritage Act 1972 (WA)

The Department of Planning, Lands and Heritage (DPLH) is responsible for the administration of the Western Australian Aboriginal Heritage Act 1972 (AHA).

Section 5 of the AHA provides the following definitions regarding Aboriginal sites:

Any place of importance or significance where people of Aboriginal descent have, or appear to have, left any object, natural or artificial, used for, or made or adapted for use for, any purpose connected with the traditional cultural life of Aboriginal people, past or present;

Any sacred, ritual or ceremonial site, which is of importance and special significance to people of Aboriginal descent;

Any place which, in the opinion of the committee, is or was associated with Aboriginal people and which is of historical, anthropological, archaeological or ethnographical interest and should be preserved because of its importance and significance to the cultural heritage of the State; and

Any place where objects to which this Act applies are traditionally stored, or to which, under the provisions of the Act, such objects have been taken or removed.

Any place determined to be a site under section 5, is then evaluated under section 39 of the AHA. Sections 39 (2) & (3) state:

(2) In evaluating the importance of places and objects the committee shall have regard to -

Any existing use or significance attributed under relevant Aboriginal custom;

Any former or reputed use or significance which may be attributed on the basis of tradition, historical association, or Aboriginal sentiment;

Any potential anthropological, archaeological or ethnographical interest; and

Aesthetic values.

(3) Associated sacred beliefs, and ritual or ceremonial usage, in so far as such matters can be ascertained, shall be regarded as the primary considerations to be taken into account in the evaluation of any place or object for the purposes of this Act.

Section 15 of the AHA outlines the obligations relating to the reporting of an archaeological find.

Under section 17 of the AHA, it is an offence to disturb any Aboriginal site. If a development is likely to impact a site, the consent of the Minister is required under section 18 of the AHA. The Minister receives a recommendation from the Aboriginal Cultural Material Committee (ACMC) before giving consent. S/he considers its recommendations and the general interests of the community when deciding. The Minister may also impose conditions on her/his approval.

The AHA was enacted to protect and preserve Aboriginal heritage. This includes any places or objects of past or present significance to Aboriginal people. It also provides for fines and custodial sentences for breaches. This legislation currently is under review, with a view to replacing it with a new Aboriginal heritage protection Act.

2.2 DPLH Aboriginal Heritage Due Diligence Guidelines (2013)

The Western Australian Department of Planning, Land and Heritage has published on their website a set of *Aboriginal Heritage Due Diligence Guidelines* for Land Users, such as mining and exploration companies (DPLH 2013). The Guidelines were originally published in 2013 by the predecessor Agency, the Department of Aboriginal Affairs.

"Purpose of the Due Diligence Guidelines (Guidelines)

2.0 All Aboriginal sites are protected by the AHA, whether or not they have previously been identified or registered, provided that the site can be determined to meet the section 5 definitions.

2.1 A land user is obliged to comply with the provisions of the AHA and failure to do so may result in prosecution. Section 17 of the AHA provides that it is an offence to excavate, destroy, damage, conceal or in any way alter an Aboriginal site. Therefore land users should carefully evaluate how a proposed activity may affect Aboriginal heritage.

2.2 In proceedings for an offence under the AHA, section 62 provides a 'special defence of lack of knowledge'. Section 62 states that "it is a defence for the person charged to prove that he did not know and could not reasonably be expected to have known, that the place or object to which the charge relates was a place or object to which [the AHA] applies".

2.3 The purpose of these Guidelines is to assist land users to be more aware of how their activities could adversely impact an Aboriginal site. Compliance with these Guidelines will not of itself guarantee compliance with the AHA. However, where the Guidelines are followed, it is less likely that Aboriginal sites will be harmed.

2.4 Due diligence may involve one or all of the following actions:

- (a) assessing the landscape where an activity is to take place;
- (b) assessing the proposed activity and the potential impact on the landscape;
- (c) searching the Register of Aboriginal Sites and the Aboriginal Heritage Inquiry System;
- (d) consulting with the relevant Aboriginal people;
- (e) agreeing to an Aboriginal heritage survey; or
- (f) other heritage management strategies." DPLH 2013: 7).

The use of these guidelines is based on the "precautionary principle":

"When using these Guidelines the 'precautionary principle'* should be applied to any circumstance where doubt exists, particularly about:

- the potential impact to Aboriginal heritage; and/or
- the nature and level of potential impact of the proposed activity(s).

If doubt exists the land user should contact the Department of Aboriginal Affairs in the first instance [predecessor Agency of DPLH]."

"*The Precautionary Principle

To apply a precautionary approach to the assessment of risk to Aboriginal heritage ensures all aspects of potential risk are considered and appropriate steps are applied to avoid or minimise damage to Aboriginal sites." (DPLH 2013: 2).

The Guidelines stress the importance of early consultation with Aboriginal people in planning ground-disturbing activities, in order to minimise or avoid any disturbance of Aboriginal sites (DPLG 2013: 8-9).

The guidelines also stress that the AHA provides blanket protection for all significant Aboriginal Heritage sites regardless of whether or not they have been previously recorded, with the following advice warning:

"2.17 Please note: Land users should exercise caution in areas where no surveys have been completed, or where surveys have only been completed for parts of the area where the proposed activity is intended. Caution is required because heritage surveys over only part of the land may not have identified all possible sites. Sole reliance on information contained in the Register may not be sufficient and consultation in the first instance with the DAA is recommended, depending on the DAA's advice this consultation may extend to include the relevant Aboriginal people." (DPLH2013: 9).

Consultation with Aboriginal Traditional Owners is highlighted in the Guidelines as the best way to obtain information regarding Aboriginal Heritage in a proposed project area:

"2.18 Information about the Aboriginal heritage for a particular area is best obtained through consultation with the relevant Aboriginal people. Whilst there is no definitive list of Aboriginal people who should be consulted for an area, the Committee suggests that the following people at least should be consulted:

- (a) determined native title holders;
- (b) registered native title claimants;

(c) persons named as informants on Aboriginal site recording forms held in the Register at DAA; and
(d) any other Aboriginal people who can demonstrate relevant cultural knowledge in a particular area.

2.19 Consultation in this context means engaging meaningfully with the relevant

Aboriginal people. The purpose of such consultation could be:

(a) to provide easily understood information about the proposed land use and to seek responses from the relevant Aboriginal people;

(b) to identify sites in the area that may not have been registered;

(c) to assess whether the proposed land activity might damage Aboriginal sites; and

(d) to develop strategies for heritage management for the proposed land use and for any longer term disturbance that might occur as part of the activity (e.g. construction of power poles and later periodic maintenance)." (DPLH 2013: 9-10).

The Guidelines also refer to the implications of Native Title claims in relation to Aboriginal heritage consultation and surveys.

"2.24 Where a license or permit application is submitted under a state law which triggers the 'future act' provisions (Division 3 of the NTA), particularly where a license proposes a significant ground disturbing activity, it is likely that an Aboriginal heritage survey of the area will be required." (DPLH 2013: 10)

"2.27 If at any time it is likely that the proposed activity will in any way impact on a registered Aboriginal site, or a suspected Aboriginal site is uncovered and consent under section 16 or 18 has not been granted to impact the site, then the activity should cease immediately and the land user should contact the DAA and the relevant Aboriginal people." (DPLH 2013: 11).

The Aboriginal Heritage Guidelines also categorise ground-disturbing activities on a scale of impacts with five categories ranging from "negligible disturbance" to "major disturbance". Exploration drilling is categorised under the highest-impact category of "major disturbance", together with "large scale changes to waterways" (DPLH 2013: 14).

2.3 Aboriginal and Torres Strait Islander's Heritage Protection Act 1984 (amended 2016), Commonwealth

The Commonwealth Aboriginal and Torres Strait Islander Heritage Protection Act 1984 provides a mechanism for the Commonwealth Minister for Sustainability, Environment, Water, Population and Communities to make declarations regarding the protection of an Aboriginal area when the Minister is satisfied that, under State or Territory law, there is ineffective protection of the area from a threat of injury or desecration. Declarations made under this Act may involve restricting activities and/or access to an Aboriginal site.

Under section 22 of the Aboriginal and Torres Strait Islander Heritage Protection Act 1984, it is an offence to conduct behaviour or partake in an action that contravenes a declaration made by the Minister. Where this relates to an Aboriginal place, the penalties applicable under this section are \$10,000 or imprisonment for five years, or both, for an individual, and \$50,000 for a corporate body. Where an Aboriginal object is concerned, the penalties are \$5000 or imprisonment for two years, or both, for an individual, and \$25,000 for a corporate body.

2.4 Native Title Act 1993, Commonwealth

The Commonwealth Native Title Act 1993 (NTA) is part of the Commonwealth's response to the High Court's decision in *Mabo v Queensland (No.2)* and adopts the common law definition of native title, defined as the rights and interests that are possessed under the traditional laws and customs of Aboriginal people in land and waters, and that are recognised by the common law. These rights may exist over Crown Land but do not exist over land held as freehold title.

The NTA recognises the existence of an Indigenous land ownership tradition where connections to country have been maintained and where acts of government have not extinguished this connection.

3 Results of the Cultural Heritage Survey

3.1 Cultural Heritage Assessment of the Survey Area

3.1.1 Environment and cultural heritage

The haul road alignment passes entirely through sandy open mulga and bulgarda-bush woodland with spinifex (Figures 3-1 to 3-3), and is aligned to avoid the breakaways and granite/ sandy gibber areas close by (Map 3-1). This factor in the chosen route simplifies cultural heritage management and minimises impacts for the project. The haul road alignment contains only the scattered, isolated artefacts (and probably some scarred trees) from traditional hunting and collecting activities, utilised from a separate base camp with a water supply, probably Wibboo Rock Holes.

Water is the key resource lacking in the sandy mulga/ spinifex country, with no significant stream channels or water holes transecting the survey area. We observed one pool containing water in a sandy stream bed (Figure 3-4) approximately 2.5 km south west of the isolated artefacts area in Map 3-1, but the channel had dissipated into a surface runoff zone before it reached the survey area.

These factors have determined the minimal archaeological signature and generic cultural/ environmental significance of this mulga/ spinifex country.



Figure 3-1: Sandy open mulga woodland with spinifex, northern haul road area.

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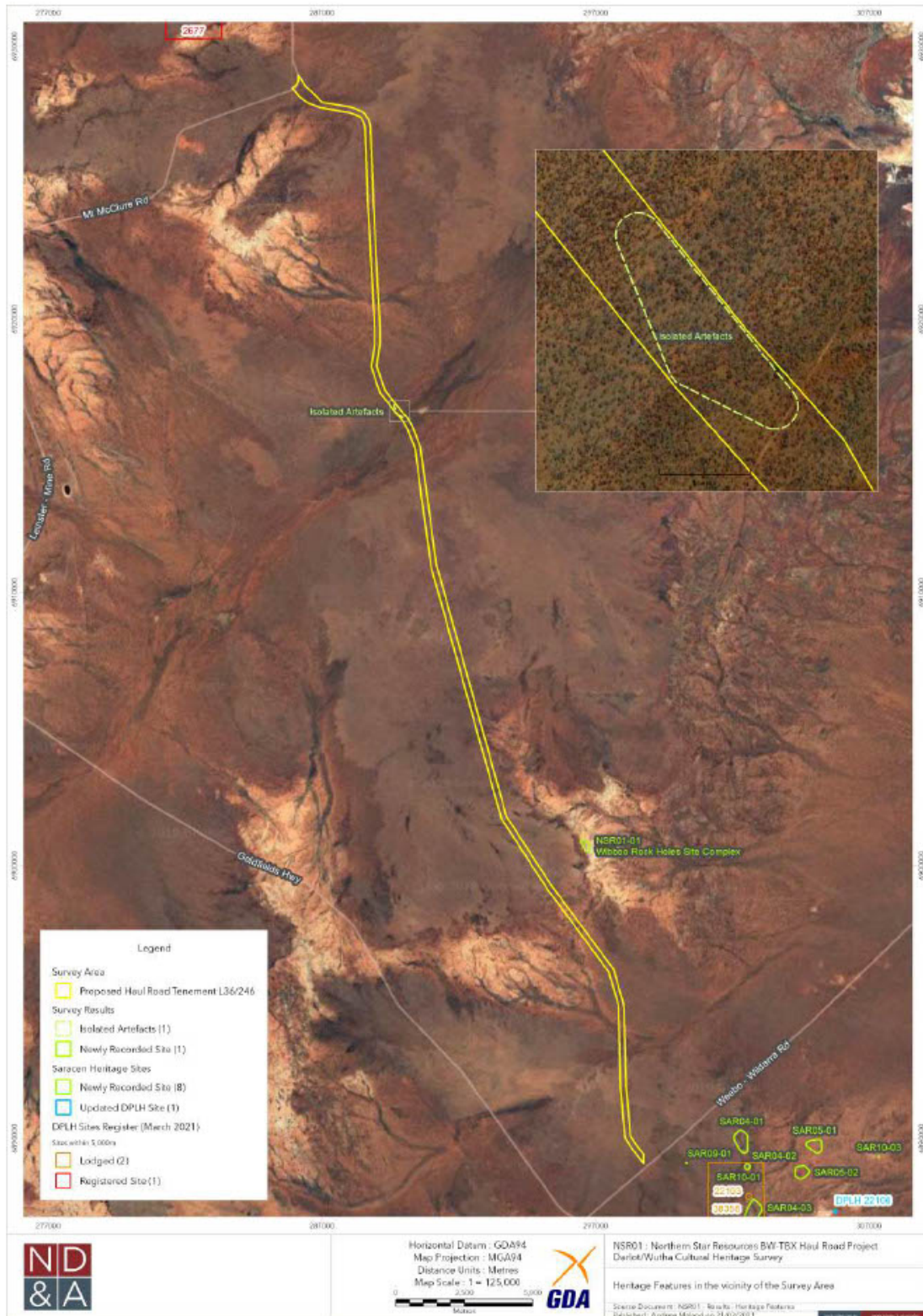




Figure 3-2: Loose sandy, open spinifex and scattered, previously burnt mulga and shrubs, central haul road area.



Figure 3-3: Open mulga woodland with spinifex, southern haul road area.



Figure 3-4: Small pool of standing water, sandy stream channel approx. 2km from haul road alignment.

The stream course shown in Figure 3-4 dissipates to the north west to become open, sandy Mulga and Wingara grass and spinifex country where it transects the haul road alignment (Figure 3-5). This area was subject to an approximately 5km long pedestrian survey, because of its proximity to the occasional stream channel and its open, sparse vegetation with more wingara grass and only sparse spinifex. Wingara grass seeds are harvested for damper and it also is an important food supply for kangaroo. Mature mulga trees and jilga (red wood) bushes are harvested for making tools and weapons, and the trees that still survive carry distinctive scars from these activities. Both the tree that is the source of the artefact to be manufactured as well the artefact itself are very culturally significant. The jilga (red wood) bush was identified by Ron Harrington Smith (Figure 3.6). The main limbs and base of these large bushes specifically are used to make traditional wadis (clubs).

Ground visibility was very good in this sparsely vegetated area, and a pattern of isolated stone artefacts was identified, that has resulted from transient traditional use of this area for hunting and resource collection and/or travelling through.



Figure 3-5: Open sandy mulga, wingara grass and sparse spinifex in the 'Isolated Artefacts' area (Map 3-1).



Figure 3-6: Jilga (red wood) bush, used for manufacturing traditional clubs, identified by Ron Harrington Smith.

3.1.2 Archaeology: Isolated finds and scarred trees

The extent of the isolated artefact concentration identified and recorded along the pedestrian survey area described above is shown on Map 3-1 and its inset. These flaked and ground stone artefacts all have been carried into, used and discarded here during past traditional use of the area. The artefact density is very low, with artefacts observed on the surface 50-100m apart, or in a few cases only 20m apart.

We observed one small granite grindstone (Figure 3-7), probably associated with grinding wingara grass among other things. Most of the isolated artefacts are small cutting and woodworking tools and the remnants of the transported cores from which they were flaked, in a wide range of introduced stone types.

Quartz artefacts are most numerous and potential sources are widespread in the local region. Figure 3-8 shows a quartz bipolar core, from which sharp cutting-flakes have been struck (not present). Figure 3-9 shows a quartz steep scraper, a wood-working tool with steep, retouched cutting edge like a chisel.

Figure 3-10 shows two 'informal' (no particular shape) cutting flakes of brown silcrete.

Chalcedony is an excellent material for stone cutting tools, so that although its availability is limited (nearest known source is around Agnew-Lawlers and Weebo Gorge to the west), small cores and tools often were transported for use (and eventual discard) elsewhere. Consequently, small chalcedony cores/ cutting tools are more frequent among the isolated artefacts observed than the limited availability of this stone would suggest (Figures 3-11 to 3-13). The chalcedony isolated artefacts are mostly small cores for producing fingernail-sized cutting flakes (as evident from their surface flake scars), which also have at least one steep scraping/ chiselling cutting edge for wood-working, that has been shaped and re-sharpened by micro-flaking.

The area of isolated artefacts shown in Map 3-1 represents the most conducive environment and highest density of artefacts along the haul road alignment. The density of artefacts is very low and they are standard forms and materials for the wider region, so that they do not constitute a significant Aboriginal Heritage Site or objects.

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Figure 3-7: Isolated artefact: small granite grindstone (Map 3-1).



Figure 3-8: Isolated artefact: Small quartz bipolar core (source of small, sharp flakes).

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Figure 3-9: Isolated artefact: quartz wood-working tool with steep, retouched cutting-edge



Figure 3-10: Isolated artefacts: two brown silcrete cutting flakes.

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Figure 3-11: Isolated artefacts: small chalcidony steep scraper (wood-working tool).



Figure 3-12: Isolated artefact: small chalcidony core and retouched steep scraper (cutting edge shaped and resharpened by flaking).



Figure 3-13: Isolated artefact: small chalcedony blade-core and retouched steep scraper.

3.1.3 Results and Recommendations

The entire haul road alignment is located on flat, sandy, open mulga forest and spinifex country. The ecological zone traditionally is country that traditional owners travel through, hunting and collecting plant foods and other resources such as timber for manufacturing tools and weapons. We observed a maximum background density averaging about one stone artefact per 100 square metres (Map 3-1) related to these activities over thousands of years. We would expect that there may be scattered, scarred trees from artefact manufacture, and other isolated artefacts occurring at some locations along the alignment. Neither the specific, isolated artefacts nor their low density represents a significant Aboriginal Heritage site or objects. The entire haul road alignment has cultural heritage clearance for construction.

The only efficient manner for identifying and recording such heritage items as scarred (culturally modified) trees is to include a Traditional Owner representative (cultural heritage monitor) in the team that clears the initial path (line tagging) for the chosen haul road route. That engagement also provides a Traditional Owner Representative for the initial vegetation clearance along the final alignment, and to record (GPS, photos) any scarred trees, significant artefacts such as grindstones, etc. that may occur along the alignment, but which would not be reliably identified even through a lengthy pedestrian survey of the entire 200m-wide corridor.

If that traditional owner monitoring is included in the initial clearance operation of the chosen corridor, the traditional owners and heritage consultant confirm that the proposed construction of the haul road within the nominated corridor has full cultural heritage clearance. The terrain and environment through which the corridor passes does not have the capacity to contain any other kinds of Aboriginal heritage sites.

Highly significant cultural heritage sites such as mythological and ceremonial sites, traditional camp sites and water sources are concentrated within the breakaway and other higher, rocky areas that occur along the eastern side, but outside of the haul road alignment. The heritage survey team identified a major site complex of this kind, Wibboo Rock holes, on the second day of the survey, approximately 2km east of the haul road alignment. Because of the significance of this previously unregistered site complex, its bearing on the comparative, lower heritage significance of the adjacent mulga/ spinifex country, and the requirement of the WA Aboriginal Heritage Act to report site discoveries (albeit in this case outside the survey area, but identified while engaged in accessing the survey area), the Aboriginal survey team and heritage consultant recorded this site for registration with DPLH (Section 4 below)..

The site complex includes two sets of culturally modified rock holes, (full of water) with associated stone, glass, metal and ceramic artefacts, three rock shelter on the breakaway margin with potential archaeological deposits, and physical evidence of the use of the rock holes for watering horse teams and the access track from the breakaways down to the eastern plain used by Cobb and Co stage coaches travelling from Lawlers east to Darlot in the early 20th century (the coach route passed through the haul road alignment but has not left any physical reminder).

4 Wibboo Rock Holes Cultural Heritage Site Complex

4.1 Location and significance

The nominated routes passes entirely through sandy open mulga woodland and spinifex, and is aligned to avoid the breakaways and granite/ sandy gibber areas close by (Map 3-1 below). While following station access tracks near the breakaways near the eastern margin of the haul road alignment on the second day, the Darlot/ Wutha participants identified that a very significant cultural heritage place, Wibboo Rock Holes, is located there, two kilometres east of the alignment. This important site has not been recorded and reported to DPLH previously, so a "Report of findings" is required under Section 15 of the WA Aboriginal Heritage Act 1972. The Traditional Owners want the site to be recorded and protected, particularly now that there will be a haul road constructed 2km away.

The nature and location of the Wibboo Rock Holes site complex also provides the explanation why the haul road alignment contains only the scattered, isolated artefacts (and probably some scarred trees) from traditional hunting and collecting activities with a separate base camp that has a water supply. Water is the key resource lacking in the sandy mulga/ spinifex country, with no significant stream channels or water holes transecting the survey area.

Following overnight discussion of these factors, the Darlot/Wutha survey team and the heritage consultant travelled along the access tracks already identified to inspect and record Wibboo Rock Holes for registration with DPLH on 25/03/2021 (see Map 4-1). Although the site description is contained in this report, it is acknowledged that it is located 2km to the east of the haul road alignment (Map 3-1) and will not be impacted by the construction or operation of the haul road within the nominated alignment, which has heritage clearance subject to traditional owner monitoring of the initial line tagging of the final route.

The site complex includes two sets of culturally modified rock holes (full of water) with associated stone, glass, metal and ceramic artefacts, three rock shelter on the breakaway margin with potential archaeological deposits, and physical evidence of the use of the rock holes for watering horse teams and the access track from the breakaways down to the eastern plain used by Cobb and Co stage coaches travelling from Lawlers east to Darlot in the early 20th century. The coach route passed through the haul road alignment but has not left any physical evidence there.

June Harrington Smith told me that her mother, Sarah Ashwin (nee Brown) camped here with her family and got water, travelling to Lawlers and then on to Sandstone. On the way to Sandstone, June's sister died and was buried there, because of Western Desert cultural customs, June never learned her name from their mother.

4.2 Wibboo Rock Holes Site Complex Description

4.2.1 The main rock holes and Cobb & Co.

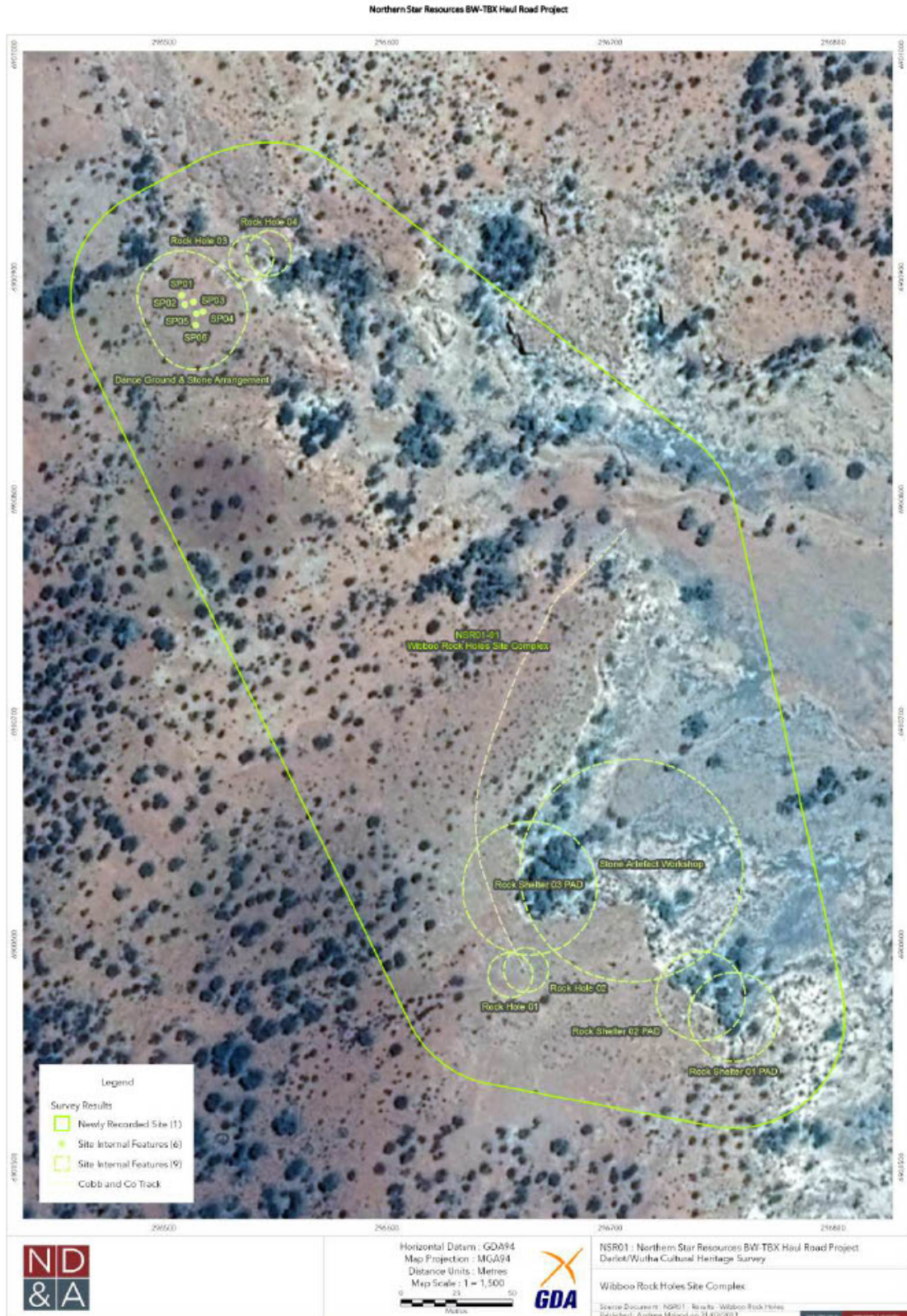
Near the eastern edge of the breakaways, there is a series of rock holes, called Wibboo (penis) Map 4-1, (Figures 4-1, 4-2). The breakaways are formed of weathered granite and silcrete, with some sandstone and calcrete. There are two larger rock holes, and several small ones in this cluster. This is an important traditional camp site area, particularly because there is no reliable water source in the sandy mulga/spinifex country to the west, or on the sandy plain with open woodland extending eastwards from the breakaways towards Darlot (Figure 4.3). Because of this substantial and reliable water supply in an otherwise very dry area, in the early twentieth century Cobb & Co coaches carrying mail, freight and passengers between Lawlers and Darlot stopped here to water their horses.

"Darlot

Darlot, originally known as Woodarra, is close to Lake Darlot which was named after pastoralist Leonard Darlot of Beringarra Station. Gold was discovered in late 1894 and Woodarra, gazetted in 1898, was named after the Aboriginal term for a nearby granite rock formation. The signposted town site, Darlot cemetery and the ruins of the Darlot Battery remain.

Lawlers

Gazetted in 1896, Lawlers was named after prospector Paddy Lawler. By the early 1900s Lawlers was a significant town amid a host of smaller settlements, with five hotels, a variety of shops as well as banks, schools, a resident mining warden, brewery, blacksmiths, cordial factory and Cobb & Co coach service. By 1905 the district's population peaked at almost 2,000, but five years later the mines began to close and by the 1920s Lawlers was a ghost town. The cemetery, old police station and the marked town site are all that remain." (<https://www.kalqoorliehistory.org.au/towns/Leinster>)



Map 4-1: Wibbo Rock Holes Cultural Heritage Site Complex.



Figure 4-1: View of the main Wibboo rock holes area near the edge of the breakaway, looking SE.



Figure 4-2: Wibboo rock holes: Rock shelter PAD 3 at centre, with the main rock holes area behind it.



Figure 4-3: Sandy plain with open woodland extending eastwards from the breakaways at Wibboo rock holes - Darlot is the high point on the horizon (one third from left).

The largest rock hole (Rock Hole 01, Map 4-1) is approximately 120 x 80 cm (depth not recorded). It was full of water (and tadpoles) at the time of our inspection. There are clear signs that the upper walls of the rock hole have been hollowed out beyond their natural size by punding and chipping with a hammer stone, which is common for desert rock holes. Rock Hole 01 also has large metal bolt hammered into the rock surrounding it and a remaining plank of the wooden cover that was secured over it to preserve the water supply during Cobb & Co use (Figures 4-4, 4-5).

Rock Hole 02 is approximately 150 x 100cm, and the TOs have placed a long stick in it to provide birds and lizards a means of accessing the water without drowning and polluting the supply (Figure 4-6). There are two other rock holes with a diameter of about 50cm, and a few smaller, shallow ones as well - the latter did not hold water at the time.



Figure 4-4: Wibboo Rock Hole 01, with metal bolts and remains of wooden cover from Cobb & Co use, early 1900s.



Figure 4-5: Second view of Wibboo Rock Hole 01 with metal bolts and timber from Cobb & Co cover, early 1900s.



Figure 4-6: Wibboo Rock Hole 02, with stick inserted to provide drinking access for birds and lizards.

Stone and glass flaked artefacts and some other manufactured items are scattered across the surface around the rock holes, with the density ranging from about 1-10 per square metre. Flaked stone artefacts are made from quartz, silcrete, chalcedony, diorite and ironstone, with a high proportion of retouched cutting and wood-working tools, and only a few cores (also used as cutting/ scraping tools) (Figures 4-7 and 4-8). All of these stone materials have been imported to the site, and are high quality materials preferentially carried from place to place. Less workable raw material such as quartz is less frequent.

We also observed rare and small grindstone pieces of diorite (Figure 4-9) and coarse silcrete (Figure 4-10).



Figure 4-7: Flaked stone artefacts, Wibboo main rock holes area: silcrete, chalcedony and diorite.



Figure 4-8: More Flaked stone artefacts, Wibboo main rock holes area: silcrete, chalcedony, quartz and ironstone.



Figure 4-9: Wibboo Rock holes: fragment of a diorite grindstone.



Figure 4-10: Wibboo Rock Holes: piece of broken silcrete grindstone.

There are many flaked tools made from old broken (mostly beer) bottles in this area as well, many having carefully shaped and resharpened cutting edges for wood-working (Figure 4-11, 4-12). Figure 4-13 shows a specialised tool with a drill/awl cutting edge for piercing and engraving work. There also are scattered metal food cans (Figures 4-11, 4-14), some pieces of horseshoes and an old spoon (Figure 4-15), and a broken ceramic plate with the name Avondale and a logo of a rounded beehive (Figure 4-16).

The Cobb & Co coach track is visible across the weathered rock surface in some places leading from the rock holes northwards to a clearly visible track from a low point of the breakaway edge on to the sandy flat below (Map 4-1, Figure 4-17).

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Figure 4-13: Wibboo Rock Holes: Drill/awl (right side) flaked from a piece of old beer-bottle glass.



Figure 4-14: Weebo Rock Holes: old metal food can.

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Figure 4-11: Wibboo Rock Holes: Flaked glass wood-working tool made from an old beer-bottle base and the remains of a food can.



Figure 4-12: Wibboo Rock Holes: flaked cutting tool made from an old beer-bottle base.

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Figure 4-15: Wibboo Rock Holes: old spoon and part of a horseshoe.



Figure 4-16: Wibboo Rock Holes: part of a broken plate with the word "Avondale" and a beehive trademark design.

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Figure 4-18: Wibboo Rock Holes: Rock Shelter 01 PAD.



Figure 4-19: Wibboo Rock Holes: Rock Shelter 01, second view.

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Figure 4-20: Wibboo Rock Holes: Rock Shelter 02 from the top of the breakaway.



Figure 4-21: Wibboo Rock Holes: Rock Shelter 002

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Figure 4-22: Wubboo Rock Holes: Rock Shelter 03, view 1 of 3.



Figure 4-23: Wubboo Rock Holes: Rock Shelter 03, view 2 of 3.



Figure 4-24: Wibboo Rock Holes: Rock Shelter 03, view 3 of 3.



Figure 4-25: Wibboo Rock Holes: old billy can with wire handle on the creek line just below Rock Shelter 03.

4.2.3 Dance ground and rock holes

Less than 250m NW of the main rock holes on the breakaway, there are two other substantial rock holes right on the edge of the breakaway and a water channel that directs runoff through these rock holes and on to the sandy plain below (Map 4-1). There are white gums, Mulgas and babulda (Jam tree) along the edge of the breakaway at places where rainfall runs off.

Rock hole 03 is the largest of them all, approximately 2-5 x 1.5m and at least 1m deep (and full of water and tadpoles) (Figure 4-26). Rock Hole 04 is smaller, approximately 1 x 1.5m (Figure 4-27). These rock holes are less than 20m away (Figure 3-28) from a dance ground on a flat rocky area, with six stone piles assembled on it (Map 4-1, Figures 4-28, 4-29). These small stone piles represent the different moieties or skin groups into which people are grouped to regulate marriages and social interaction.

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Figure 4-26: Wibboo Rock Hole 03 with tadpoles.



Figure 4-27: Wibboo Rock Hole 04 on the edge of the breakaway (right foreground).
Rock hole 3 is behind the three people.

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Figure 4-28: View east across Wibboo Rock Holes 03 and 04, from the northern end of the adjacent dance ground.



Figure 4-29: Wibboo Rock Holes: Dance Ground with stone piles.

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Figure 4-30: Wiboo Rock Holes: Dance Ground with six stone piles representing 'skin groups' (facing south).

5 Bibliography

Draper, N., A. Donald and A. Maland 2021 *Northern Star Thunderbox Haul Road, Otto Bore & Bundarra Exploration Areas. Darlot Native Title Group Cultural Heritage Survey*. Report by Neale Draper & Associates for Saracen Metals Ltd and the Wutha/Darlot Native Title Claim Group.

Eastern Goldfields Historical Society website
06/04/2021 Near Leinster.
<https://www.kalgoorliehistory.org.au/towns/Leinster>



Appendix 3: Surface Water Assessment Report



Clearing Permit Supporting Information – Orelia South Proposed Haul Road

Water Assessment

HAUL ROAD - BRONZEWING TO THUNDERBOX

Surface Water Study



EWP20230.002
003b
05 May 2021

REPORT

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Approval for issue

Rhod Wright	<i>RW Wright</i>	5 May 2021
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REPORT

1 INTRODUCTION

1.1 Background

NSR is proposing to construct a new section of haul road to Thunderbox Processing Plant, adjacent to the Goldfields Highway, 40km south east of Leinster and 320km north of Kalgoorlie. An existing road to Leinster (Mt McClure Road) runs south west from Bronzewing acquired in November 2019. The proposed new section of road will tee off about 50km south west of Bronzewing. The new road then heads south through Weebo Station, a sheep and cattle pastoral lease, and crosses the Goldfields Highway to the Thunderbox processing plant (~60km), where the Thunderbox mill will be expanded. The total distance Bronzewing to Thunderbox is about 110km.

The haul road will be constructed for site access for personnel travelling between Bronzewing and Thunderbox, and road train haulage of the ore from Bronzewing to Thunderbox.

The road will be gravelled to road train specification, 12m running pavement width. Road drainage will comprise side drainage (table drains), turn outs and at grade floodways across water courses, so as not to interrupt flow paths.

NSR requires a surface water assessment for the project, comprising flood modelling as required and associated figures to support the Mining Proposal application to Department of Mines, Industry Regulation and Safety (DMIRS).

1.2 Scope of Services

The surface water assessment includes:

- Description of the proposed access / haul road route and associated terrain
- Characterisation and description of drainage conditions from a regional and local perspective - the existing surface water environment, including climate, location and size of catchments, existing drainage conditions and flow directions
- Identify surface water management issues / hydrological risks associated with the development, particularly local creek lines affecting infrastructure and impacts on natural drainage systems
- Estimation of flood flows for various probabilities, at flow path crossings, in particular major crossings
- Figures illustrating the surface water impacts on the road and its surrounds

REPORT

2 HYDROLOGY

2.1 Climate Zones

WA has three broad climate divisions - the dry tropical northern part of the State, receiving summer rainfall; the south-west corner of WA with a Mediterranean climate, with long hot summers and wet winters; and the arid central eastern areas of WA, in which Bronzewing / Thunderbox is located.

2.2 Seasonal Rainfall and Evaporation

Bronzewing / Thunderbox is in a semi-arid / desert area with a hot dry summer and cold winter (subtropical desert / low-latitude arid hot climate). Rainfall is unreliable and intermittent. The average annual rainfall at Leinster (BOM, Site number 012314) is 253mm (measured over 27 years from 1994). Rainfall is highly variable, with the annual rainfall varying from about 0.4 – 1.7x the average.

The majority of rainfall occurs in December-April (24-41mm average per month), and a drier June-November (3-16mm average). There is a 14% chance of a rainy day, mostly likely occurring December to June.

Class A pan evaporation is in the order of 3200mm pa (about 450mm in January and 100mm in June / July).

The area includes dryland creek systems with unpredictably variable hydrological regimes (erratic extremes of drought and flood), and in the physical, chemical and biological characteristics that depend on these regimes. Regional surface water drainage in the area is relatively undefined.

Drainage trends north east (at about 0.1%) across the road alignment towards salt lakes 20-80km east of the haul road.

2.3 Intensity-Frequency-Duration (IFD)

Intensity-Frequency-Duration (IFD) data is required to characterise rainfall intensities in the area. This is generally provided by techniques in ARR (Australian Rainfall and Runoff), a national guideline for the estimation of design flood characteristics in Australia. Typical IFD rainfall data for various AEPs (Annual Exceedance Probability) and ARIs (Average Recurrence Interval) in the area are:

Table 1 - Intensity-Frequency-Duration (IFD)

Duration	Duration (mins)	63.2% 1 yr ARI	50% 1.4yr ARI	20% 4.5yr ARI	10% 9.5yr ARI	5% 20yr ARI	2% 50yr ARI	1% 100yr ARI
1 hour	60 mins	12	15	23	30	37	49	58
2 hour	120 mins	15	18	29	37	47	60	72
6 hour	360 mins	22	26	41	53	66	85	100
12 hour	720 mins	28	33	53	67	83	105	124
24 hour	1,440 mins	34	41	66	84	104	132	155
36 hour	2,160 mins	38	46	74	95	117	149	175
48 hour	2,880 mins	41	49	79	102	126	161	190
72 hour	4,320 mins	43	53	85	110	137	177	211

The 1000 year rainfalls are ~1.5 x 100 year values.

2.4 Flood Estimation

There are no relevant streamflow gauging data / gauged catchments from which flood estimates may be made directly. The main ARR flood estimation method for ungauged catchments is the Regional Flood Frequency Estimation (RFFE) technique, based on data from gauged (often very remote) catchments. Thunderbox / Leinster is located over 300km from the nearest stream gauge used to develop the RFFE parameters, and results therefore have a lower accuracy, but provide a reasonable and likely conservative estimate of flows, as a guide to the size of a creek.

REPORT

Over a range of catchments impacting the haul road, the 100 year flow estimates can be generalised as:

- $Q_{100} = 3.73 \times Ac^{0.716}$ (Ac in km²)

More frequent flood flows in this area can (again generally) be estimated as a proportion of the 100 year flows.

Table 2 – Flood Flow Estimates

AEP % /ARI (years)	Flow (as proportion of 100 year flow)
50% / 1.4 year	0.11
20% / 4.5 year	0.27
10% / 9.5 year	0.39
5% / 20 year	0.58
2% / 50 year	0.76
1% / 100 year	1.00

The largest catchment the road crosses (904km²) has an estimated 100 year flow in the order of 500m³/s. There is a 50% chance that a flow of 50m³/s would occur each year, and 130m³/s every 5 years on average.

REPORT

3 BRONZEWING TO THUNDERBOX ROAD

3.1 General

A general layout of the haul road from the Leinster – Bronzewing Road (Mt McClure Rd) to the Thunderbox process plant is shown in Figure A.

Much of this region consists of a broad, relatively featureless plateau. The road generally lies between RL465-515m above sea level.

From Mt McClure Rd at RL480m, the proposed haul road slopes down to RL470m over 3.5km, climbs slightly and then descends to RL465m where it runs flat for 3km through a large drainage “floodplain” (catchment ~900km²) as the lowest point in the road. It then ascends for 15km to the top of the road RL515m,

Over the next 7km the road slopes gently down towards another large drainage (~183km²), and then slopes up for 17km to the Thunderbox process plant.

The variation in altitude is low and the longitudinal road grades are minimal – the road would overall appear to be flat (gently undulating locally). A typical haul road is shown below.



Picture 1 - Typical Haul Road / Floodway

3.2 Creeks and Drainage Line Crossings

Drainage is an important aspect of design, construction and maintenance of a road. Drainage considerations include a gravel pavement, surface cross fall (camber), side drains and scour protection, regular turn-outs to lead water from side drains out into the road surrounds (and in steeper terrain, a cut-off contour bank constructed above the road embankment / cut faces).

REPORT

The area includes hardpan wash plains and sandplains (with some stony plains, hills, mesas and salt lakes) on the Yilgarn Craton. Soils are red loamy and sandy earths. Vegetation is mulga shrublands with spinifex grasslands.

The road route crosses two very large drainage channels and seven small to medium drainage channels (refer Figure B). The drainage channels are undefined as they cross the road, with potential flood extents ~3km wide for the larger drainage channels.

The type of creek crossing adopted for a road is generally determined by the level of immunity from flooding that is required, and the time of closure acceptable during a flow period. Design considerations are centred on discharge capacity and duration of road closure (road closure is typically assumed when flow depth exceeds ~0.3m for cars and ~0.6m for trucks). Engineering issues at major waterways relate to pavement resistance to submergence and velocity / scour protection, or subsequent maintenance required.

At ground floodways are commonly used with low traffic volumes, where it is uneconomical to construct culverts or bridges. Gravel floodways at natural surface level are proposed. In a desert context, the durations of flooding are low, flow depths are shallow, velocities are low, and there are no practical consequences to a flow event crossing the road. The road may require grading (and possibly additional gravel) following a significant flow event if surface roughness (damage) occurs.

The relevant catchments are shown in Figure B.

The estimated 100 year flows are shown on Figure C.



Picture 2 – Typical Floodway

REPORT

4 EROSION AND RUNOFF

The landscape can be subject to heavy rainfall, and there is a risk of erosion and sedimentation on disturbed or degraded land associated with the road. The risk derives from vegetation and topsoil removal, and general construction activities. It is noted that erosion and downstream water quality (washed off sediment) risk is less in very flat terrain (where stream powers are very low).

However, adherence to surface water protection principles and implementation of environmental control measures during construction are appropriate can reduce environmental impacts. Construction impacts include revolve around disturbance and excavation, and activities such as fuel and chemical storage, and handling /spillage of materials. Some activities require more detailed management plans, such as clearing and grubbing; topsoil stripping and stockpiling; waterway crossings, chemical storage and use; refuelling operations, water monitoring methods, etc).

Site inspections / informal visual checks are required to monitor any mitigation and control measures put in place. Such site inspections can include event based inspections i.e. inspection prior to or following large rain events. The outcomes of inspections, monitoring, and audits facilitate the identification of problems and recurring issues or areas for improvement.

REPORT

5 CLOSURE

Mining is a temporary land use and at closure, the road may be passed over to the local Shire (for example) or otherwise removed.

Rehabilitation objectives should be consistent with the projected future land use, and maintenance free over the long term.

On completion of mining then consultation can be conducted with the relevant stakeholders, and consideration given to transferring the road to interested parties, pastoralist, etc and if required formal transfer of infrastructure then undertaken.

Otherwise once completion criteria has been achieved, the road area will be relinquished and the land returned for pastoral use, the underlying and pre-existing land use in the area. This not expected to change after the completion of mining. The objective is to rehabilitate the road to a safe and stable state, with endemic plant communities that approximate those that existed prior to the disturbance i.e. a focus on surface stability and revegetation of surfaces. The ground should be left free draining, non-polluting and visually compatible with its surrounds and suitable for alternative land use (such as pastoralism, and heritage conservation).

The road will be rehabilitated to facilitate natural drainage and establish native vegetation. Roads will be stripped, and windrows will be graded and re-contoured to resemble the natural landscape. Sheet water flow will be reinstated. The process will include removal of signage and infrastructure (delineators etc), deep rip all roads, grade windrows and re-contour to match the surround landscape, spread available vegetative material to improve resistance to erosion, provide source of seed and organic matter and provide fauna refuge/habitat, seed with species of local provenance

REPORT

6 SUMMARY

NSR is proposing to construct a new section of haul road between Bronzewing mine NE of Leinster to Thunderbox Processing Plant, a distance of about 110km. The new section of road, about 60km long, is to be constructed from the Mt McClure Road, south through Weebo Station to cross the Goldfields Highway at Thunderbox.

The new road to Thunderbox will be a 12m wide gravel road (to road train specification), constructed for site access for personnel travelling between Bronzewing and Thunderbox, and road train haulage of the ore from Bronzewing to Thunderbox for processing.

Bronzewing and Thunderbox are in a semi-arid / desert area with an average annual rainfall of about 250mm, mostly in December-April with a hot dry summer and cold winter. There are no relevant streamflow gauging data / gauged catchments from which flood estimates may be made directly. The main ARR flood estimation method for ungauged catchments is the Regional Flood Frequency Estimation (RFFE) technique. The nearest gauge is over 300km away and the method has a lower accuracy, but is considered sufficient for these purposes. Over a range of catchments impacting the haul road, the 100 year flow estimates can be generalised as $Q_{100} = 3.73 \times Ac^{0.716}$ (Ac in km²). More frequent flood flows can be estimated as a proportion of the 100 year flows.

Much of this region consists of a broad, relatively featureless plateau 300m- 600m above sea level. The topography in the haul road area is flat to undulating. The area includes hardpan wash plains and sandplains (with some stony plains, hills, mesas and salt lakes) on the Yilgarn Craton. Soils are red loamy and sandy earths. Vegetation is mulga shrublands with spinifex grasslands.

The longitudinal road grades are minimal, and the road would overall appear to be flat (gently undulating locally). Drainage considerations include a gravel pavement, surface cross fall (camber), side drains and scour protection, and regular turn-outs to lead water from side drains out into the surrounds. The road route crosses two very large drainage channels and seven small to medium drainage channels. The drainage channels are undefined as they cross the road, with potential flood extents ~3km wide for the larger drainage channels.

Floodways are commonly used with low traffic volumes, and gravel floodways at natural surface level are proposed. The durations of flooding are low, flow depths are shallow, velocities are low and impact on the road are low. The road may require grading / graveling following a significant flow event if surface damage occurs.

The risk of erosion and sedimentation derives from vegetation and topsoil removal, and general construction activities. The disturbance and runoff caused by roads is typically controlled by side table drains and drain turn outs. Erosion and downstream water quality (washed off sediment) risk is less in very flat terrain (where stream powers are very low, and sediment does not migrate).

Mining is a temporary land use and at closure, the road may be passed over to other users or otherwise removed and the area rehabilitated. The objective is to rehabilitate disturbed areas with a focus on surface stability and revegetation of surfaces. The ground should be left free draining, non-polluting and visually compatible with its surrounds and suitable for alternative land use (such as pastoralism, and heritage conservation).



REPORT

FIGURES

- Figure A Location Plan
- Figure B Catchment Boundaries
- Figure C 100-Year Flows

Clearing Permit Supporting Information – Orelia South Proposed Haul Road

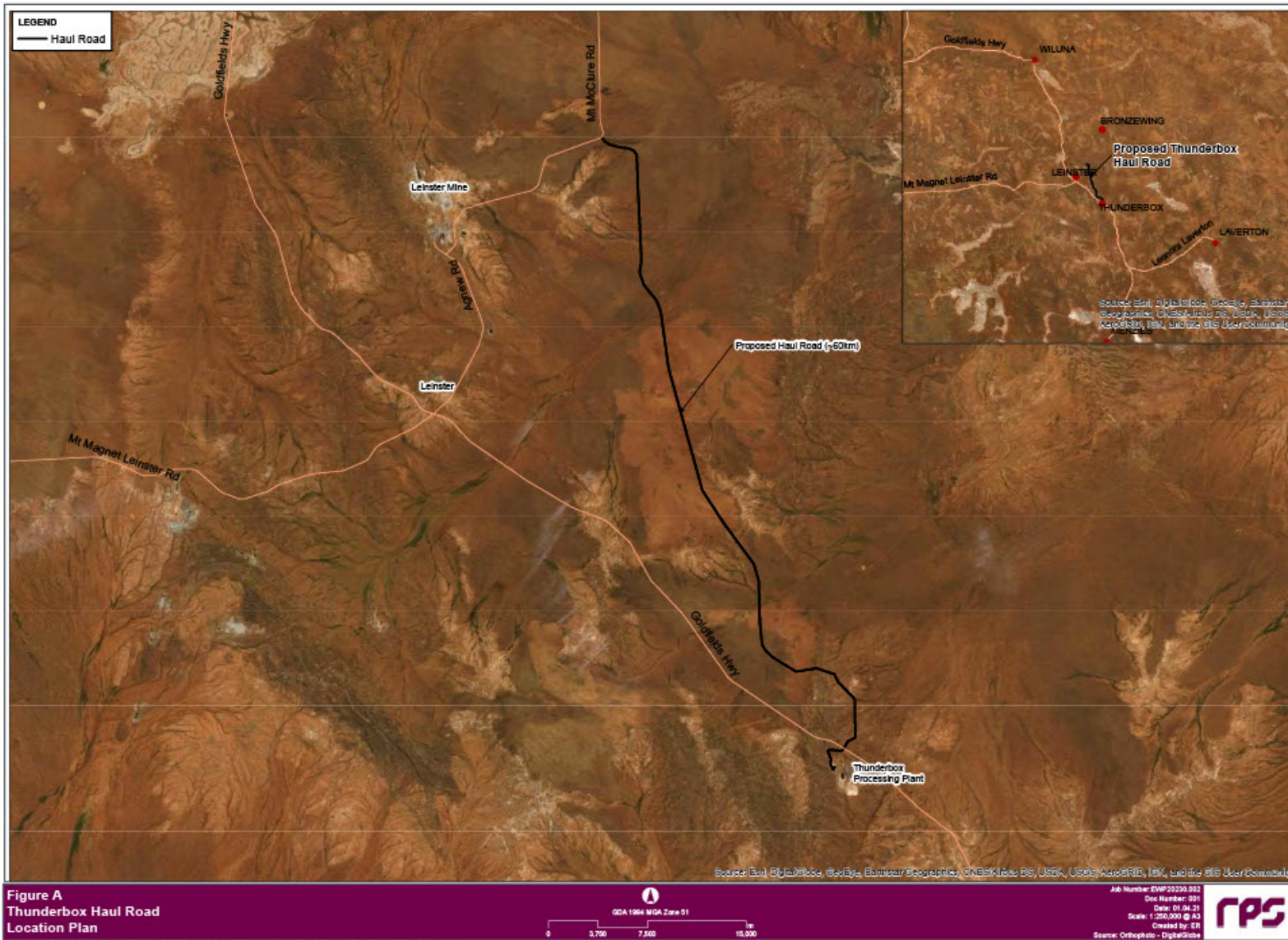




Figure B
Thunderbox Haul Road
Catchment Boundaries



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Doc Number: 001
Date: 01.04.21
Scale: 1:200,000 @ A3
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Source: Orthophoto - DigitalGlobe

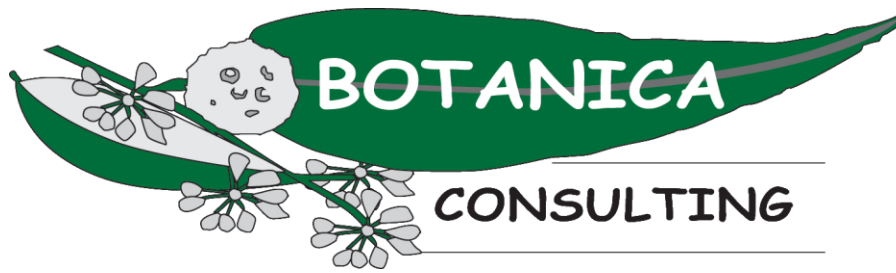






Clearing Permit Supporting Information – Orelia South Proposed Haul Road

Appendix 4: Flora and Fauna Survey Report



Reconnaissance Flora and Basic Fauna Survey of the proposed Bronzewing to Thunderbox Haul Road (L36/246)

Prepared for Northern Star Resources Ltd.



October 2021
Version 2

Prepared by:
Botanica Consulting Pty Ltd
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Glossary

Acronym	Description
BAM Act	<i>Biosecurity and Agriculture Management Act 2007</i> , WA Government.
BC Act	<i>Biodiversity Conservation Act 2016</i> , WA Government.
Botanica	Botanica Consulting Pty Ltd.
BoM	Bureau of Meteorology.
DAFWA	Department of Agriculture and Food (now DPIRD), WA Government.
DAWE	Department of the Agriculture, Water and Environment (formerly known as DotEE), Australian Government.
DBCA	Department of Biodiversity, Conservation and Attractions (formerly DPaW), WA Government.
DEC	Department of Environment and Conservation (now DBCA), WA Government.
DER	Department of Environment Regulation (now DWER), WA Government.
DMIRS	Department of Mines, Industry Regulation and Safety (formerly DMP), WA Government
DotEE	Department of the Environment and Energy (now known as DAWE), Australian Government.
DoW	Department of Water (now DWER), WA Government.
DPaW	Department of Parks and Wildlife (now DBCA), WA Government.
DPIRD	Department of Primary Industries and Regional Development, WA Government
DWER	Department of Water and Environmental Regulation (formerly EPA, DER and DoW), WA Government
EP Act	Environmental Protection Act 1986, WA Government.
EP Regulations	Environmental Protection (Clearing of Native Vegetation) Regulations 2004, WA Government.
EPA	Environmental Protection Authority, WA Government.
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i> , Australian Government.
ESA	Environmentally Sensitive Area.
Ha	Hectare (10,000 square meters).
IBRA	Interim Biogeographic Regionalization for Australia.
IUCN	International Union for the Conservation of Nature and Natural Resources – commonly known as the World Conservation Union.
JAMBA	<i>Japan Australia Migratory Bird Agreement 1981</i> .
Km	Kilometer (1,000 meters).
LGA	Local Government Area
NVIS	National Vegetation Information System.
PEC	Priority Ecological Community.
TEC	Threatened Ecological Community.
WA	Western Australia.
WAHERB	Western Australian Herbarium.
WAM	Western Australian Museum, WA Government.

Executive Summary

Botanica Consulting Pty Ltd (Botanica) was commissioned by Northern Star Resources Ltd (NSR) to undertake a reconnaissance flora/ vegetation survey and basic fauna survey of the proposed Bronzewing to Thunderbox haul road, encompassing the entire boundary of tenement L36/246 (referred to as 'survey area'). The survey area consists of a corridor approximately 60 km in length, 200m in width with an area of approximately 1,230 ha in extent. The survey area is located approximately 18 km east of Leinster, Western Australia. The survey is required to support a Native Vegetation Clearing Permit (NVCP) application and Mining Proposal.

The survey area lies within the Eastern Murchison (MUR1) subregion of the Murchison Bioregion, as defined by the Interim Biogeographic Regionalisation of Australia (IBRA).

The Eastern Murchison comprises the northern parts of the craton's Southern Cross and Eastern Goldfields Terrains and is characterised by internal drainage and extensive areas of elevated red desert sandplains with minimal dune development. Salt Lake systems are associated with the occluded paleodrainage system. Broad plains of red-brown soils and breakaways complexes as well as red sandplains are widespread. Vegetation is dominated by Mulga woodlands and is often rich in ephemerals, hummock grasslands, saltbush shrublands and *Tecticornia* shrublands (Cowan, 2001).

The dominant land uses of the Eastern Murchison subregion include grazing native pastures (85.47%), unallocated crown reserves (11.34%), conservation (1.4%) and mining (1.79%) (Cowan, 2001). The survey area is located within the Weebo Pastoral Lease.

Prior to the field assessment a literature review was undertaken of previous flora and fauna assessments conducted within the local region. Documents reviewed included:

- Botanica Consulting (2014). *Level 1 Flora and Vegetation Survey of the Thunderbox to Bannockburn Project*. Prepared for Saracen Metals Pty Limited.
- Botanica Consulting (2016). *Level 1 Flora and Fauna Survey Julius Project*, Prepared for Echo Resources Limited.
- Botanica Consulting (2018a). *Reconnaissance Flora & Fauna Assessment Otto Bore*. Prepared for Saracen Metals Pty Limited.
- Botanica Consulting (2018b). *Reconnaissance Flora/ Vegetation and Fauna Survey Orelia Project*. Prepared for Echo Resources Limited.
- Botanica Consulting (2019). *Reconnaissance Flora/ Vegetation and Fauna Survey Mt Joel Project*. Prepared for Echo Resources Limited.
- Botanica Consulting (2020). *Reconnaissance Flora/ Vegetation & Fauna Survey Julius Haul Road alternative locations*. Prepared For Northern Star Resources Limited.

In addition to the literature review, searches of the following databases were undertaken to aid in the compilation of a list of significant flora within the survey area:

- DBCA Threatened/ Priority Flora spatial data (DBCA, 2019a);
- DBCA NatureMap database (DBCA, 2021b); and
- EPBC Protected Matters search tool (DAWE, 2021a).

The NatureMap species search and EPBC Protected Matters search were conducted with a 40 km buffer from the survey area.

The desktop review identified 339 vascular flora species as occurring within 40 km of the survey area, representing 146 genera from 49 families. The most diverse families were Fabaceae (54 species), Asteraceae (41 species) and Chenopodiaceae (33 species). Significant genera were *Acacia* (31 species), *Eremophila* (28 species) and *Eucalyptus* (13 species).

The desktop review identified ten introduced flora (weed) species as potentially occurring in the vicinity of the survey area. None of these species are listed as a Declared Pest on the Western Australian Organism List (WAOL) under the *Biosecurity and Agriculture Management (BAM) Act 2007* or as a Weed of National Significance (WONS).

The assessment of the DBCA Priority/ Threatened flora data (DBCA, 2019a), NatureMap search (DBCA, 2021b), Protected Matters searches (DAWE, 2021a) and previous relevant literature identified eight significant flora species recorded within a 40 km radius of the survey area¹.

These taxa were assessed for distribution and known habitat to determine their likelihood of occurrence within the survey area. The assessment identified four significant flora taxa as possible to occur in the survey area. The remaining taxa were considered unlikely to occur within the survey area.

The Protected Matters search (DAWE, 2020a) did not identify any Threatened Ecological Communities recorded within 40 km of the survey area. Analysis of the Priority Ecological Communities within the Eastern Murchison region (DBCA, 2021a) did not identify any significant vegetation assemblages as likely or possibly occurring within the survey area.

All Pre-European vegetation associations retain >98% of their pre-European extent.

The desktop review identified a total of 114 terrestrial vertebrate fauna taxa have been recorded within 40 km of the survey area, consisting of 79 bird, six mammal, 25 reptile and four amphibian taxa.

The desktop review identified seven terrestrial fauna species of conservation significance as previously being recorded in the regional area, consisting of five Threatened and two migratory or otherwise protected species. In addition, five migratory wading/shorebird species were assessed collectively due to their similar habitat requirements.

Habitat and distribution data was used to determine the likelihood of occurrence within the survey area. The assessment identified two significant fauna species as potentially occurring in the survey area.

There are no proposed or vested Conservation Reserves located within the survey area.

There are no DBCA managed lands or lands of interest located within the survey area.

There are no Environmentally Sensitive Areas (ESAs) located within the survey area.

There are no Nationally Important or RAMSAR wetlands located within the survey area.

¹ One taxon listed on the database searches is no longer listed as Priority Flora

The closest significant environmental feature is Wanjarri Nature Reserve, located approximately 30 km north of the survey area. This area is also categorised as an ESA. Disturbances within the survey area are unlikely to impact this area.

Botanica conducted a reconnaissance flora/ vegetation and basic fauna survey on the 24th to 25th March 2021, with the area traversed on foot and 4WD by Jim Williams (Director/Principal Botanist, Diploma of Horticulture) and Jennifer Jackson (Senior Botanist, BSc (Honours) Environmental Management).

The field survey identified 82 vascular flora taxa within the survey area. These taxa represented 39 genera across 25 families, with the most diverse genera being *Acacia* (14 species), *Eremophila* (eight species) and *Maireana* (five species). Dominant families include, Fabaceae (18 species), Proteaceae (seven species) and Malvaceae (six species).

No introduced (weed) species were recorded within the survey area.

No Threatened or Priority flora species or otherwise significant flora were recorded within the survey area.

A total of seven broad-scale vegetation communities were identified within the survey area. Vegetation community descriptions and extents were determined from field survey results, aerial imagery interpretation and extrapolation of the communities.

The survey found CLP-OMW/AFW1 was the most widespread community in the survey area, occupying 419.7 ha (34.4%), while RS-AFW1 was the most restricted with 29.9 ha (2.4%). The most diverse community was CLP-OMW/AFW1 with 38 species (46.3%) while the least diverse was SP-OMW1, with 12 species (14.6%).

No Threatened or Priority Ecological Communities or otherwise significant vegetation were identified within the survey area.

Based on vegetation and associated landforms identified during the flora and vegetation assessment, seven broad scale terrestrial fauna habitats were identified as occurring within the survey area.

No evidence of significant fauna species were observed during the survey, including no evidence of Malleefowl nesting mounds or other activity.

Native vegetation within the survey area was rated as 'good'. 'Good' condition depicts more obvious signs of damage caused by human activity since European settlement, including impacts to vegetation structure and composition from low levels of grazing, changed fire regimes and/or slightly aggressive weeds. Areas cleared of vegetation, including major roads and raw material extraction pits, were categorized as 'completely degraded'.

Based on the outcomes from the survey undertaken, Botanica assessed the results of the desktop and field survey with regards to the native vegetation clearing principles listed under Schedule 5 of the EP Act. The assessment found that the proposed vegetation clearing activities may be at variance with clearing principle (f).

1 **INTRODUCTION**

1.1 **Project Description**

Botanica Consulting Pty Ltd (Botanica) was commissioned by Northern Star Resources Ltd to undertake a reconnaissance flora/ vegetation survey and basic fauna survey of the proposed Bronzewing to Thunderbox haul road, within tenement L36/246 (referred to as 'survey area') (Figure 1-1). The survey area consists of a corridor approximately 60 km in length, 200m in width with an area of approximately 1,230 ha in extent. The survey area is located approximately 18 km east of Leinster, Western Australia. The survey is required to support a Native Vegetation Clearing Permit (NVCP) application.

1.2 **Objectives**

The flora assessment was conducted in accordance with the requirements of a reconnaissance flora survey as defined in *Technical Guidance - Flora and Vegetation Surveys for Environmental Impact Assessment – December 2016* (EPA, 2016a). The objectives of the assessment were to:

- gather background information on flora and vegetation in the target area (literature review, database and map-based searches);
- identify significant flora, vegetation and ecological communities and assess the potential sensitivity to impact;
- conduct a field survey to verify / ground truth the desktop assessment findings;
- undertake floristic community mapping to a scale appropriate for the bioregion and described according to the National Vegetation Information System (NVIS) structure and floristics;
- undertake vegetation condition mapping;
- assess the project area's plant species diversity, density, composition, structure and weed cover, using NVIS classification system for vegetation description;
- assess Matters of National Environmental Significance (MNES) and indicate whether potential impacts on MNES as protected under the EPBC Act are likely to require referral of the project to the Commonwealth DAWE; and
- determine the State legislative context of environmental aspects required for the assessment.

The fauna assessment was conducted in accordance with the requirements for a basic terrestrial fauna survey as defined in *Technical Guidance - Terrestrial Fauna Surveys for Environmental Impact Assessment – June 2020* (EPA, 2020). The objectives of the assessment were to:

- Gather background information on fauna in the survey area (literature review, database and map-based searches);
- Delineate and characterise the faunal assemblages and fauna habitats present in the survey area; and
- Assess the likelihood of significant fauna occurring within the survey area.

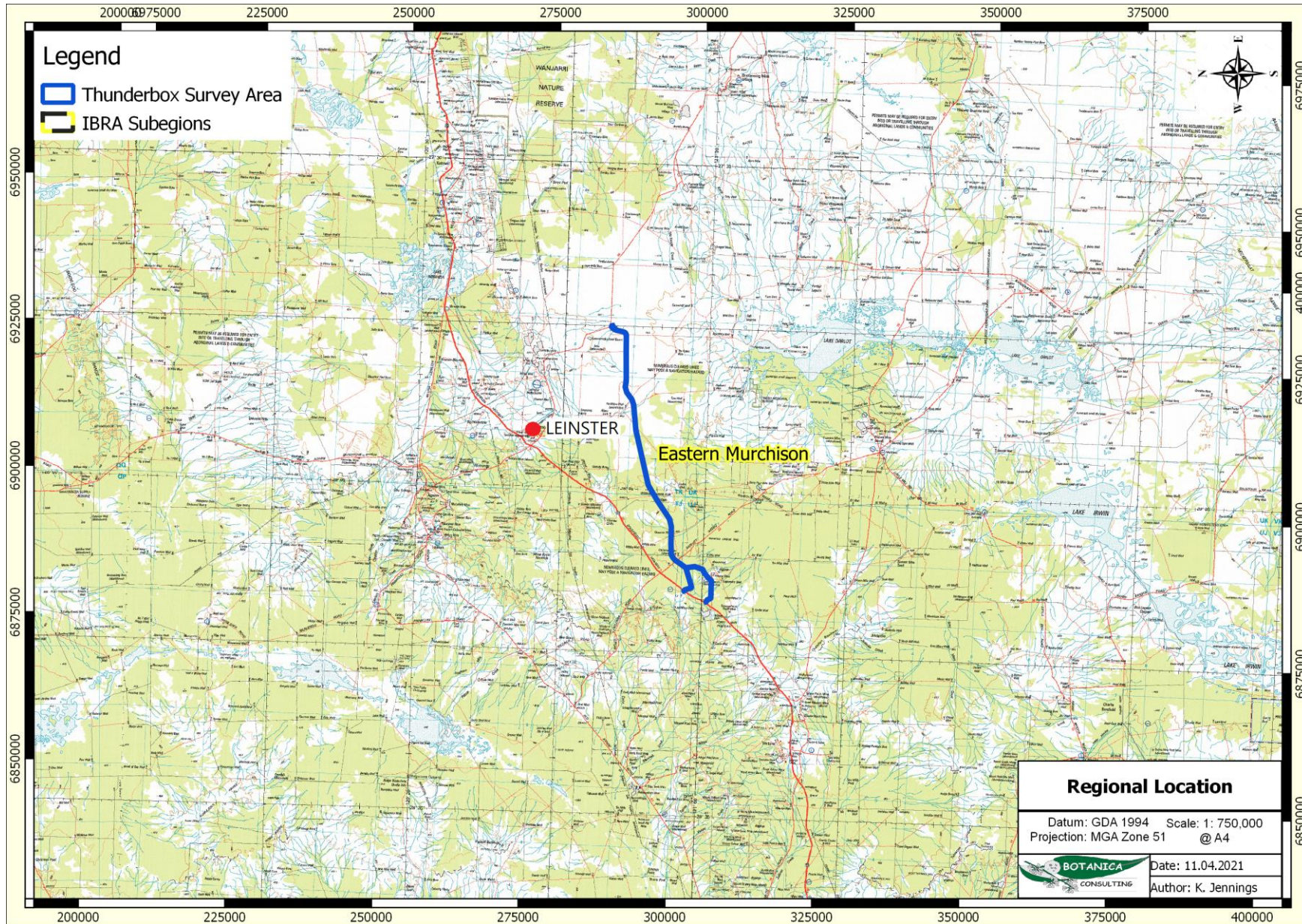


Figure 1-1: Regional map of the survey area

2 BIOPHYSICAL ENVIRONMENT

2.1 Regional Environment

The survey area lies within the Eastern Murchison (MUR1) subregion of the Murchison Bioregion, as defined by the Interim Biogeographic Regionalisation of Australia (IBRA).

The Eastern Murchison comprises the northern parts of the craton's Southern Cross and Eastern Goldfields Terrains and is characterised by internal drainage and extensive areas of elevated red desert sandplains with minimal dune development. Salt Lake systems are associated with the occluded paleodrainage system. Broad plains of red-brown soils and breakaways complexes as well as red sandplains are widespread. Vegetation is dominated by Mulga woodlands and is often rich in ephemerals, hummock grasslands, saltbush shrublands and *Tecticornia* shrublands (Cowan, 2001).

In accordance with Beard (1990), the Murchison region is located in the Austin Botanical District within the Eremaean Province of WA. It is defined by the vegetational expression of geological boundaries of the Yilgarn Block, described as Archaean granite with infolded volcanics and meta-sediments (greenstones) of a like age. The topography is undulating, with occasional ranges of low hills and extensive sandplains in the eastern half. The principal soil type is shallow earthy loam overlying red-brown hardpan, with shallow stony loams on hills and red earthy sands on sandplains. The western half of the region more or less coincides with the basin of the Murchison River, the eastern half embraces the drainage of former rivers, now dry, draining towards the Eucla Basin. Vegetation is predominantly mulga low woodland (*Acacia aneura*) on plains, reduced to scrub on hills, with a tree steppe of *Eucalyptus* spp. and *Triodia basedowii* on sandplains. The climate is arid, with summer and winter rains and an average annual precipitation of 200 mm.

2.2 Land Use

The dominant land uses of the Eastern Murchison subregion include grazing native pastures (85.47%), unallocated crown reserves (11.34%), conservation (1.4%) and mining (1.79%) (Cowan, 2001). The survey area is located within the Yandal and Weebo Pastoral Lease.

2.3 Soils and Landscape Systems

The survey area lies within the Murchison Province, which consists of hardpan wash plains and sandplains (with some stony plains, hills, mesas and salt lakes) on the granitic rocks and greenstone of the Yilgarn Craton. The Murchison Province is located in the inland Mid-west and northern Goldfields between Three Springs, the Gascoyne River, Wiluna, Cosmo Newberry and Menzies Soil types consist of red loamy earths, red sandy earths, red shallow loams, red deep sands and red-brown hardpan shallow loams with some red shallow sands and red shallow sandy duplexes present. Vegetation communities are predominately Mulga shrublands with spinifex grasslands, with areas of bowgada shrublands, Eucalypt woodlands and halophytic shrublands (Tille, 2006).

The Murchison Province is further divided into soil-landscape zones, with the survey area located within the Salinaland Plains Zone (279). The Salinaland Plains Zone comprises of sandplains (with hardpan wash plains and some mesas, stony plains and salt lakes) on granitic rocks (and some greenstone) of the Yilgarn Craton. Soils include red sandy earths, red deep sands, red shallow loams and red loamy earths with some red-brown hardpan shallow loams, salt lake soils and red shallow sandy duplexes. Vegetation consists of mulga shrublands with spinifex grasslands (and some halophytic shrublands and eucalypt woodlands). This zone is located in the northern Goldfields from Lakes Barlee and Ballard to Wiluna and Laverton (Tille, 2006).

The Salinaland Plains Zone is further divided into soil landscape systems, with the survey area located within nine soil landscape systems, as shown in Table 2-1 and Figure 2-1, in accordance with soil landscape system mapping data (Government of Western Australia, 2019).

Table 2-1: Soil Landscape Systems within the survey area

Soil Landscape System	Description	Extent within Survey Area ha (%)
Ararak System	Broad plains with mantles of ironstone gravel supporting mulga shrublands with wanderrie grasses.	9.1 ha (0.7%)
Bevon System	Irregular low ironstone hills with stony lower slopes supporting mulga shrublands.	45.1 ha (3.7%)
Bullimore System	Gently undulating sandplain with occasional linear dunes and stripped surfaces supporting spinifex grasslands with mallees and acacia shrubs.	730.6 ha (59.4%)
Desdemona System	Plains with deep sandy or loamy soils supporting mulga tall shrublands and wanderrie grasses.	184.7 ha (15.0%)
Gransal System	Stony plains and low rises based on granite supporting mainly halophytic low shrublands.	24.9 ha (2.0%)
Jundee System	Hardpan plains with variable gravelly mantles and minor sandy banks supporting weakly groved mulga shrublands.	124.0 ha (10.1%)
Ranch System	Hardpan plains and prominent broad drainage tracts supporting dense mulga tall shrublands.	57.5 ha (4.7%)
Violet System	Gently undulating gravelly plains on greenstone, laterite and hardpan, with low stony rises and minor saline plains; supporting groved mulga and bowgada shrublands and occasionally chenopod shrublands.	20.7 ha (1.7%)
Yanganoo System	Almost flat hardpan wash plains, with or without small wanderrie banks and weak groving; supporting mulga shrublands and wanderrie grasses on banks.	33.3 ha (2.7%)

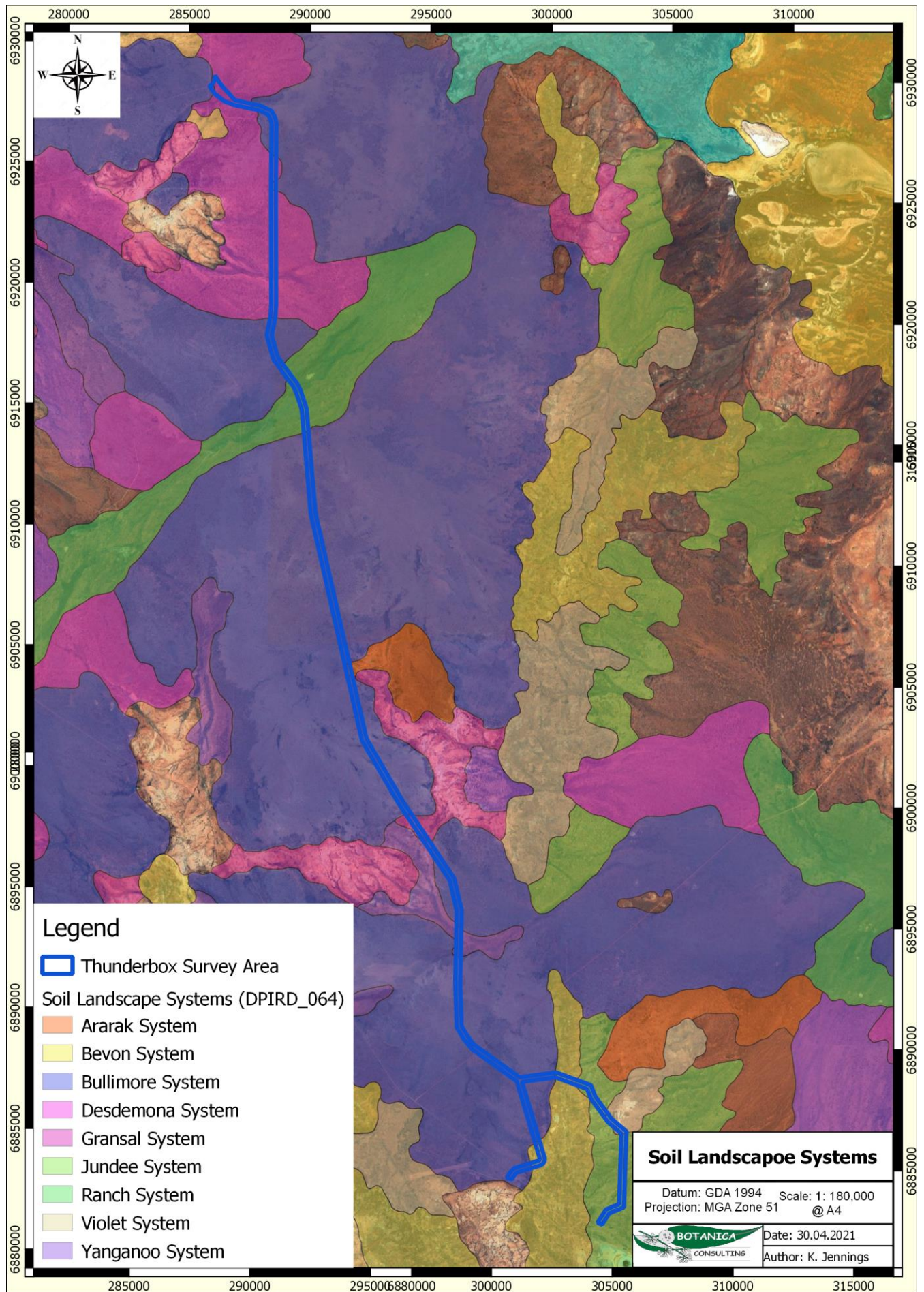


Figure 2-1: Soil Landscape Systems within the survey area

2.4 Regional Vegetation

The vegetation of the Murchison region is described by Tille (2006) as Mulga (*Acacia aneura*) shrublands and woodlands with gidgee (*A. pruinocarpa*), kurara (*A. tetragonophylla*), *A. linophylla*, bowgada (*A. ramulosa*), jam (*A. acuminata*), minniritchie (*A. grasbyi*), *Senna* spp. and *Eremophila* spp. which dominate the hardpan wash plains. Denser, taller mulga woodlands are found on groves while the sandy banks support mulga, bowgada and kurara shrublands with an understorey of wanderrrie grasses (*Eragrostis* and *Eriachne* spp. and *Monachather paradoxa*). Snakewood (*A. xiphophylla*), bluebush (*Maireana* spp.) and saltbush (*Atriplex* spp.) grow on the saline drainage tracts.

The sandplains in the east support grasslands of hard spinifex (*Triodia basedowii*). These grasslands occur with an open tree and shrub steppe of mulga, marble gum (*Eucalyptus gongylocarpa*), mallees (*E. kingsmillii*, *E. longissima*, *E. brachycorys* and *E. youngiana*), bowgada and spinifex wattle (*A. coolgardiensis*). In places denser woodlands of mulga, spinifex wattle or mallee are found over the spinifex. On western sandplains shrublands are dominated by bowgada with cypress pine (*Callitris columellaris*), mallees (e.g. *E. leptopoda* and *E. kingsmillii*), mulga and *Grevillea* spp. On the yellow sandplains in the south-west are closed mixed shrublands with *Melaleuca*, *Hakea*, *Calothamnus*, *Baeckea*, *Banksia prionotes*, *Allocasuarina*. and *Acacia* spp. The mesas have bowgada, mulga and *A. linophylla* shrublands above the breakaways, while the footslopes support shrublands with saltbush (*Atriplex* spp.), *Frankenia* spp., *Ptilotus* spp. and *Eremophila pterocarpa*. The hilly terrain has shrublands of mulga, minniritchie, *Eremophila* spp. and cotton bush (*Ptilotus obovatus*). Hills in the far west have woodlands of York gum (*Eucalyptus loxophleba*), salmon gum (*E. salmonophloia*) and jam (*Acacia acuminata*). The stony plains support shrublands of mulga, gidgee, granite wattle (*Acacia quadrimarginea*), minniritchie, prickly wattle, snakewood, jam and *Eremophila* spp. in the valley floors there are shrublands of samphire (*Tecticornia* spp.), saltbush, sage (*Cratystylis subspinescens*) and *Frankenia* spp. surrounding salt lakes. Floodplains along the Murchison and its tributaries have shrublands of bluebush (*Maireana* spp.), saltbush and *Frankenia* spp., as well as mulga, prickly wattle and *Acacia distans* (Tille 2006).

2.5 Conservation Values

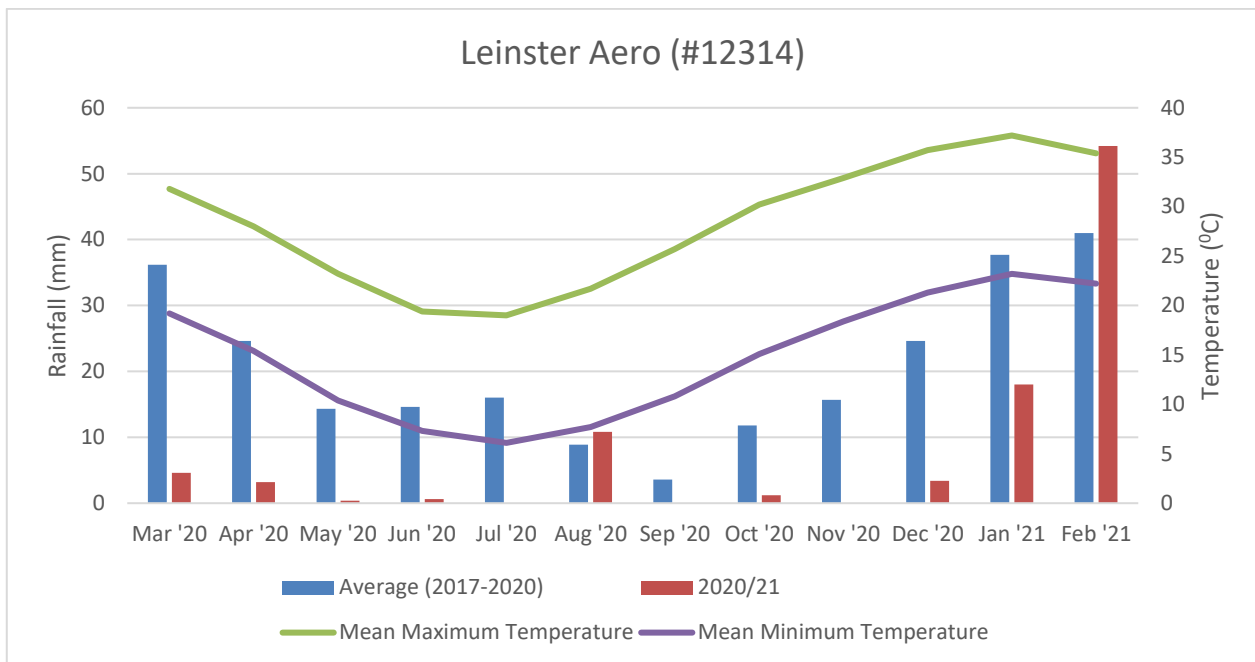
The Eastern Murchison subregion contains 41 vegetation associations (hummock grasslands, succulent steppe or low woodlands) that have at least 85 per cent of their total extent in the Bioregion. The Bioregion is rich and diverse in flora and fauna but most species are wide ranging and usually occur in adjoining regions. A snake (*Pseudechis butleri*) is the only known regionally endemic vertebrate species.

There are six wetlands of national importance in the Bioregion, all of which are salt lakes: Lake Ballard, Lake Barlee, Lake Marmion, Lake Wooleen, Lake Breberle and Lake Anneen. There is one wetland of regional importance within the Murchison Bioregion; the Mungawolagudgi Claypan on Muggon Station.

No ecosystems are listed as threatened under WA State legislation occur within the Murchison Bioregion, but 52 communities and vegetation associations are thought to be at risk for a variety of reasons. Grazing from livestock, goats and rabbits and changed fire regimes are the main threatening processes in the region, with clearing, impacts of mining, erosion and sedimentation also causing significant impacts.

2.6 Climate

The climate of the Eastern Murchison subregion is characterised as an arid climate with summer and winter rainfall of approximately 200 mm annually (Beard, 1990). Rainfall data for the Leinster Aero weather station (#12314), located approximately 15 km west of the survey area, is shown in Graph 2-1 (BoM, 2021a). Mean monthly rainfall ranges from 23.2 mm in January to 6.1 mm in July, with a mean annual rainfall of 253.0 mm. The survey was conducted in March 2021, with the preceding month (February) experiencing several significant rainfall events totalling 54.2 mm. Flowering material and ephemeral species are expected to be present, and the survey is not expected to be constrained by climatic conditions.



Graph 2-1: Average and recent rainfall and average temperature data of Leinster Aero (BoM, 2021a)

2.7 Hydrology

According to the Geoscience Australia database (2015), there are no permanent or ephemeral inland waters within the survey area. Several ephemeral drainage lines occur throughout the survey area (Figure 2-2).

Groundwater Dependent Ecosystems (GDE) includes biological assemblages of species such as wetlands or woodlands that use groundwater either opportunistically or as their primary water source. For the purposes of this report, a GDE is defined as any vegetation community that derives part of its water budget from groundwater and must be assumed to have some degree of groundwater dependency. In accordance with the BoM *Atlas of Groundwater Dependent Ecosystems* (BoM, 2021b) database, approximately 673.1 ha (54.7%) of the survey area is located within a low-potential terrestrial GDE community (Figure 2-2). There are no potential aquatic GDE's within the survey area.

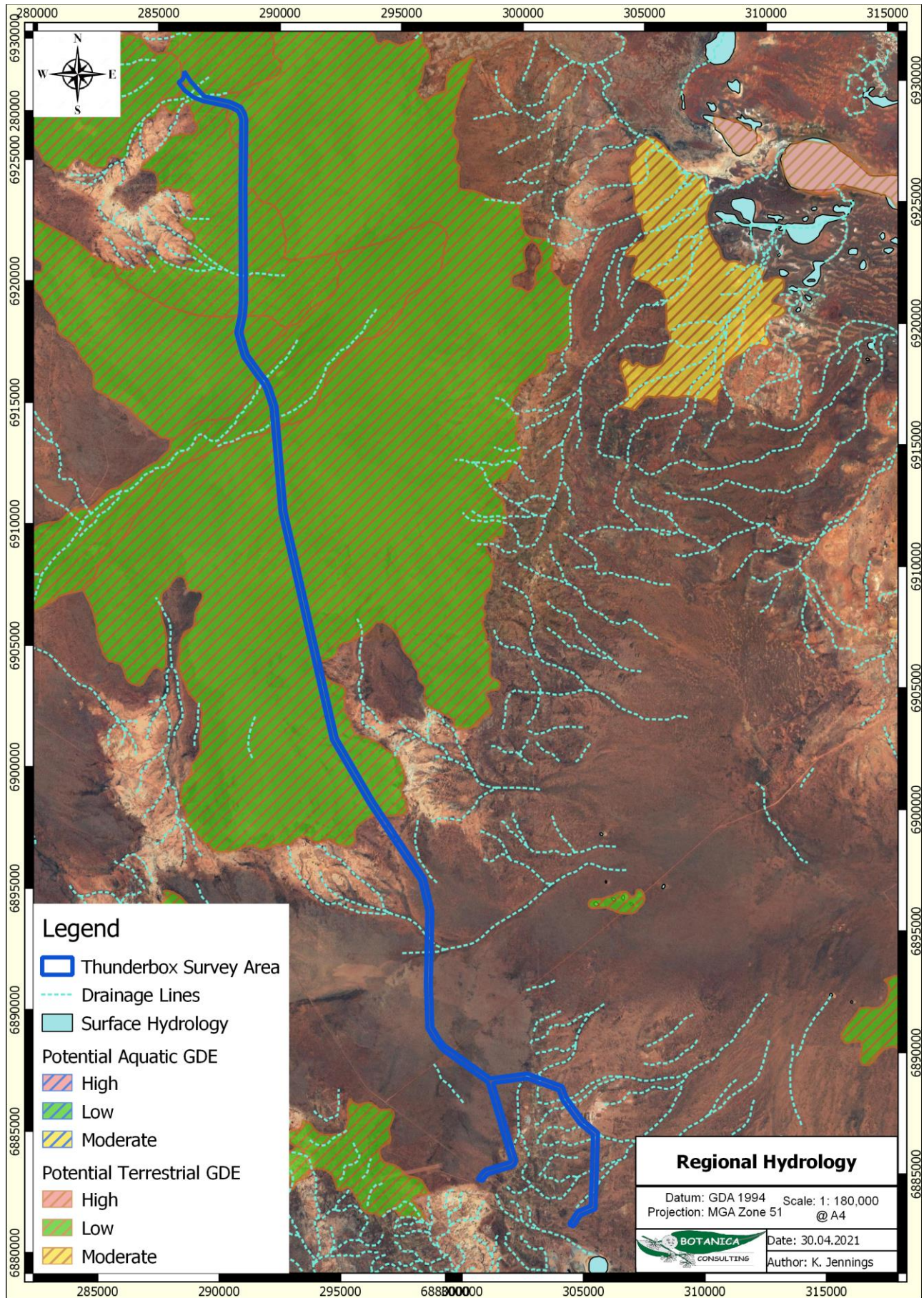


Figure 2-2: Surface Hydrology of the survey area

3 SURVEY METHODOLOGY

3.1 Desktop Assessment

Prior to the field assessment a literature review was undertaken of previous flora and fauna assessments conducted within the local region. Documents reviewed included:

- Botanica Consulting (2014). Level 1 Flora and Vegetation Survey of the Thunderbox to Bannockburn Project. Prepared for Saracen Metals Pty Limited.
- Botanica Consulting (2016). Level 1 Flora and Fauna Survey Julius Project, Prepared for Echo Resources Limited.
- Botanica Consulting (2018a). Reconnaissance Flora & Fauna Assessment Otto Bore. Prepared for Saracen Metals Pty Limited.
- Botanica Consulting (2018b). Reconnaissance Flora/ Vegetation and Fauna Survey Orelia Project. Prepared for Echo Resources Limited.
- Botanica Consulting (2019). Reconnaissance Flora/ Vegetation and Fauna Survey Mt Joel Project. Prepared for Echo Resources Limited.
- Botanica Consulting (2020). Reconnaissance Flora/ Vegetation & Fauna Survey Julius Haul Road alternative locations. Prepared For Northern Star Resources Limited.

In addition to the literature review, searches of the following databases were undertaken to aid in the compilation of a list of significant flora within the survey area:

- DBCA Threatened/ Priority Flora spatial data (DBCA, 2019a);
- DBCA NatureMap database (DBCA, 2021b); and
- EPBC Protected Matters search tool (DAWE, 2021a).

The NatureMap species search and EPBC Protected Matters search were conducted with a 40 km buffer from the survey area.

Conservation significant flora and fauna species identified by the desktop review were assessed with regards to their population extent and distribution and preferred habitat to determine their likelihood of occurrence within the survey area.

The assessment categorised flora species as follows:

- Unlikely- Suitable habitat is not expected to occur and/or the survey area is outside the known range of the species.
- Possible- Suitable habitat may be present, and the area is within the known range of the species. This option is also used when there is insufficient information to determine the preferred habitat of a species.
- Likely- Suitable habitat is expected to occur and there are records within 10 km of the survey area.
- Previously Recorded- A record for this species is located within the survey area. Field survey will ground-truth currently occurring individuals and populations.

Fauna species were categorised as follows:

- Would Not Occur: There is no suitable habitat for the species in the survey area and/or there is no documented record of the species in the general area since records have been kept and/or the species is generally accepted as being locally/regionally extinct (supported by a lack of recent records).

- Locally Extinct: Populations no longer occur within a small part of the species natural range, in this case within 10 or 20km of the survey area. Populations do however persist outside of this area.
- Regionally Extinct: Populations no longer occur in a large part of the species natural range, in this case within the Goldfields region. Populations do however persist outside of this area.
- Unlikely to Occur: The survey area is outside of the currently documented distribution for the species in question, or no suitable habitat (type, quality and extent) was identified as being present during the field assessment. Individuals of some species may occur occasionally as vagrants/transients especially if suitable habitat is located nearby but the site itself would not support a population or part population of the species.
- Possibly Occurs: Survey area is within the known distribution of the species in question and habitat of at least marginal quality was identified as likely to be present during the field survey and literature review, supported in some cases by recent records being documented in literature from within or near the survey area. In some cases, while a species may be classified as possibly being present at times, habitat may be marginal (e.g. poor quality, fragmented, limited in extent) and therefore the frequency of occurrence and/or population levels may be low.
- Known to Occur: The species in question has been positively identified as being present (for sedentary species) or as using the survey area as habitat for some other purpose (for non-sedentary/mobile species) during field surveys within or near the survey area. This information may have been obtained by direct observation of individuals or by way of secondary evidence (e.g. tracks, foraging debris, scats). In some cases, while a species may be classified as known to occur, habitat may be marginal (e.g. poor quality, fragmented, limited in extent) and therefore the frequency of occurrence and/or population levels may be low.

It should be noted that these lists are based on observations from a broader area than the assessment area (40 km radius) and therefore may include taxa not present. The databases also often include very old records that may be incorrect or in some cases the taxa in question have become locally or regionally extinct. Information from these sources should therefore be taken as indicative only and local knowledge and information also needs to be taken into consideration when determining what actual species may be present within the specific area being investigated.

The conservation significance of flora and fauna taxa was assessed using data from the following sources:

- *Environment Protection and Biodiversity and Conservation (EPBC) Act 1999*. Administered by the Australian Government (DAWE);
- *Biodiversity Conservation (BC) Act 2016*. Administered by the WA Government (DBCA);
- Red List produced by the Species Survival Commission (SSC) of the World Conservation Union (also known as the IUCN Red List – the acronym derived from its former name of the International Union for Conservation of Nature and Natural Resources). The Red List has no legislative power in Australia but is used as a framework for State and Commonwealth categories and criteria; and
- Priority Flora/ Fauna list. A non-legislative list maintained by DBCA for management purposes (fauna list released April 2019; flora list released December 2018).

The EPBC Act also requires the compilation of a list of migratory species that are recognized under international treaties including the:

- Japan Australia Migratory Bird Agreement 1981 (JAMBA)²;
- China Australia Migratory Bird Agreement 1998 (CAMBA);
- Republic of Korea-Australia Migratory Bird Agreement 2007 (ROKAMBA); and
- Bonn Convention 1979 (The Convention on the Conservation of Migratory Species of Wild Animals).

Most but not all migratory bird species listed in the annexes to these bilateral agreements are protected in Australia as Matters of National Environmental Significance (MNES) under the EPBC Act. Descriptions of conservation significant species and communities are provided in Appendix 1.

3.2 Field Assessment

Botanica conducted a reconnaissance flora/ vegetation and basic fauna survey on the 24th to 25th March 2021, with the area traversed on foot and 4WD by Jim Williams (Director/Principal Botanist, Diploma of Horticulture) and Jennifer Jackson (Senior Botanist, BSc (Honours) Environmental Management). The survey area consists of a corridor approximately 60 km in length, 200m in width with an area of approximately 1,230 ha in extent. The entire length of tenement L36/246 was traversed during the survey. The survey targeted the centreline of the tenement which is the preferred and likely location of the proposed clearing activities and haul road. Given the small scale of impacts proposed (haul road which intersects an existing shire road, the survey area is not located in a fragmented landscape, high biodiversity region or a conservation reserve and the desktop assessment identified low potential for significant habitats (i.e. widespread/ common habitats), a reconnaissance survey was conducted.

² Most but not all species listed under JAMBA are also specially protected under Specially Protected Species of the BC Act.

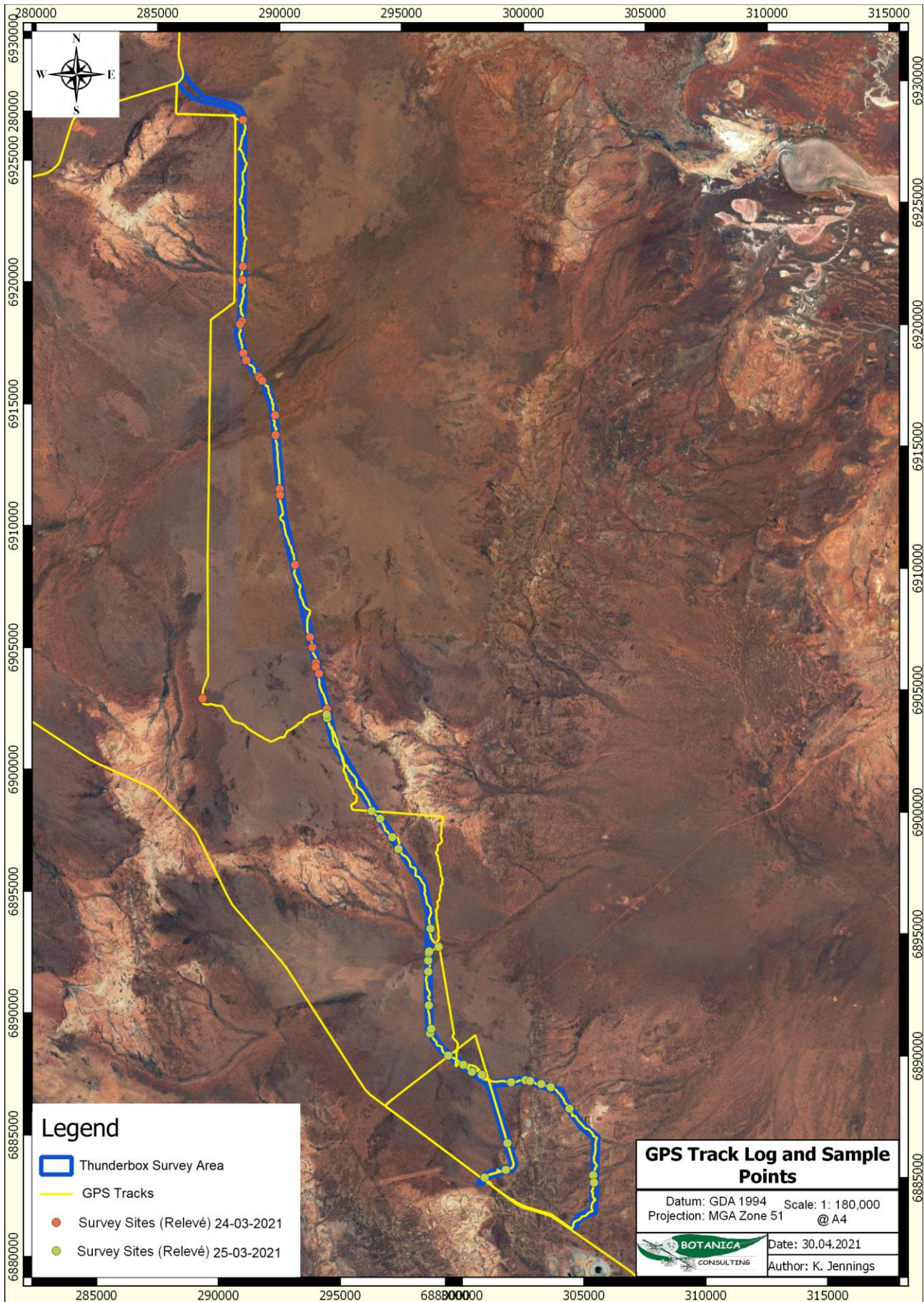


Figure 3-1: Field Assessment

3.2.1 Flora Assessment

Prior to the commencement of field work, aerial photography was inspected and obvious differences in the vegetation assemblages were identified. The different vegetation communities identified were then inspected during the field survey to assess their validity. A handheld GPS unit was used to record the coordinates of the boundaries between existing vegetation communities.

The survey was conducted using a series of survey sites (relevés) as shown in Figure 3-1. At each relevé site, the area was walked on foot to observe and record all flora species. The distance surveyed at each relevé varied dependent on the diversity/ variability of species and landforms/ vegetation types. At each relevé, the following information was recorded:

- GPS location;
- Photograph of vegetation;
- Dominant taxa for each stratum;
- All vascular taxa (including annual taxa);
- Landform classification;
- Vegetation condition rating;
- Collection and documentation of unknown plant specimens; and
- GPS location, photograph and collection of flora of conservation significance (if encountered).

In addition to the relevés, flora was actively searched for along the full length of the survey area and opportunistic records and or sampling of flora was conducted with a particular focus on identifying and recording Priority Flora taxa and any unique or otherwise significant flora.

Unknown specimens collected during the survey were identified with the aid of samples housed at the Botanica Herbarium and Western Australian Herbarium. Vouchering of the specimens with the Western Australian Herbarium was not required as none of the specimens were of significance (i.e. conservation flora, novel taxa, range extensions etc.). A complete species list was generated from the relevé data for each of the vegetation types identified within the survey area (Appendix 3). Structural vegetation classification was used to characterise the different vegetation types. Vegetation types were described in accordance with NVIS classifications-Vegetation Types (Level V).

3.2.2 Fauna Assessment

Vegetation and landform units identified during the flora assessment have been used to define broad fauna habitat types across the site. This information has been supplemented with observations made during the fauna assessment.

The main aim of the fauna habitat assessment was to determine the likelihood of fauna species of conservation significance utilizing the areas that may be impacted during site development. The habitat information obtained was also used to aid in finalizing the overall potential fauna list.

As part of the desktop literature review, available information on the habitat requirements of the species of conservation significance listed as possibly occurring in the area was researched. During the field survey, the habitats within the study area were assessed and specific elements identified, if present, to determine the likelihood of listed threatened species utilizing the area and its significance to them.

Opportunistic observations of fauna species were made during all field survey work which involved a series of transects across the study area during the day including observations of bird species with binoculars. Secondary evidence of a species presence such as tracks, scats, skeletal remains, foraging evidence or calls were also noted if observed/heard.

3.2.3 Scientific Licences

Table 3-1: Scientific Licences of Botanica Staff coordinating the flora survey

Licensed staff	Permit Number	Valid Until
Jim Williams	FB62000108 (Licence to take flora for scientific purposes)	27/05/2022
Jennifer Jackson	FB62000309 (Licence to take flora for scientific purposes)	11/01/2024

3.3 Survey Limitations and Constraints

It is important to note that flora surveys will entail limitations notwithstanding careful planning and design. Potential limitations are listed in Table 3-2.

The conclusions presented in this report are based upon field data and environmental assessments and/or testing carried out over a limited period of time and are therefore merely indicative of the environmental condition of the site at the time of the field assessments. Also, it should be recognised that site conditions can change with time. Information not available at the time of this assessment which may subsequently become available may alter the conclusions presented.

Some species are reported as potentially occurring based on there being suitable habitat (quality and extent) within the survey area or immediately adjacent. The habitat requirements and ecology of many of the species known to occur in the wider area are however often not well understood or documented. It can therefore be difficult to exclude species from the potential list based on a lack of a specific habitats or microhabitats within the survey area. As a consequence of this limitation, the potential species list produced is most likely an overestimation of those species that actually utilise the survey area for some purpose.

In recognition of survey limitations, a precautionary approach has been adopted for this assessment. Any flora and fauna species that would possibly occur within the survey area (or immediately adjacent), as identified through ecological databases, publications, discussions with local experts/residents and the habitat knowledge of the author, has been listed as having the potential to occur.

Table 3-2: Limitations and constraints associated with the survey

Variable	Potential Impact on Survey	Details
Access problems	Not a constraint	The survey was conducted via 4WD and on foot. Numerous tracks were located within the survey area, providing ease of access.
Competency/ Experience	Not a constraint	The BC personnel that conducted the survey were regarded as suitably qualified and experienced. Coordinating Botanist/ Zoologist: Jim Williams Data Interpretation: Jim Williams, Jennifer Jackson and Kelby Jennings.
Timing of survey, weather & season	Not a constraint	Fieldwork was undertaken during the EPA's recommended primary survey time period for the Eremaean Province (i.e., 6-8 post wet season March-June) and conducted following above average rainfall received in February 2021.
Area disturbance	Not a constraint	The area has been disturbed from exploration and mining operations, cattle grazing and other human impacts; however, vegetation was mostly intact and comprised of native vegetation.
Survey Effort/ Extent	Not a constraint	Survey intensity was appropriate for the size/significance of the area with a reconnaissance survey completed to identify vegetation types/fauna habitats and conservation significant species/communities.
Availability of contextual information at a regional and local scale	Not a constraint	Threatened flora database searches provided by the DBCA were used to identify any potential locations of Threatened/Priority taxa. BoM, DWER, DPIRD, DBCA and DAWE databases were reviewed to obtain appropriate regional desktop information on the biophysical environment of the local region. Previous flora/ fauna surveys within the local area have been assessed for pertinent information and environmental context of the regional area.
Completeness	Not a constraint	In the opinion of Botanica, the survey area was covered sufficiently in order to identify vegetation assemblages. All observed flora individuals were able to be identified to species level. The vegetation types for this study were based on visual descriptions of locations in the field. The distribution of these vegetation communities/ fauna habitats outside the study area is not known, however vegetation types identified were categorised via comparison to vegetation distributions throughout WA specified in the NVIS Major Vegetation Groups (DotEE, 2017b).

4 **RESULTS**

4.1 **Desktop Assessment**

4.1.1 **Flora**

The desktop review identified 339 vascular flora species as occurring within 40 km of the survey area, representing 146 genera from 49 families. The most diverse families were Fabaceae (54 species), Asteraceae (41 species) and Chenopodiaceae (33 species). Significant genera were *Acacia* (31 species), *Eremophila* (28 species) and *Eucalyptus* (13 species). This total includes eight introduced (weed) species (2.4%).

4.1.1.1 **Introduced Flora**

The desktop review identified ten introduced flora (weed) species as potentially occurring in the vicinity of the survey area. None of these species are listed as a Declared Pest on the Western Australian Organism List (WAOL) under the *Biosecurity and Agriculture Management (BAM) Act 2007* or as a Weed of National Significance (WONS).

The full list of potential weed species is contained in Appendix 2.



4.1.1.2 **Significant Flora**

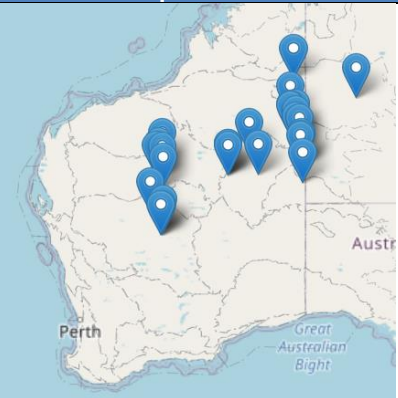


The assessment of the DBCA Priority/ Threatened flora data (DBCA, 2019a), NatureMap search (DBCA, 2021b), Protected Matters searches (DAWE, 2021a) and previous relevant literature identified eight significant flora species recorded within a 40 km radius of the survey area³.

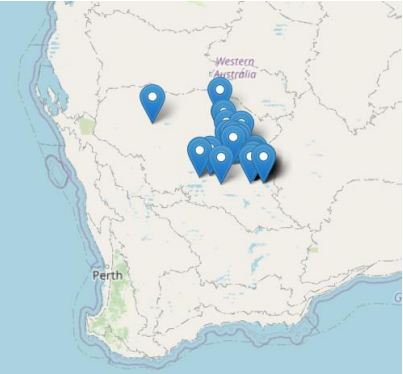

These taxa were assessed for distribution and known habitat to determine their likelihood of occurrence within the survey area (Table 4-1). The assessment did not identify any significant flora species as likely to occur in the survey area. Four taxa were identified as 'possible' to occur in the survey area. The locations of the DBCA database records are illustrated spatially in Figure 4-1.

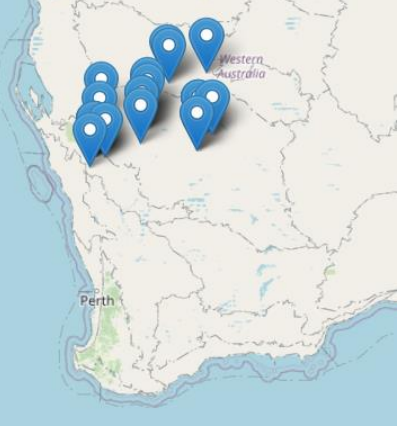

³ One taxon listed on the database searches is no longer listed as Priority Flora

Table 4-1: Likelihood of occurrence for conservation significant flora within the survey area

Taxon	Rank	Populations	Description	Likelihood of occurrence
<p><i>Baeckea</i> sp. Sandstone (C.A. Gardner s.n. 26 Oct. 1963)</p>	<p>P3</p>	 <p>Florabase (2021).</p>	<ul style="list-style-type: none"> • Eight collections in WAHERB. Most collections are in the Sandstone area (Murchison IBRA region), except for one collection near Tropicana in the Great Victoria Desert. • Associated vegetation is usually Low shrubland with occasional emergent Eucalypts. • Soils are usually red or orange sand. • Number of plants noted in each population ranges from 2-5 to common in area. 	<p>Possible</p> <p>Located within known range (closest DBCA record located 11km south-west of the survey area) however majority of records found around Sandstone. Suitable habitat may be present.</p>
<p><i>Eremophila pungens</i></p>	<p>P4</p>	 <p>Florabase (2021).</p>	<ul style="list-style-type: none"> • 44 collections in WAHERB over a range of about 500 km. • Associated vegetation is usually open mulga shrubland. • Usually grows in rocky areas, either on granite outcrops, weathered breakaways or sandstone mesas. • Number of plants noted in each population ranges from 1, to common in area to >1,000. 	<p>Unlikely</p> <p>No breakaways, granite outcrops or sandstone mesas in the survey area.</p>

Taxon	Rank	Populations	Description	Likelihood of occurrence
<i>Goodenia modesta</i>	P3	 <p>Florabase (2021).</p>  <p>ALA (2021).</p>	<ul style="list-style-type: none"> • 27 collections in WAHERB over a range of about 1400 km, including populations in the Northern Territory (NT). Atlas of Living Australia (ALA) records show that it is common in NT and South Australia. • Associated vegetation is usually a Low open shrubland with occasional emergent Eucalypts. • Usually grows in red sandy/clay plains, some records are associated with clay pans near large wetlands. • Number of plants noted in each population ranges from 1, to common in area to >10,000. 	<p>Possible</p> <p>Survey area is located within the southern extent of its range, Suitable habitat may be present.</p>
<i>Grevillea inconspicua</i>	P4	 <p>Florabase (2021).</p>	<ul style="list-style-type: none"> • 61 collections in WAHERB over a range of about 400 km. • Associated vegetation is usually sparse or open Acacia shrub communities, or with <i>Eucalyptus camaldulensis</i> if growing in a drainage line. • Grows on rocky hills, sometimes associated with ironstones or greenstone, or in loamy and gravelly soils along drainage lines. • Number of plants noted in each population ranges from isolated plants, no more than 100 plants. 	<p>Unlikely</p> <p>Located within known range however suitable habitat unlikely with no large rocky hills, ironstone or greenstone rises in the survey area.</p>

Taxon	Rank	Populations	Description	Likelihood of occurrence
<i>Hemigenia exilis</i>	P4	 <p>Florabase (2021).</p>	<ul style="list-style-type: none"> • 42 collections in WAHERB over a range of about 600 km. • Associated vegetation is usually sparse or open Acacia shrub communities. • Grows on a range of soil types including laterite and is often associated with stony ironstone hills. • Number of plants noted in each population ranges from isolated plants, to >1,000. 	<p>Unlikely Located within known range however suitable habitat unlikely with no stony ironstone hills within the survey area.</p>
<i>Micromyrtus chrysodema</i>	P1	 <p>Florabase (2021).</p>	<ul style="list-style-type: none"> • One collection in WAHERB, about 40 km SE of Leinster, 1 km E of the Goldfields Hwy. • Was found growing in a red sandplain with <i>Eucalyptus gongylocarpa</i>, <i>Acacia aneura</i> and <i>Triodia basedowii</i>. • Number of plants was not recorded. 	<p>Possible. Only one collection, so likely very rare. This one collection is located approximately 5km south of the southern end of the survey area.</p>

Taxon	Rank	Populations	Description	Likelihood of occurrence
<p><i>Sauropus</i> sp. Woolgorong (M. Officer s.n. 10/8/94)</p>	<p>P3</p>	 <p>Florabase (2021).</p>	<ul style="list-style-type: none"> • 23 collections in WAHERB over a range of about 600 km. • Associated vegetation is usually tall Acacia shrubland. • Usually growing in a flat plain with red loamy sand; 1 collection is on a weathered granite breakaway plateau community; several collections are from a weathered banded ironstone outcrop with red orange shallow sandy loam soils. • Number of plants noted in each population usually <10. 	<p>Possible Survey area is located within known range, Suitable habitat may be present.</p>
<p><i>Thryptomene</i> sp. Leinster (B.J. Lepschi & L.A. Craven 4362)</p>	<p>P3</p>	<p>NA</p>	<p>NA</p>	<p><i>Thryptomene</i> sp. Leinster (G. Cockerton 1534) is more recently known as Hysterobaeckea occlusa Rye which is not listed as P flora.</p>
<p><i>Thryptomene nealensis</i></p>	<p>P3</p>	 <p>Florabase (2021).</p>	<ul style="list-style-type: none"> • 12 collections in WAHERB over a range of about 600 km. • Associated vegetation is usually open mulga shrubland. • All records were collected from lateritic breakaways. • Where the number of plants was noted in each population this was >200. 	<p>Unlikely No breakaway areas in the survey area.</p>

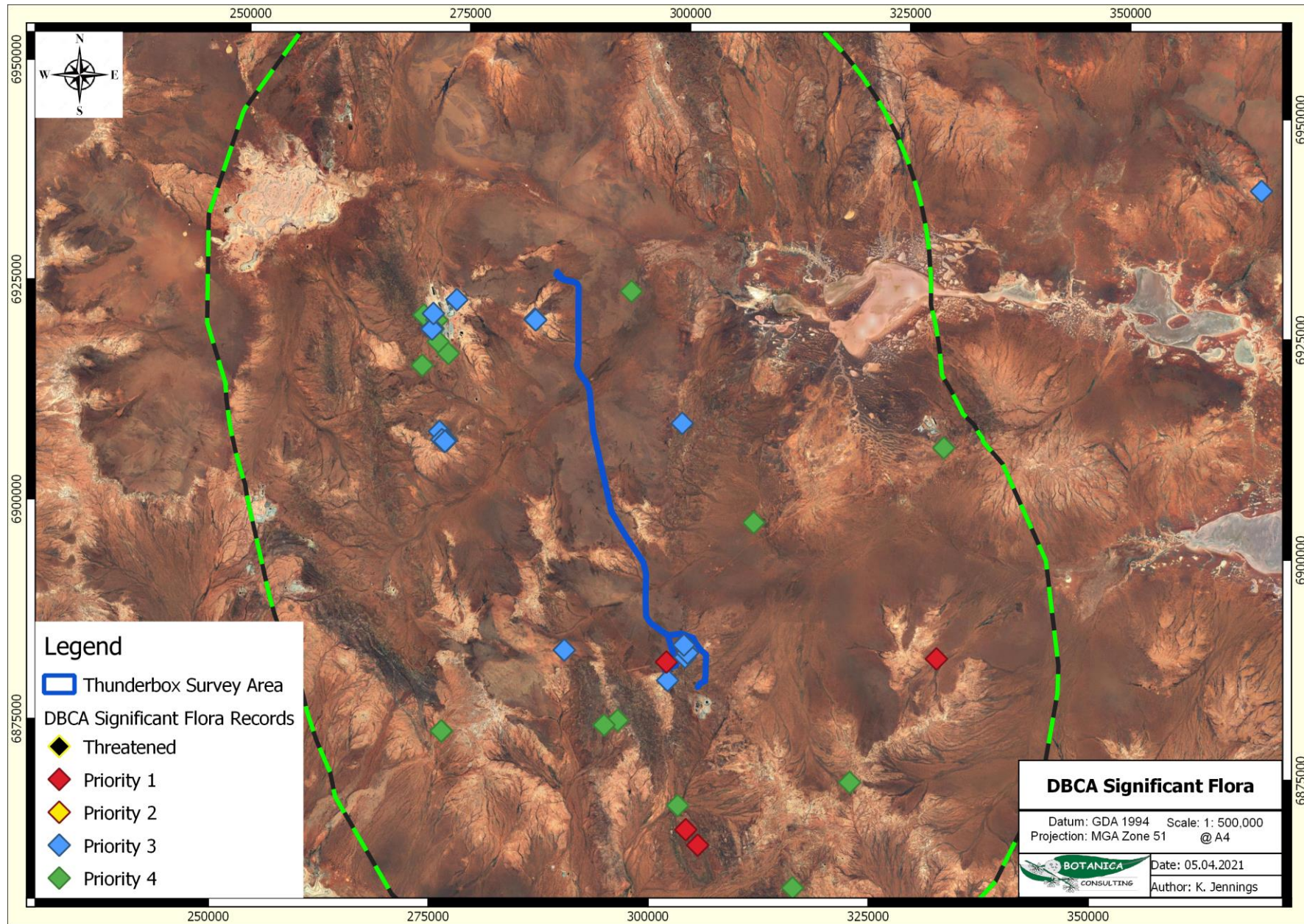


Figure 4-1: DBCA significant flora records

4.1.2 Vegetation and Ecological Communities

4.1.2.1 Vegetation Associations

The Pre-European vegetation association spatial mapping dataset (DPIRD, 2018) identifies five vegetation associations as occurring within the survey area (Figure 4-2). The association descriptions and their remaining extents, as specified in the 2018 Statewide Vegetation Statistics (DBCA, 2019b) are provided in Table 4-2. Areas retaining less than 30% of their pre-European vegetation extent generally experience exponentially accelerated species loss, while areas with less than 10% are considered “endangered” (EPA, 2000). All vegetation associations retain >98% of their pre-European extent, and development within the survey area will not significantly reduce the current extent of these vegetation associations.

Table 4-2: Pre-European Vegetation Associations within the survey area

Vegetation Association	Current Extent (ha)	Pre-European extent remaining (%)	% Protected for Conservation	Floristic Description	Extent within Survey Area ha (%)
Laverton 18	2,339,335.13	99.55	-	Low woodland; mulga (<i>Acacia aneura</i>)	706.0 ha (57.4%)
Laverton 28	131,531.31	98.35	-	Open low woodland; mulga	81.5 ha (6.6%)
Laverton 109	152,223.38	99.37	-	Hummock grasslands, shrub steppe; <i>Eucalyptus youngiana</i> over hard spinifex	84.7 ha (6.9%)
Wiluna 18	4,256,038.04	99.59	1.05	Low woodland; mulga (<i>Acacia aneura</i>)	327.6 ha (26.6%)
Wiluna 109	5,366.61	100.0	-	Hummock grasslands, shrub steppe; <i>Eucalyptus youngiana</i> over hard spinifex	29.8 ha (2.4%)

4.1.2.2 Significant Ecological Communities

The Protected Matters search (DAWE, 2020a) did not identify any Threatened Ecological Communities recorded within 40 km of the survey area. Analysis of the Priority Ecological Communities within the Midwest region (DBCA, 2021a) did not identify any significant vegetation assemblages as likely or possibly occurring within the survey area.

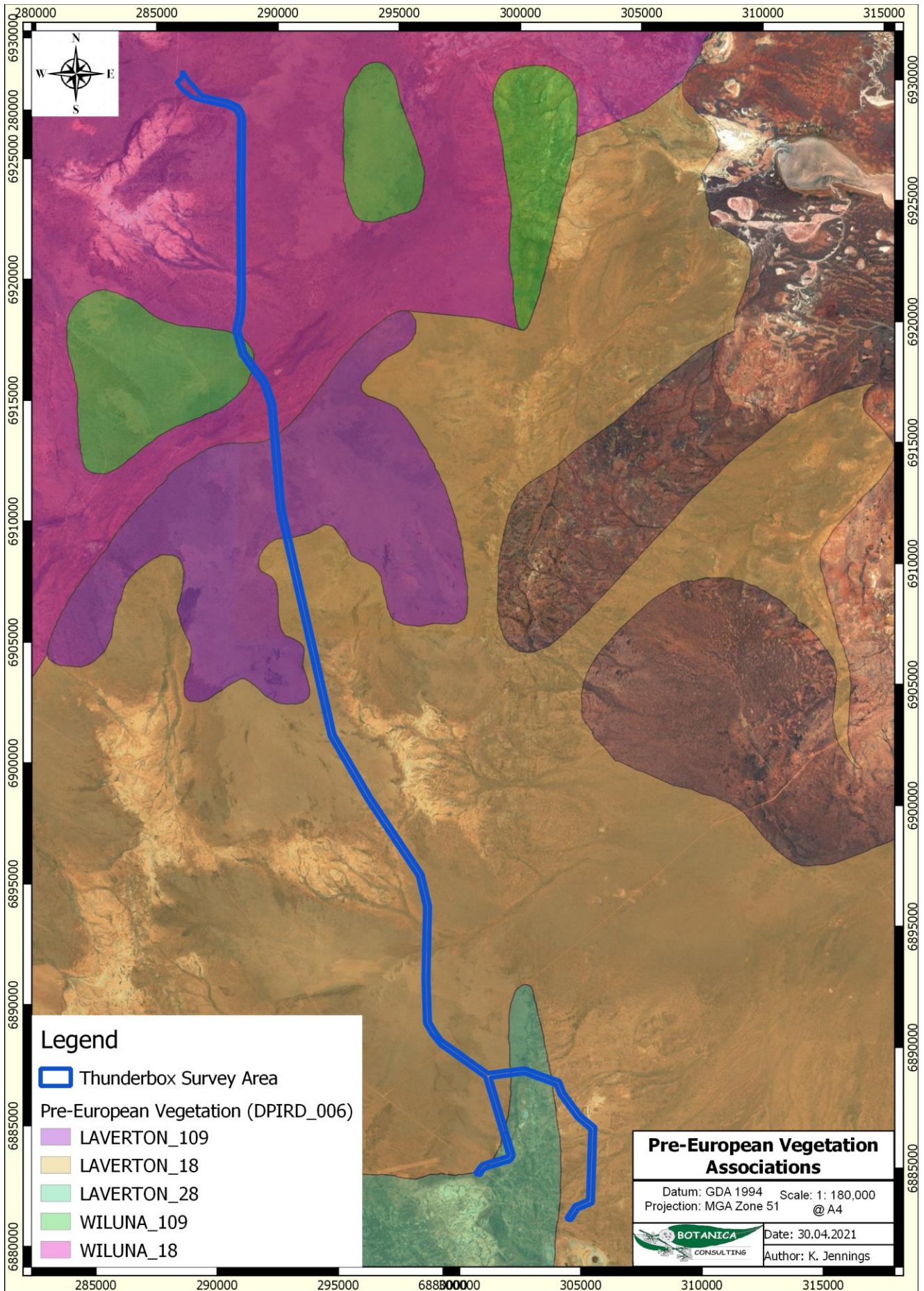


Figure 4-2: Pre-European Vegetation Associations within the survey area

4.1.3 Fauna

According to the results of the NatureMap search (DBCA, 2021b), a total of 114 terrestrial vertebrate fauna taxa have been recorded within 40 km of the survey area, consisting of 79 bird, six mammal, 25 reptile and four amphibian taxa. This total includes one introduced (feral) species (0.9%).

4.1.3.1 Introduced (Feral) Fauna

The NatureMap and EPBC database searches identified eight feral fauna species, representing seven families, as potentially occurring in the survey area (Table 4-3).

Table 4-3: Potentially Occurring Introduced Fauna

Family	Taxon	Common Name
Bovidae	<i>Capra hircus</i>	Goat
Camelidae	<i>Camelus dromedarius</i>	Dromedary Camel
Canidae	<i>Canis lupus familiaris</i>	Domestic Dog
	<i>Vulpes vulpes</i>	Red Fox
Equidae	<i>Equus asinus</i>	Donkey, Ass
Felidae	<i>Felis catus</i>	Cat
Leporidae	<i>Oryctolagus cuniculus</i>	Rabbit
Muridae	<i>Mus musculus</i>	House Mouse

4.1.3.2 Conservation Significant Fauna

The desktop review identified seven terrestrial fauna species of conservation significance as previously being recorded in the regional area, consisting of five Threatened and two migratory or otherwise protected species. In addition, five migratory wading/shorebird species were assessed collectively due to their similar habitat requirements.

Habitat and distribution data was used to determine the likelihood of occurrence within the survey area. The assessment identified two significant fauna species as potentially occurring in the survey area (Table 4-4).

Table 4-4: Likelihood of occurrence for conservation significant fauna within the survey area

Species	Conservation Status			Habitat Description	Likelihood of occurrence
	EPBC Act	BC Act	DBCAs Priority		
Night Parrot <i>Pezoporus occidentalis</i>	EN	CR	-	Most habitat records are of <i>Triodia</i> (Spinifex) grasslands and/or chenopod shrublands in the arid and semi-arid zones, or <i>Astrelba</i> spp. (Mitchell grass), shrubby samphire and chenopod associations, scattered trees and shrubs, <i>Acacia aneura</i> (Mulga) woodland, treeless areas and bare gibber are associated with sightings of the species. Roosting and nesting sites are consistently reported as within clumps of dense vegetation, primarily old and large Spinifex (<i>Triodia</i>) clumps, but sometimes other vegetation types (DAWE, 2020b).	Unlikely At extreme of known range, no suitable habitat expected to occur.
Grey Falcon <i>Falco hypoleucos</i>	VU	VU		The Grey Falcon occurs at low densities across inland Australia. The species frequents timbered lowland plains, particularly acacia shrublands that are crossed by tree-lined water courses. The species has been observed hunting in treeless areas and frequents tussock grassland and open woodland, especially in winter. While breeding Grey Falcons feed almost exclusively on birds.	Possibly Occurs. Survey area may form part of larger home range.
Princess Parrot <i>Polytelis alexandrae</i>	VU	-	P4	Confined to arid regions of Western Australia, the Northern Territory, and South Australia. In Western Australia, it is sparsely distributed from near Coolgardie in the west and the Murchison River to the east, and north to near the Fitzroy River in Western Australia and to Howell Ponds in the Northern Territory. It is believed that the population is mainly concentrated in the Great Sandy, Gibson, Tanami and Great Victoria Deserts, and in the central ranges. It inhabits sand dunes and sand flats in the arid zone of western and central Australia, in open savanna woodlands and shrublands that usually consist of scattered stands of Eucalyptus (including <i>E. gongylocarpa</i> , <i>E. chippendalei</i> and mallee species), Casuarina or Allocasuarina trees; an understorey of shrubs such as <i>Acacia</i> (especially <i>A. aneura</i>), <i>Senna</i> , <i>Eremophila</i> , <i>Grevillea</i> , <i>Hakea</i> and <i>Senna</i> ; and a ground cover dominated by <i>Triodia</i> species (DAWE, 2020b).	Unlikely to Occur. Rarely recorded this far south and no recent records nearby.
Malleefowl <i>Leipoa ocellata</i>	VU	VU	-	Scrublands and woodlands dominated by mallee and wattle species (DAWE, 2020b).	Possibly Occurs. Habitat likely marginal and unsuitable for breeding. Occasional transients only.
Fork-tailed Swift <i>Apus pacificus</i>	MI	MI	-	Low to very high airspace over varied habitat from rainforest to semi desert (Birdlife Australia, 2019).	Unlikely to occur. Very occasional transients only.
Grey Wagtail <i>Motacilla cinerea</i>	MI	-	-	Running water in disused quarries, sandy, rocky streams in escarpments and rainforest, sewerage ponds, ploughed fields and airfields (Morecombe 2004).	Would Not Occur. No suitable habitat.
Chuditch, Western Quoll	VU	VU		Previously occurred throughout arid and semi-arid Australia but is now restricted to south-west Western Australia. (DAWE, 2020b).	Unlikely to Occur. Considered to be locally extinct.

Species	Conservation Status			Habitat Description	Likelihood of occurrence
	EPBC Act	BC Act	DBCA Priority		
<i>Dasyurus geoffroii</i>					
Migratory Shorebirds (Various species)	IA/MI	IA/MI	P4	Prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. This includes lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, saltpans and hypersaline salt lakes inland (DAWE, 2020b).	Would Not Occur. Habitat would not be present.

4.1.4 Conservation Areas

There are no proposed or vested Conservation Reserves located within the survey area.

There are no DBCA managed lands or lands of interest located within the survey area.

There are no Environmentally Sensitive Areas (ESAs) located within the survey area.

There are no Nationally Important or RAMSAR wetlands located within the survey area.

The closest significant environmental feature is Wanjarri Nature Reserve, located approximately 30 km north of the survey area. This area is also categorised as an ESA. Disturbances within the survey area are unlikely to impact this area. The location of conservation areas in relation to the survey area is provided in Figure 4-3.

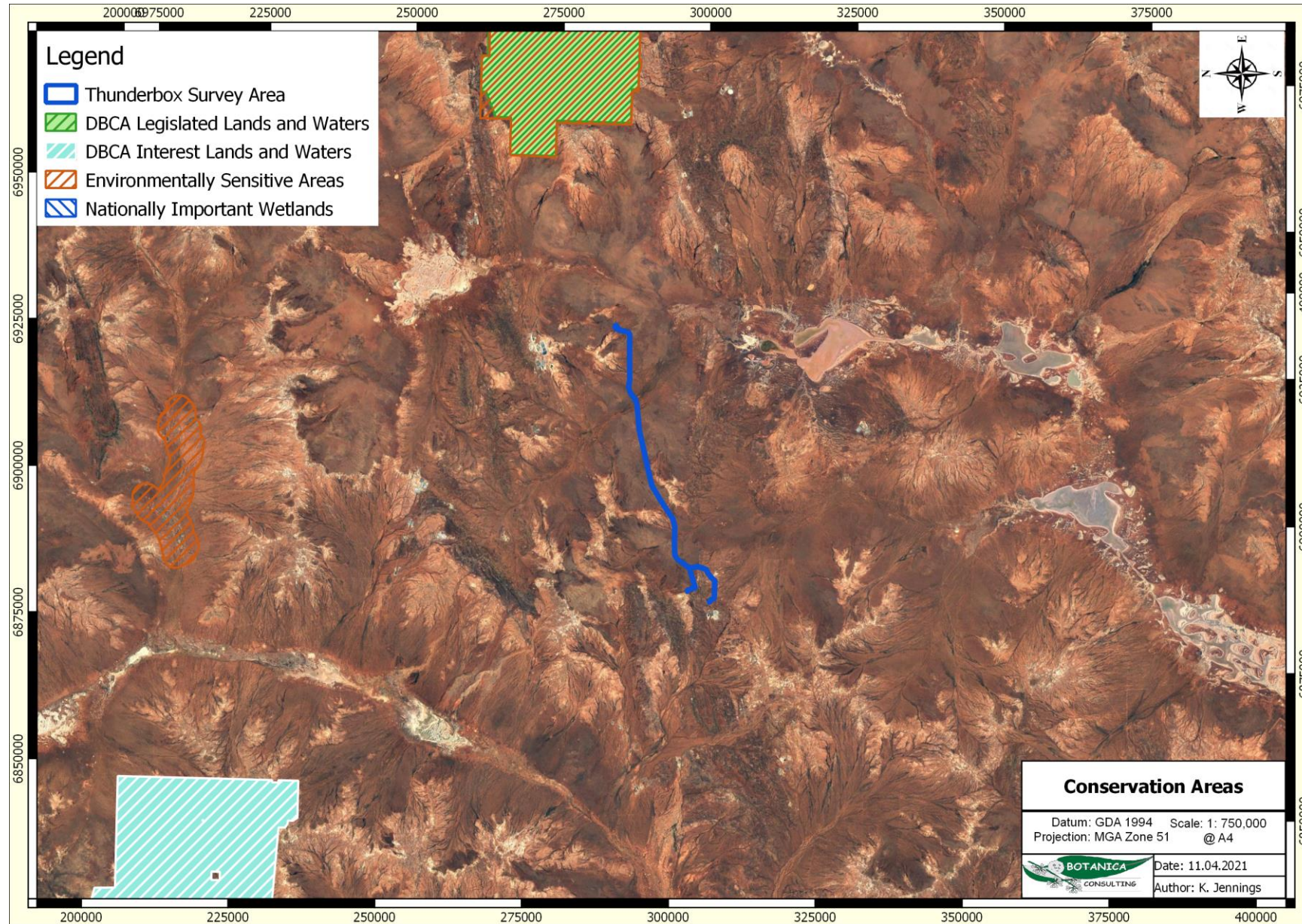


Figure 4-3: Conservation Areas

4.2 Field Assessment

4.2.1 Flora

The field survey identified 82 vascular flora taxa within the survey area. These taxa represented 39 genera across 25 families, with the most diverse genera being *Acacia* (14 species), *Eremophila* (eight species) and *Maireana* (five species). Dominant families include, Fabaceae (18 species), Proteaceae (seven species) and Malvaceae (six species). No introduced (weed) species were recorded. The full field species inventory is listed in Appendix 3.

4.2.1.1 Introduced Flora

No species of introduced flora were recorded within the survey area.

4.2.1.2 Significant Flora

According to the EPA *Environmental Factor Guideline for Flora and Vegetation* (EPA, 2016b) significant flora includes:

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

No Threatened or Priority flora species were recorded within the survey area. An assessment on the potential for suitable habitats to be present within the survey area (based on the field assessments) for Priority Flora identified in the desktop assessment is provided below in Table 4-5. The assessment identified Sandplain Eucalypt woodland vegetation (SP-EW1) which represents 12.4% of the total survey area may represent suitable habitat for two Priority Flora taxon. Sandplain Mallee vegetation (SP-OMW1) which represents 5.3% of the total survey area may represent suitable habitat for one Priority Flora taxon.

Table 4-5: Assessment on potential conservation significant flora

Taxon	Rank	Description	Field Assessment
<i>Baeckea</i> sp. Sandstone (C.A. Gardner s.n. 26 Oct. 1963)	P3	<ul style="list-style-type: none"> • Eight collections in WAHERB. Most collections are in the Sandstone area (Murchison IBRA region), except for one collection near Tropicana in the Great Victoria Desert. • Associated vegetation is usually Low shrubland with occasional emergent Eucalypts. • Soils are usually red or orange sand. • Number of plants noted in each population ranges from 2-5 to common in area. 	Sandplain Eucalypt woodland vegetation (SP-EW1) which represents 12.4% of the total survey area may represent suitable habitat for this taxon, however this taxon was not recorded during the field survey.
<i>Eremophila pungens</i>	P4	<ul style="list-style-type: none"> • 44 collections in WAHERB over a range of about 500 km. • Associated vegetation is usually open mulga shrubland. • Usually grows in rocky areas, either on granite outcrops, weathered breakaways or sandstone mesas. • Number of plants noted in each population ranges from 1, to common in area to >1,000. 	No suitable habitat identified with no large rocky hillslopes, granite outcrops or breakaways identified within the survey area. This taxon was not recorded during the field survey.
<i>Goodenia modesta</i>	P3	<ul style="list-style-type: none"> • 27 collections in WAHERB over a range of about 1400 km, including populations in the Northern Territory (NT). Atlas of Living Australia (ALA) records show that it is common in NT and South Australia. • Associated vegetation is usually a Low open shrubland with occasional emergent Eucalypts. • Usually grows in red sandy/clay plains, some records are associated with clay pans near large wetlands. • Number of plants noted in each population ranges from 1, to common in area to >10,000. 	Sandplain Eucalypt woodland vegetation (SP-EW1) which represents 12.4% of the total survey area may represent suitable habitat for this taxon, however this taxon was not recorded during the field survey.
<i>Grevillea inconspicua</i>	P4	<ul style="list-style-type: none"> • 61 collections in WAHERB over a range of about 400 km. • Associated vegetation is usually sparse or open Acacia shrub communities, or with <i>Eucalyptus camaldulensis</i> if growing in a drainage line. • Grows on rocky hills, sometimes associated with ironstones or greenstone, or in loamy and gravelly soils along drainage lines. • Number of plants noted in each population ranges from isolated plants, no more than 100 plants. 	No suitable habitat identified with no large rocky hills, ironstone or greenstone rises in the survey area. This taxon was not recorded during the field survey.
<i>Hemigenia exilis</i>	P4	<ul style="list-style-type: none"> • 42 collections in WAHERB over a range of about 600 km. • Associated vegetation is usually sparse or open Acacia shrub communities. 	No suitable habitat identified with no laterite or stony ironstone hills identified within the survey area.



Taxon	Rank	Description	Field Assessment
		<ul style="list-style-type: none"> Grows on a range of soil types including laterite and is often associated with stony ironstone hills. Number of plants noted in each population ranges from isolated plants, to >1,000. 	
<i>Micromyrtus chrysodema</i>	P1	<ul style="list-style-type: none"> One collection in WAHERB, about 40 km SE of Leinster, 1 km E of the Goldfields Hwy. Was found growing in a red sandplain with <i>Eucalyptus gongylocarpa</i>, <i>Acacia aneura</i> and <i>Triodia basedowii</i>. Number of plants was not recorded. 	Sandplain Eucalypt woodland vegetation (SP-EW1) which represents 12.4% of the total survey area may represent suitable habitat for this taxon, however this taxon was not recorded during the field survey.
<i>Sauropus</i> sp. Woolgorong (M. Officer s.n. 10/8/94)	P3	<ul style="list-style-type: none"> 23 collections in WAHERB over a range of about 600 km. Associated vegetation is usually tall <i>Acacia</i> shrubland. Usually growing in a flat plain with red loamy sand; 1 collection is on a weathered granite breakaway plateau community; several collections are from a weathered banded ironstone outcrop with red orange shallow sandy loam soils. Number of plants noted in each population usually <10. 	Sandplain Mallee vegetation (SP-OMW1) which represents 5.3% of the total survey area may represent suitable habitat for this taxon, however this taxon was not recorded during the field survey.
<i>Thryptomene nealensis</i>	P3	<ul style="list-style-type: none"> 12 collections in WAHERB over a range of about 600 km. Associated vegetation is usually open mulga shrubland. All records were collected from lateritic breakaways. Where the number of plants was noted in each population this was >200. 	No suitable habitat identified with no breakaway areas identified within the survey area.



4.2.2 Vegetation Communities



A total of seven broad-scale vegetation communities were identified within the survey area. Vegetation community descriptions and extent are listed below in Table 4-6 and illustrated spatially in Figure 4-4. Vegetation community descriptions and extents were determined from field survey results, aerial imagery interpretation and extrapolation of the communities.


The survey found CLP-AOW1 was the most widespread community in the survey area, occupying 392.0 ha (31.9%), while RS-AFW1 was the most restricted with 29.9 ha (2.4%). The most diverse community was CLP-OMW/AFW1 with 38 species (46.3%) while the least diverse was SP-OMW1, with 12 species (14.6%). There were no lateritic, banded ironstone, breakaway or granite outcrops or ridges within the survey area.

Table 4-6: Vegetation Community Descriptions and Extent

Vegetation Community	Broad Floristic Formation (NVIS III)	Habitat Description	Vegetation Description (NVIS V)	Image
CLP-AOW1 392.0 ha (31.9%)	<i>Acacia</i> open woodland	Plain with red-brown clay-loam soils. Hard surface crust. No hillslopes or ridges. No exposed bedrock/ rock outcropping.	<i>Acacia incurvaneura</i> , <i>A. craspedocarpa</i> and <i>Grevillea berryana</i> open woodland over <i>Eremophila forrestii</i> , <i>E. margarethae</i> and <i>Scaevola spinescens</i> open shrubland over <i>Eragrostis eriopoda</i> , <i>Triodia melvillei</i> tussock grassland/ <i>Maireana tomentosa</i> low open shrubland.	
CLP-OMW/AFW1 383.8 ha (31.2%)	<i>Eucalyptus</i> open mallee woodland/ <i>Acacia</i> woodland	Plain with red-brown clay-loam soils. Hard surface crust. No hillslopes or ridges. No exposed bedrock/ rock outcropping.	<i>Eucalyptus lucasii</i> open mallee woodland/ <i>Acacia incurvaneura</i> and <i>A. caesaneura</i> woodland over <i>Acacia effusifolia</i> , <i>A. ramulosa</i> and <i>Psyrax suaveolens</i> shrubland over <i>Triodia melvillei</i> , <i>Monachather paradoxus</i> tussock grassland.	

Vegetation Community	Broad Floristic Formation (NVIS III)	Habitat Description	Vegetation Description (NVIS V)	Image
DD-AOW1 53.6 ha (4.4%)	<i>Acacia</i> woodland	Ephemeral drainage line with yellow-brown clay-loam soils. Hard surface crust. No hillslopes or ridges. No exposed bedrock/ rock outcropping.	<i>Acacia incurvaneura</i> and <i>A. aptaneura</i> woodland over <i>Eremophila margarethae</i> , <i>Acacia erinacea</i> and <i>A. tetragonophylla</i> sparse shrubland over <i>Aristida contorta</i> , <i>Eriachne pulchella</i> tussock grassland/ <i>Ptilotus obovatus</i> var. <i>obovatus</i> low sparse shrubland	
RP-AOW1 144.2 ha (11.7%)	<i>Acacia</i> open woodland	Plain with red-brown clay-loam soils and quartz stones on surface. Hard surface crust. No hillslopes or ridges. No exposed bedrock/ rock outcropping.	<i>Acacia incurvaneura</i> and <i>A. aptaneura</i> open woodland over <i>Eremophila margarethae</i> , <i>Acacia erinacea</i> and <i>A. tetragonophylla</i> sparse shrubland over <i>Aristida contorta</i> , <i>Eriachne pulchella</i> tussock grassland/ <i>Ptilotus obovatus</i> var. <i>obovatus</i> low sparse shrubland.	

Vegetation Community	Broad Floristic Formation (NVIS III)	Habitat Description	Vegetation Description (NVIS V)	Image
RS-AFW1 29.9 ha (2.4%)	<i>Acacia</i> low open forest	Low rise with red-brown clay-loam soils. Hard surface crust, gravelly-rocky surface. No ridges. No exposed bedrock/ rock outcropping.	<i>Acacia incurvaneura</i> , <i>A. mulganeura</i> and <i>A. quadrimarginea</i> low open forest over <i>Eremophila georgei</i> , <i>Dodonaea microzyga</i> and <i>D. viscosa</i> open shrubland over <i>Ptilotus obovatus</i> var. <i>obovatus</i> , <i>P. schwartzii</i> and <i>Solanum lasiophyllum</i> low open shrubland.	
SP-EW1 151.9 ha (12.4%)	<i>Eucalyptus</i> open woodland	Firm red-brown sandplain with surface crust. No hillslopes or ridges. No exposed bedrock/ rock outcropping.	<i>Eucalyptus gongylocarpa</i> open woodland and <i>Acacia caesaneura</i> and <i>A. ligulata</i> open woodland over <i>Alyogyne pinoniana</i> , <i>Eremophila platycalyx</i> subsp. <i>platycalyx</i> and <i>Seringa velutina</i> open shrubland over <i>Triodia melvillei</i> , <i>Eragrostis eriopoda</i> and <i>Monachather paradoxus</i> tussock grassland.	

Vegetation Community	Broad Floristic Formation (NVIS III)	Habitat Description	Vegetation Description (NVIS V)	Image
SP-OMW1 65.4 ha (5.3%)	<i>Eucalyptus</i> open mallee woodland	Firm red-brown sandplain with surface crust. No hillslopes or ridges. No exposed bedrock/ rock outcropping.	<i>Eucalyptus lucasii/ E. youngiana</i> open mallee woodland and <i>Acacia incurvaneura</i> woodland over <i>Eremophila forrestii</i> , <i>E. margarethae</i> and <i>E. latrobei</i> subsp. <i>glabra</i> open shrubland over <i>Triodia melvillei</i> , <i>Eragrostis eriopoda</i> and <i>Monachather paradoxus</i> tussock grassland.	

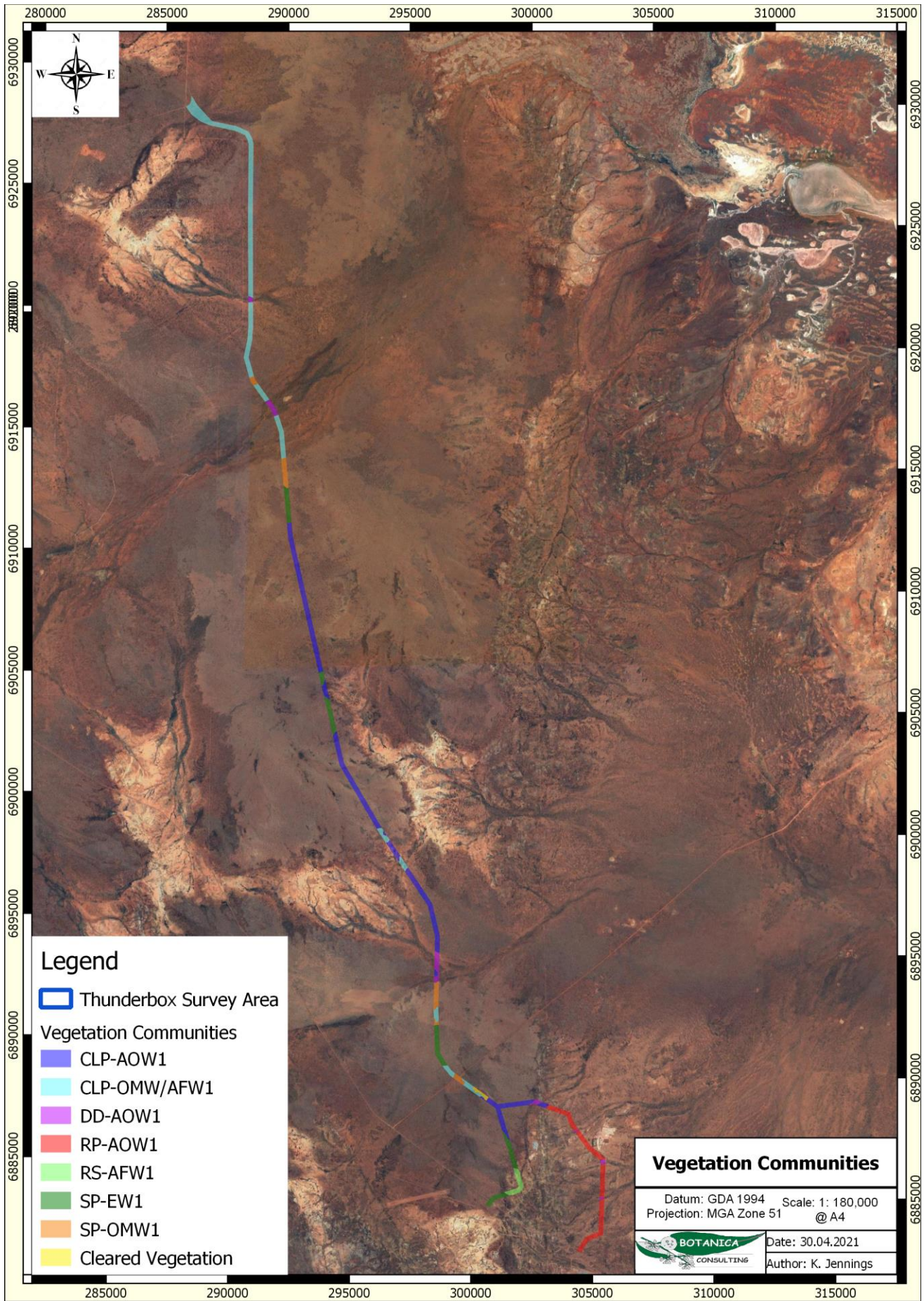


Figure 4-4: Vegetation Communities

4.2.3 Vegetation Condition

Based on the vegetation condition rating scale adapted from Keighery (1994) and Trudgen, (1988), native vegetation within the survey area was rated as 'good' (Table 4-7, Figure 4-5). 'Good' condition depicts more obvious signs of damage caused by human activity since European settlement, including impacts to vegetation structure and composition from low levels of grazing, changed fire regimes and/or slightly aggressive weeds. Areas cleared of vegetation, including major roads and raw material extraction pits, were categorized as 'completely degraded'.

Table 4-7: Vegetation Condition within the survey area

Condition Rating	Area (ha)	Area (%)
Good	1,220	99.2
Completely Degraded	10	0.8
Total	1,230	100

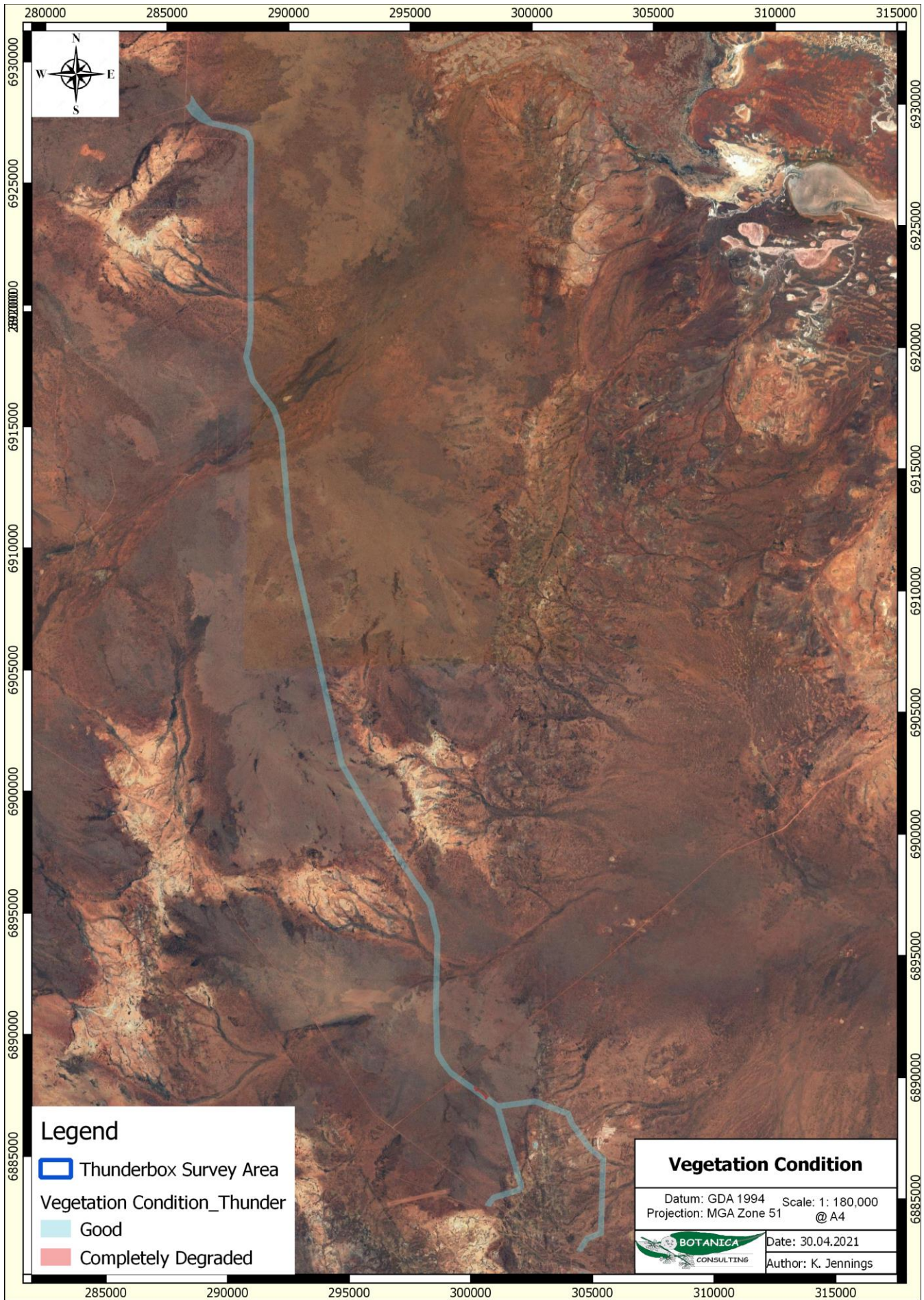


Figure 4-5: Vegetation Condition

4.2.4 Significant Vegetation

According to the EPA *Environmental Factor Guideline for Flora and Vegetation* (EPA, 2016b) significant vegetation includes:


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



No Threatened or Priority Ecological Communities or otherwise significant vegetation were identified within the survey area.



4.2.5 Fauna Habitat



Based on vegetation and associated landforms identified during the flora and vegetation assessment, seven broad scale terrestrial fauna habitats were identified as occurring within the survey area. Table 4-8 provides a visual representation of this habitat type, and the extent of fauna habitat is shown spatially in Figure 4-6.

Table 4-8: Terrestrial Fauna Habitats within the survey area

Fauna Habitat	Example Image
<p><u>Acacia woodland on clay-loam plain</u> Area: 392.0 ha (31.9%)</p>	

Fauna Habitat	Example Image
<p><u>Acacia/ mallee woodland on clay-loam plain</u> Area: 383.8 ha (31.2%)</p>	 A photograph showing a landscape of Acacia and mallee trees on a clay-loam plain. The ground is reddish-brown and sandy, with sparse, low-lying vegetation. The trees are scattered across the plain under a clear blue sky with a few wispy clouds.
<p><u>Acacia woodland in drainage depression</u> Area: 53.6 ha (4.4%)</p>	 A photograph showing a drainage depression with Acacia trees. The ground is reddish-brown and sandy, with some water visible in the foreground. The trees are scattered across the depression, with some showing signs of stress or death. The sky is clear blue.

Fauna Habitat	Example Image
<p><u>Acacia woodland on rocky plain</u> Area: 144.2 ha (11.7%)</p>	 A photograph showing a rocky plain covered with sparse, low-lying vegetation and scattered trees under a clear blue sky. The ground is reddish-brown and rocky.
<p><u>Acacia forest on rocky slope</u> Area: 29.9 ha (2.4%)</p>	 A photograph showing a rocky slope covered with dense, tall Acacia trees and shrubs under a clear blue sky. The ground is reddish-brown and rocky.

Fauna Habitat	Example Image
<p><u><i>Eucalyptus</i></u> <u>woodland on</u> <u>sandplain</u> Area: 151.9 ha (12.4%)</p>	
<p><u><i>Eucalyptus</i></u> <u>mallee</u> <u>woodland on</u> <u>sandplain</u> Area: 65.4 ha (5.4%)</p>	

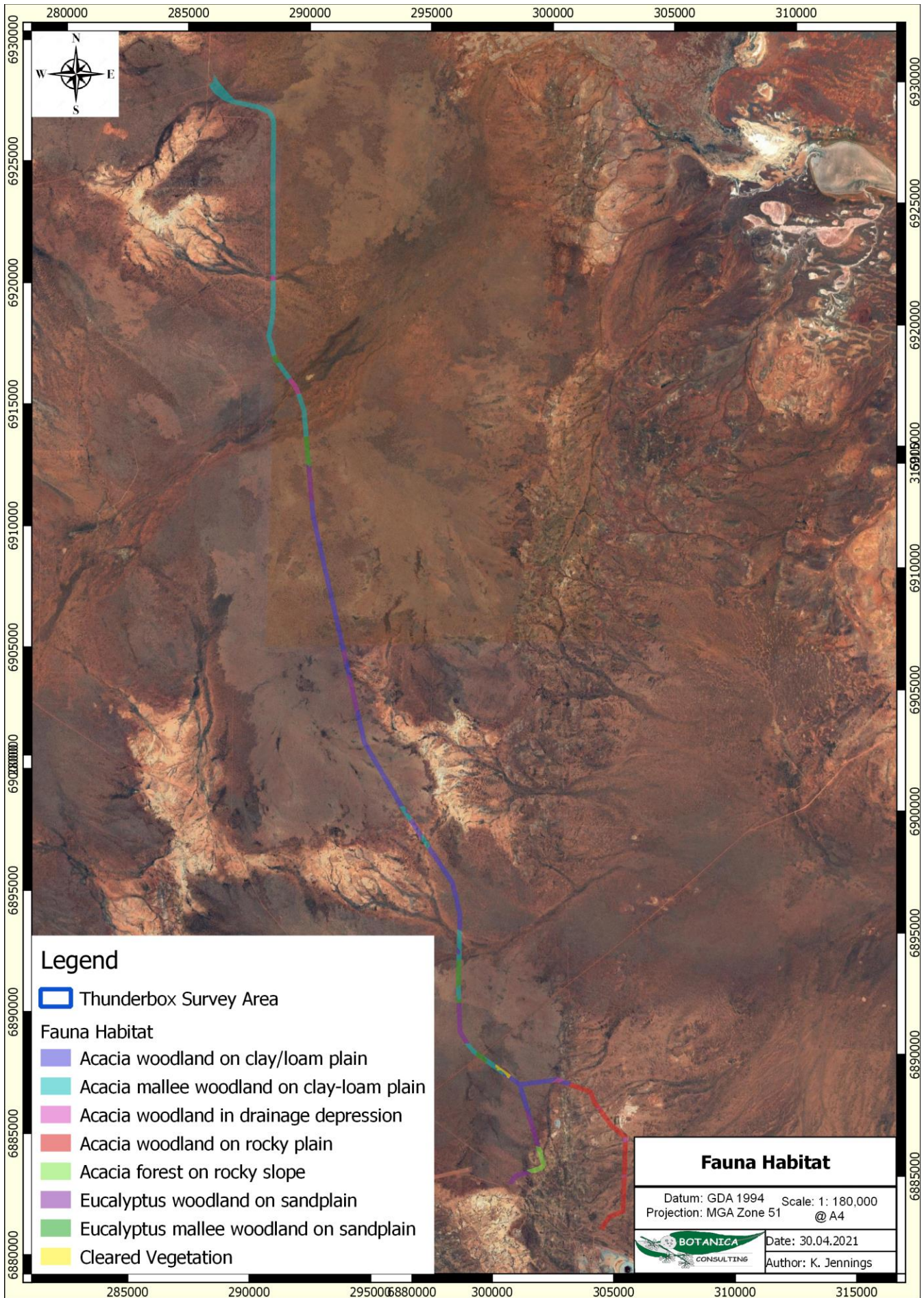


Figure 4-6: Terrestrial Fauna Habitats

4.2.6 Significant Fauna

According to the EPA *Environmental Factor Guideline for Terrestrial Fauna* (EPA, 2016d) significant fauna includes:

- Fauna being identified as a threatened or priority species;
- Fauna species with restricted distribution;
- Fauna subject to a high degree of historical impact from threatening processes; and
- Fauna providing an important function required to maintain the ecological integrity of a significant ecosystem.

No evidence of significant fauna species were observed during the survey, including no evidence of Malleefowl nesting mounds or other activity.

The current status of some species on site and/or in the general area is difficult to determine, however, based on the habitats present and, in some cases, direct observations or recent nearby records, the following species of conservation significance can be regarded as possibly utilising the survey area for some purpose at times, these being:

- **Malleefowl (*Leipoa ocellata*) - Vulnerable (EPBC Act and BC Act)**
This species is occasionally recorded in the Eastern Murchison subregion. Habitat appears marginal/or unsuitable for breeding, however occasional transients could potentially occur. No evidence of malleefowl activity (inactive or active mounds, tracks, feathers or bird observations etc.) were observed within the survey area. Significant impact unlikely.
- **Grey Falcon (*Falco hypoleucos*) - Vulnerable (EPBC Act and BC Act)**
This species is sparsely recorded throughout inland Australia. Suitable habitat may be present but is unlikely to represent critical habitat. Significant impact unlikely.

It should be noted that while habitats onsite for one or more of the species listed above are considered possibly suitable, some or all may be marginal in extent/quality and therefore the fauna species considered as possibly occurring may in fact only visit the area for short periods as infrequent vagrants.

4.3 Matters of National Environmental Significance

4.3.1 *Environment Protection and Biodiversity Conservation Act 1999*

The EPBC Act protects matters of national environmental significance and is used by the Commonwealth DAWE to list threatened taxa and ecological communities into categories based on the criteria set out in the Act (www.environment.gov.au/epbc/index.html). The Act provides a national environmental assessment and approval system for proposed developments and enforces strict penalties for unauthorised actions that may affect matters of national environmental significance. Matters of national environmental significance as defined by the Commonwealth EPBC Act include:

- Nationally threatened flora and fauna species;
- World heritage properties;
- National heritage places;
- Wetlands of international importance (often called ‘Ramsar’ wetlands after the international treaty under which such wetlands are listed);
- Nationally threatened ecological communities;
- Commonwealth marine area;
- The Great Barrier Reef Marine Park; and
- Nuclear actions (including uranium mining) a water resource, in relation to coal seam gas development and large coal mining development.

No matters of national environmental significance as defined by the Commonwealth EPBC Act were identified within the survey area.

4.4 Matters of State Environmental Significance

4.4.1 *Environmental Protection Act WA 1986*

The EP Act provides for the prevention, control and abatement of pollution and environmental harm, for the conservation, preservation, protection, enhancement and management of the environment. The Act is administered by The Department of Water and Environment Regulation (DWER), which is the State Government’s environmental regulatory agency.

Under Section 51C of the EP Act and the *Environmental Protection (Clearing of Native Vegetation) Regulations (Regulations) WA 2004* any clearing of native vegetation in Western Australia that is not eligible for exemption under Schedule 6 of the *EP Act 1986* or under the Regulations 2004 requires a clearing permit from the DWER or DMIRS. Under Section 51A of the *EP Act 1986* native vegetation includes aquatic and terrestrial vegetation indigenous to Western Australia, and intentionally planted vegetation declared by regulation to be native vegetation, but not vegetation planted in a plantation or planted with commercial intent. Section 51A of the *EP Act 1986* defines clearing as “the killing or destruction of; the removal of; the severing or ringbarking of trunks or stems of; or the doing of substantial damage to some or all of the native vegetation in an area, including the flooding of land, the burning of vegetation, the grazing of stock or an act or activity that results in the above”. Exemptions under Schedule 6 of the EP Act and the EP Regulations do not apply in ESAs as declared under Section 51B of the EP Act or TEC listed under State and Commonwealth legislation.

No evidence of the survey area containing any TEC or Threatened flora or fauna was found during the survey period. The survey area is not located within an ESA.

4.4.2 Biodiversity Conservation Act 2016

This Act is used by the Western Australian DBCA for the conservation and protection of biodiversity and biodiversity components in Western Australia and to promote the ecologically sustainable use of biodiversity components in the State. Taxa are classified as ‘Threatened’ when their populations are geographically restricted or are threatened by local processes (see following sections for Threatened definitions). Under this Act all native flora and fauna are protected throughout the State. Financial penalties are enforced under this Act if threatened species are collected without an appropriate license.

Under Section 54(1) of the BC Act, habitat is eligible for listing as critical habitat if:

- a) it is critical to the survival of a threatened species or a threatened ecological community; and
- b) its listing is otherwise in accordance with the ministerial guidelines.

No threatened species or critical habitat listed under the BC Act were recorded within the survey area.

4.5 Native Vegetation Clearing Principles

Based on the outcomes from the survey undertaken, Botanica assessed the results of the desktop and field survey with regards to the native vegetation clearing principles listed under Schedule 5 of the EP Act (Table 4-9). The assessment found that the proposed vegetation clearing activities may be at variance with clearing principle (f).

Table 4-9: Assessment against native vegetation clearing principles

Letter	Principle	Assessment	Outcome
	Native vegetation should not be cleared if it:		
(a)	comprises a high level of biological diversity.	Vegetation identified within the survey area is not considered to be of high biological diversity and is well represented outside of the survey area. The survey area does not occur within any mapped Priority Ecological Communities (PECs), Threatened Ecological Communities (TECs) or associated buffer zones and does not contain any Banded Ironstone Formations.	Clearing is unlikely to be at variance with this principle
(b)	comprises the whole or part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to WA.	No significant fauna were observed within the survey area. No significant fauna habitat was observed within the survey area.	Clearing is unlikely to be at variance with this principle
(c)	includes, or is necessary for the continued existence of rare flora.	No Threatened Flora taxa, pursuant to the BC Act and the EPBC Act were identified within the survey area.	Clearing is not at variance with this principle
(d)	comprises the whole or part of or is necessary for the maintenance of a threatened ecological community (TEC).	No TEC listed under the EPBC Act or by the BC Act occur within the survey area or the Eastern Murchison subregion.	Clearing is not at variance with this principle

Letter	Principle	Assessment	Outcome
Native vegetation should not be cleared if it:			
(e)	is significant as a remnant of native vegetation in an area that has been extensively cleared	All vegetation associations retain >98% of their original pre-European vegetation extent.	Clearing is unlikely to be at variance with this principle
(f)	is growing, in, or in association with, an environment associated with a watercourse or wetland	Several minor ephemeral drainage lines intersect the survey area. One vegetation type was associated with these ephemeral drainage lines; DD-AOW1 which accounts for 53.6 ha (4.4%) of the total survey area.	Clearing may be at variance with this principle
(g)	Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.	The survey area and surrounding region has not been extensively cleared. Clearing within the survey area is not considered likely to lead to land degradation issues such as salinity, water logging or acidic soils.	Clearing is unlikely to be at variance with this principle
(h)	Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.	The closest significant environmental feature is Wanjarri Nature Reserve, located approximately 30 km north of the survey area. Disturbances within the survey area are unlikely to impact this area.	Clearing is unlikely to be at variance with this principle
(i)	Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.	No surface water bodies are located within the survey area. Clearing in ephemeral drainage lines is unlikely to result in significant impacts to water quality.	Clearing is unlikely to be at variance with this principle
(j)	Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence of flooding	Rainfall in the Eastern Murchison subregion has an average rainfall of 200mm. Rainfall events are unlikely to result in localised flooding. Clearing within the survey area is not likely to increase the incidence or intensity of flooding within the survey area or surrounds.	Clearing is unlikely to be at variance with this principle

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Appendix 1: Conservation Ratings BC Act and EPBC Act

Definitions of Conservation Significant Species

Code	Category
State categories of threatened and priority species	
Threatened Species (T)	
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).	
CR	<p>Critically Endangered</p> <p>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”.</p> <p>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.</p>
EN	<p>Endangered</p> <p>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”.</p> <p>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.</p>
VU	<p>Vulnerable</p> <p>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”.</p> <p>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.</p>
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	<p>Extinct</p> <p>Species where “<i>there is no reasonable doubt that the last member of the species has died</i>”, and listing is otherwise in accordance with the ministerial guidelines (section 24 of the BC Act).</p> <p>Published as presumed extinct under schedule 4 of the <i>Wildlife Conservation (Specially Protected Fauna) Notice 2018</i> for extinct fauna or the <i>Wildlife Conservation (Rare Flora) Notice 2018</i> for extinct flora.</p>
EW	<p>Extinct in the Wild</p> <p>Species that “<i>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</i>”, and listing is otherwise in accordance with the ministerial guidelines (section 25 of the BC Act).</p> <p>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.</p>
Specially protected species	
Listed by order of the Minister as specially protected under section 13(1) of the BC Act. Meeting one or more of the following categories: species of special conservation interest; migratory species; cetaceans; species subject to international agreement; or species otherwise in need of special protection.	
Species that are listed as threatened species (critically endangered, endangered or vulnerable) or extinct species under the BC Act cannot also be listed as Specially Protected species.	
IA	<p>International Agreement/ Migratory</p> <p>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).</p> <p>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 <i>Convention on the Conservation of Migratory Species of Wild Animals</i> (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.</p>

Code	Category
	Published as migratory birds protected under an international agreement under schedule 5 of the <i>Wildlife Conservation (Specially Protected Fauna) Notice 2018</i> .
CD	Species of special conservation interest 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 <i>Wildlife Conservation (Specially Protected Fauna) Notice 2018</i> .
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 <i>Wildlife Conservation (Specially Protected Fauna) Notice 2018</i> .
Priority species Possibly threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Fauna or Priority Flora Lists under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened fauna or flora. Species that are adequately known, are rare but not threatened, or meet criteria for near threatened, or that have been recently removed from the threatened species or other specially protected fauna lists for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring. Assessment of Priority codes is based on the Western Australian distribution of the species, unless the distribution in WA is part of a contiguous population extending into adjacent States, as defined by the known spread of locations.	
P1	Priority 1: Poorly-known species Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.
P2	Priority 2: Poorly-known species Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.
P3	Priority 3: Poorly-known species Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.
P4	Priority 4: Rare, Near Threatened and other species in need of monitoring (a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These species are usually represented on conservation lands. (b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as Conservation Dependent. (c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.
Commonwealth categories of threatened species	
EX	Extinct Taxa where there is no reasonable doubt that the last member of the species has died.
EW	Extinct in the Wild Taxa where it is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
CR	Critically Endangered Taxa that are facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
EN	Endangered

Code	Category
	Taxa which are not critically endangered and is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.
VU	Vulnerable Taxa which are not critically endangered or endangered and is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.
CD	Conservation Dependent Taxa which are the focus of a specific conservation program the cessation of which would result in the species becoming vulnerable, endangered or critically endangered; or (b) the following subparagraphs are satisfied: (i) the species is a species of fish; (ii) the species is the focus of a plan of management that provides for actions necessary to stop the decline of, and support the recovery of, the species so that its chances of long term survival in nature are maximised; (iii) the plan of management is in force under a law of the Commonwealth or of a State or Territory; (iv) cessation of the plan of management would adversely affect the conservation status of the species.

Definitions of Conservation Significant Communities

Category Code	Category
State categories of Threatened Ecological Communities (TEC)	
PD	Presumed Totally Destroyed
	An ecological community will be listed as Presumed Totally Destroyed if there are no recent records of the community being extant and either of the following applies:
	<ul style="list-style-type: none"> records within the last 50 years have not been confirmed despite thorough searches or known likely habitats or; all occurrences recorded within the last 50 years have since been destroyed.
CR	Critically Endangered
	An ecological community will be listed as Critically Endangered when it has been adequately surveyed and is found to be facing an extremely high risk of total destruction in the immediate future, meeting any one of the following criteria:
	The estimated geographic range and distribution has been reduced by at least 90% and is either continuing to decline with total destruction imminent, or is unlikely to be substantially rehabilitated in the immediate future due to modification;
	The current distribution is limited i.e. highly restricted, having very few small or isolated occurrences, or covering a small area;
	The ecological community is highly modified with potential of being rehabilitated in the immediate future.
EN	Endangered
	An ecological community will be listed as Endangered when it has been adequately surveyed and is not Critically Endangered but is facing a very high risk of total destruction in the near future. The ecological community must meet any one of the following criteria:
	The estimated geographic range and distribution has been reduced by at least 70% and is either continuing to decline with total destruction imminent in the short-term future, or is unlikely to be substantially rehabilitated in the short-term future due to modification;
	The current distribution is limited i.e. highly restricted, having very few small or isolated occurrences, or covering a small area;
	The ecological community is highly modified with potential of being rehabilitated in the short-term future.
VU	Vulnerable
	An ecological community will be listed as Vulnerable when it has been adequately surveyed and is not Critically Endangered or Endangered but is facing high risk of total destruction in the medium to long term future. The ecological community must meet any one of the following criteria:
	The ecological community exists largely as modified occurrences that are likely to be able to be substantially restored or rehabilitated;
	The ecological community may already be modified and would be vulnerable to threatening process, and restricted in range or distribution;

Category Code	Category
	The ecological community may be widespread but has potential to move to a higher threat category due to existing or impending threatening processes.
Commonwealth categories of Threatened Ecological Communities (TEC)	
CE	Critically Endangered If, at that time, an ecological community is facing an extremely high risk of extinction in the wild in the immediate future (indicative timeframe being the next 10 years).
EN	Endangered If, at that time, an ecological community is not critically endangered but is facing a very high risk of extinction in the wild in the near future (indicative timeframe being the next 20 years).
VU	Vulnerable If, at that time, an ecological community is not critically endangered or endangered, but is facing a high risk of extinction in the wild in the medium-term future (indicative timeframe being the next 50 years).
Priority Ecological Communities (PEC)	
P1	Poorly-known ecological communities
	Ecological communities with apparently few, small occurrences, all or most not actively managed for conservation (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) and for which current threats exist.
P2	Poorly-known ecological communities
	Communities that are known from few small occurrences, all or most of which are actively managed for conservation (e.g. within national parks, conservation parks, nature reserves, State forest, un-allocated Crown land, water reserves, etc.) and not under imminent threat of destruction or degradation.
P3	Poorly known ecological communities
	Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or:
	Communities known from a few widespread occurrences, which are either large or within significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat, or;
	Communities made up of large, and/or widespread occurrences, that may or not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing and inappropriate fire regimes.
P4	Ecological communities that are adequately known, rare but not threatened or meet criteria for near threatened, or that have been recently removed from the threatened list. These communities require regular monitoring.
P5	Conservation Dependent ecological communities
	Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.

Appendix 2: Potentially Occurring Introduced (Weed) Flora Species

Family	Taxon	Common Name	WAOL Status	Control Category	WONS
Asphodelaceae	<i>Asphodelus fistulosus</i>	Onion Weed	Permitted - s11	No Control Category	No
Brassicaceae	<i>Carrichtera annua</i>	Ward's Weed	Permitted - s11	No Control Category	No
Geraniaceae	<i>Erodium aureum</i>	-	Permitted - s11	No Control Category	No
Poaceae	<i>Cenchrus ciliaris</i>	Black Buffel-grass	Permitted - s11	No Control Category	No
	<i>Digitaria ciliaris</i>	Summer Grass	Permitted - s11	No Control Category	No
	<i>Setaria verticillata</i>	Whorled Pigeon Grass	Permitted - s11	No Control Category	No
Polygonaceae	<i>Rumex hypogaeus</i>	-	Permitted - s11	No Control Category	No
Primulaceae	<i>Lysimachia arvensis</i>	Pimpernel	Permitted - s11	No Control Category	No
Solanaceae	<i>Solanum nigrum</i>	Black Berry Nightshade	Permitted - s11	No Control Category	No
Zygophyllaceae	<i>Tribulus terrestris</i>	Caltrop	Permitted - s11	No Control Category	No

Appendix 3: List of species identified within each vegetation type

Family	Taxon	CLP-AOW1	CLP-OMW/AFW1	DD-AOW1	RP-AOW1	RS-AFW1	SP-EW1	SP-OMW1
Amaranthaceae	<i>Ptilotus aervoides</i>				*			
	<i>Ptilotus obovatus</i> var. <i>obovatus</i>	*		*	*	*	*	
	<i>Ptilotus schwartzii</i>				*	*		
Apocynaceae	<i>Marsdenia australis</i>		*		*			
Boraginaceae	<i>Halgania cinerea</i>						*	
Chenopodiaceae	<i>Maireana convexa</i>		*					
	<i>Maireana georgei</i>				*			
	<i>Maireana glomerata</i>				*			
	<i>Maireana tomentosa</i>	*		*				
	<i>Maireana triptera</i>				*			
Fabaceae	<i>Acacia aptaneura</i>				*			
	<i>Acacia caesaneura</i>						*	
	<i>Acacia colletioides</i>		*					
	<i>Acacia craspedocarpa</i>	*		*				
	<i>Acacia effusifolia</i>							*
	<i>Acacia erinacea</i>				*			
	<i>Acacia incurvaneura</i>	*	*	*	*	*	*	*
	<i>Acacia ligulata</i>						*	
	<i>Acacia mulganeura</i>					*		
	<i>Acacia pachyacra</i>		*					
	<i>Acacia pachyacra</i>						*	
	<i>Acacia quadrimarginea</i>					*		
	<i>Acacia ramulosa</i>		*		*			*
	<i>Acacia tetragonophylla</i>	*	*	*	*	*		
	<i>Leptosema chambersii</i>						*	
	<i>Senna artemisioides</i> subsp. <i>filifolia</i>	*	*	*	*		*	*
	<i>Senna artemisioides</i> x <i>artemisioides</i>	*		*				
	<i>Senna pleurocarpa</i>						*	
Goodeniaceae	<i>Scaevola spinescens</i>	*	*	*	*	*		
Gyrostemonaceae	<i>Codonocarpus cotinifolius</i>						*	
Haloragaceae	<i>Haloragis odontocarpa</i>		*					
Hemerocallidaceae	<i>Dianella revoluta</i>		*		*			*
Lamiaceae	<i>Dicrastylis sessilifolia</i>		*					
	<i>Teucrium teucriiflorum</i>	*	*	*	*			
Malvaceae	<i>Alyogyne pinoniana</i>						*	
	<i>Brachychiton gregorii</i>				*		*	

Family	Taxon	CLP-AOW1	CLP-OMW/AFW1	DD-AOW1	RP-AOW1	RS-AFW1	SP-EW1	SP-OMW1
	<i>Seringia velutina</i>						*	*
	<i>Sida calyxhymenia</i>	*	*	*	*	*		
	<i>Sida</i> sp. Golden calyces glabrous (H.N. Foote 32)		*					
	<i>Sida spodochroma</i>		*					
Montiaceae	<i>Calandrinia</i> sp. sterile						*	
	<i>Eucalyptus gongylocarpa</i>						*	
	<i>Eucalyptus kingsmillii</i>		*					
	<i>Eucalyptus lucasii</i>		*					*
	<i>Eucalyptus youngiana</i>						*	*
	<i>Melaleuca glomerata</i>		*					
	<i>Boerhavia coccinea</i>		*					
Nyctaginaceae	<i>Boerhavia erecta</i>						*	
Oleaceae	<i>Jasminum didymum</i> subsp. <i>lineare</i>						*	
	<i>Aristida contorta</i>		*		*			
	<i>Eragrostis eriopoda</i>	*	*	*		*	*	
	<i>Eriachne pulchella</i>				*			
	<i>Monachather paradoxus</i>	*	*	*			*	*
	<i>Triodia melvillei</i>	*	*	*	*		*	*
	<i>Grevillea berryana</i>	*		*				
	<i>Grevillea juncifolia</i>						*	
	<i>Grevillea oncogyne</i>		*					
	<i>Grevillea acacioides</i>		*					
	<i>Hakea divaricata</i>				*			
	<i>Hakea lorea</i> subsp. <i>lorea</i>		*					
	<i>Hakea minyma</i>							*
Pteridaceae	<i>Cheilanthes sieberi</i>				*			
Rhamnaceae	<i>Cryptandra connata</i>	*		*				
	<i>Psydrax latifolia</i>					*		
	<i>Psydrax suaveolens</i>	*	*	*		*		*
	<i>Exocarpos sparteus</i>						*	
	<i>Santalum acuminatum</i>						*	
	<i>Santalum lanceolatum</i>	*	*	*				
	<i>Dodonaea microzyga</i>					*		
	<i>Dodonaea viscosa</i> subsp. <i>angustissima</i>					*		
	<i>Eremophila forrestii</i>	*	*	*			*	
	<i>Eremophila georgei</i>					*		
	<i>Eremophila gilesii</i>		*					

Family	Taxon	CLP-AOW1	CLP-OMW/AFW1	DD-AOW1	RP-AOW1	RS-AFW1	SP-EW1	SP-OMW1
	<i>Eremophila homoplastica</i>		*					
	<i>Eremophila latrobei</i> subsp. <i>glabra</i>		*		*	*		
	<i>Eremophila margarethae</i>		*		*			
	<i>Eremophila pantonii</i>				*			
	<i>Eremophila platycalyx</i> subsp. <i>platycalyx</i>						*	
Solanaceae	<i>Solanum cleistogamum</i>		*					
	<i>Solanum lasiophyllum</i>	*	*	*	*	*	*	
	<i>Solanum nummularium</i>		*					
Zygophyllaceae	<i>Tribulus terrestris</i>		*					

Appendix 4: Vegetation Condition Rating

Vegetation Condition Rating	South West and Interzone Botanical Provinces	Eremaean and Northern Botanical Provinces
Pristine	Pristine or nearly so, no obvious signs of disturbance or damage caused by human activities since European settlement.	N/A
Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species. Damage to trees caused by fire, the presence of non-aggressive weeds and occasional vehicle tracks.	Pristine or nearly so, no obvious signs of damage caused by human activities since European settlement.
Very Good	Vegetation structure altered, obvious signs of disturbance. Disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.	Some relatively slight signs of damage caused by human activities since European settlement. For example, some signs of damage to tree trunks caused by repeated fire, the presence of some relatively non-aggressive weeds, or occasional vehicle tracks.
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. Disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.	More obvious signs of damage caused by human activity since European settlement, including some obvious impact on the vegetation structure such as that caused by low levels of grazing or slightly aggressive weeds.
Poor	N/A	Still retains basic vegetation structure or ability to regenerate it after very obvious impacts of human activities since European settlement, such as grazing, partial clearing, frequent fires or aggressive weeds.
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. Disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds at high density, partial clearing, dieback and grazing.	Severely impacted by grazing, very frequent fires, clearing or a combination of these activities. Scope for some regeneration but not to a state approaching good condition without intensive management. Usually with a number of weed species present including very aggressive species.
Completely Degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees and shrubs.	Areas that are completely or almost completely without native species in the structure of their vegetation; i.e. areas that are cleared or 'parkland cleared' with their flora comprising weed or crop species with isolated native trees or shrubs.

Appendix 5: NatureMap Species List (40km buffer)

NatureMap Species Report

Created By Guest user on 30/03/2021

Current Names Only Yes
Core Datasets Only Yes
Method 'By Circle'
Centre 120° 52' 38" E, 27° 56' 42" S
Buffer 40km
Group By Family

Family	Species	Records
Acanthizidae	9	44
Acarosporaceae	1	1
Accipitridae	4	13
Actinopodidae	1	1
Aegothelidae	2	3
Agamidae	4	12
Aizoaceae	2	3
Amaranthaceae	9	47
Anatidae	3	3
Apocynaceae	1	3
Araliaceae	1	1
Artamidae	1	4
Asparagaceae	2	2
Asphodelaceae	1	1
Asteraceae	41	69
Boraginaceae	1	1
Brassicaceae	5	7
Cacatuidae	1	9
Campephagidae	2	11
Candelariaceae	1	2
Caprimulgidae	1	1
Carphodactylidae	1	1
Casuariidae	1	9
Casuarinaceae	1	1
Celastraceae	1	1
Charadriidae	3	4
Chenopodiaceae	33	66
Cinclosomatidae	2	3
Climacteridae	2	2
Colchicaceae	1	3
Columbidae	2	19
Convolvulaceae	3	4
Corvidae	2	22
Cracticidae	4	66
Crassulaceae	1	2
Cuculidae	1	4
Cucurbitaceae	1	1
Cyperaceae	2	2
Dasyuridae	4	7
Dicaeidae	1	1
Dicruridae	2	24
Diplodactylidae	3	8
Echinosteliaceae	2	4
Elapidae	4	6
Estrilidae	1	10
Euphorbiaceae	3	9
Fabaceae	54	154
Falconidae	3	10
Frankeniaceae	1	1
Gekkonidae	2	5
Geraniaceae	3	8
Goodeniaceae	10	19
Haloragaceae	2	9
Hirundinidae	3	12
Idiopidae	1	2
Juncaceae	1	1
Lamiaceae	7	16
Lecideaceae	1	2
Liceaceae	3	8
Limnodynastidae	3	3
Loranthaceae	4	6
Maluridae	2	2
Malvaceae	12	19
Megapodiidae	1	1
Meliphagidae	7	57
Montiaceae	3	6
Muridae	2	2
Myobatrachidae	1	4
Myrtaceae	30	112
Nyctaginaceae	1	1
Ophioglossaceae	1	1
Pachycephalidae	3	19
Pardalotidae	1	3
Petroicidae	2	11
Phyllanthaceae	2	5
Physaraceae	3	4
Pittosporaceae	1	2

Poaceae	29	68
Podargidae	1	2
Polygalaceae	1	4
Polygonaceae	2	2
Pomatostomidae	2	2
Portulacaceae	1	3
Primulaceae	1	1
Proteaceae	6	20
Psittacidae	7	19
Pteridaceae	1	1
Ptilonorhynchidae	1	4
Pygopodidae	1	1
Recurvirostridae	1	1
Rhamnaceae	1	1
Rutaceae	1	1
Santalaceae	4	7
Sapindaceae	5	7
Scincidae	7	12
Scrophulariaceae	29	77
Solanaceae	10	22
Stemonitidaceae	2	2
Stylidiaceae	1	2
Theraphosidae	1	1
Thymelaeaceae	4	8
Trichiaceae	1	1
Tytonidae	1	1
Urodacidae	2	4
Varanidae	3	3
Zygophyllaceae	3	6
TOTAL	473	1305

Name ID	Species Name	Naturalised	Conservation Code	Endemic To Query Area
Acanthizidae				
1.	24260 <i>Acanthiza apicalis</i> (Broad-tailed Thornbill, Inland Thornbill)			
2.	24261 <i>Acanthiza chrysorrhoa</i> (Yellow-rumped Thornbill)			
3.	24264 <i>Acanthiza robustirostris</i> (Slaty-backed Thornbill)			
4.	24265 <i>Acanthiza uropygialis</i> (Chestnut-rumped Thornbill)			
5.	25528 <i>Aphelocephala leucopsis</i> (Southern Whiteface)			
6.	24269 <i>Calamanthus campestris</i> (Rufous Fieldwren)			
7.	25530 <i>Gerygone fusca</i> (Western Gerygone)			
8.	24278 <i>Pyrrholaemus brunneus</i> (Redthroat)			
9.	30948 <i>Smicronis brevirostris</i> (Weebill)			
Acarosporaceae				
10.	27574 <i>Acarospora citrina</i>			
Accipitridae				
11.	25535 <i>Accipiter cirrocephalus</i> (Collared Sparrowhawk)			
12.	24285 <i>Aquila audax</i> (Wedge-tailed Eagle)			
13.	<i>Elanus axillaris</i>			
14.	24297 <i>Hamirostra melanosternon</i> (Black-breasted Buzzard)			
Actinopodidae				
15.	<i>Missulena occatoria</i>			
Aegothelidae				
16.	25544 <i>Aegotheles cristatus</i> (Australian Owlet-nightjar)			
17.	24301 <i>Aegotheles cristatus</i> subsp. <i>cristatus</i> (Australian Owlet-nightjar)			
Agamidae				
18.	24869 <i>Ctenophorus caudicinctus</i> subsp. <i>mensarum</i> (Ring-tailed Dragon)			
19.	24882 <i>Ctenophorus nuchalis</i> (Central Netted Dragon)			
20.	24886 <i>Ctenophorus reticulatus</i> (Western Netted Dragon)			
21.	30814 <i>Tympanocryptis cephalus</i> (Pebble Dragon)			
Aizoaceae				
22.	2808 <i>Gunnioopsis rodwayi</i>			
23.	2822 <i>Tetragonia eremaea</i>			
Amaranthaceae				
24.	2690 <i>Ptilotus aervoides</i>			
25.	2708 <i>Ptilotus chamaecladus</i>			
26.	2721 <i>Ptilotus exaltatus</i> (Tall Mulla Mulla)			
27.	2731 <i>Ptilotus helipteroides</i> (Hairy Mulla Mulla)			
28.	2747 <i>Ptilotus obovatus</i> (Cotton Bush)			
29.	2751 <i>Ptilotus polystachyus</i> (Prince of Wales Feather)			
30.	2754 <i>Ptilotus roei</i>			
31.	2755 <i>Ptilotus rotundifolius</i> (Royal Mulla Mulla)			
32.	2757 <i>Ptilotus schwartzii</i>			
Anatidae				
33.	24312 <i>Anas gracilis</i> (Grey Teal)			
34.	24321 <i>Chenonetta jubata</i> (Australian Wood Duck, Wood Duck)			
35.	24331 <i>Tadorna tadornoides</i> (Australian Shelduck, Mountain Duck)			
Apocynaceae				
36.	12949 <i>Marsdenia australis</i>			
Araliaceae				
37.	6268 <i>Trachymene cyanopetala</i>			
Artamidae				
38.	25566 <i>Artamus cinereus</i> (Black-faced Woodswallow)			
Asparagaceae				
39.	1343 <i>Thysanotus patersonii</i>			
40.	29457 <i>Thysanotus</i> sp. <i>Eremaean</i> (S. van Leeuwen 1067)			
Asphodelaceae				
41.	1364 <i>Asphodelus fistulosus</i> (Onion Weed)	Y		
Asteraceae				
42.	7846 <i>Asteridea athrixioides</i>			
43.	7871 <i>Brachyscome ciliaris</i>			
44.	7891 <i>Calocephalus francisii</i> (Fine-leaf Beauty-heads)			
45.	7893 <i>Calocephalus knappii</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
46.	7895 <i>Calocephalus multiflorus</i> (Yellow-top)			
47.	7903 <i>Calotis hispidula</i> (Bindy Eye)			
48.	7905 <i>Calotis multicaulis</i> (Many-stemmed Burr-daisy)			
49.	7922 <i>Cephalopterum drummondii</i> (Pompom Head)			
50.	12613 <i>Chrysocephalum eremaeum</i>			
51.	12619 <i>Chthonocephalus viscosus</i>			
52.	7951 <i>Cratystylis subspinescens</i> (Australian Sage, Spiny Grey Bush)			
53.	7970 <i>Erodiophyllum acanthocephalum</i>			
54.	7988 <i>Gnephosis arachnoidea</i> (Cobwebby-headed Gnephosis)			
55.	8045 <i>Helipterum craspedioides</i> (Yellow Billy Buttons)			
56.	13289 <i>Lawrencella davenportii</i>			
57.	19727 <i>Leiocarpa semicalva</i> subsp. <i>semicalva</i>			
58.	12628 <i>Lemooria burkittii</i>			
59.	13258 <i>Leucochrysum stipitatum</i>			
60.	8108 <i>Minuria gardneri</i>			
61.	8109 <i>Minuria integerrima</i> (Smooth Minuria)			
62.	8110 <i>Minuria leptophylla</i> (Minnie Daisy)			
63.	8116 <i>Myriocephalus guerinae</i>			
64.	8151 <i>Olearia stuartii</i>			
65.	8167 <i>Pluchea dentex</i>			
66.	45238 <i>Podolepis aristata</i> subsp. <i>affinis</i>			
67.	8173 <i>Podolepis capillaris</i> (Wiry Podolepis)			
68.	8188 <i>Pogonolepis stricta</i>			
69.	8196 <i>Quinqueremulus linearis</i>			
70.	13308 <i>Rhodanthe charsleyae</i>			
71.	13242 <i>Rhodanthe chlorocephala</i> subsp. <i>splendida</i>			
72.	13300 <i>Rhodanthe citrina</i>			
73.	13246 <i>Rhodanthe humboldtiana</i>			
74.	13238 <i>Rhodanthe maryonii</i>			
75.	42011 <i>Rhodanthe polakii</i>			
76.	13303 <i>Rhodanthe steriliscens</i>			
77.	13285 <i>Schoenia ayersii</i>			
78.	8207 <i>Senecio glossanthus</i> (Slender Groundsel)			
79.	9366 <i>Senecio gregorii</i> (Fleshy Groundsel)			
80.	8213 <i>Senecio magnificus</i> (Showy Groundsel)			
81.	8273 <i>Vittadinia sulcata</i>			
82.	8275 <i>Waitzia acuminata</i> (Orange Immortelle)			
Boraginaceae				
83.	6687 <i>Halgania cyanea</i> (Rough Halgania)			
Brassicaceae				
84.	3033 <i>Lepidium oxytrichum</i>			
85.	3037 <i>Lepidium phlebopetalum</i> (Veined Peppercross)			
86.	3050 <i>Menkea australis</i> (Fairy Spectacles)			
87.	3053 <i>Menkea sphaerocarpa</i>			
88.	3076 <i>Stenopetalum filifolium</i>			
Cacatuidae				
89.	<i>Eolophus roseicapillus</i>			
Campephagidae				
90.	24361 <i>Coracina maxima</i> (Ground Cuckoo-shrike)			
91.	25568 <i>Coracina novaehollandiae</i> (Black-faced Cuckoo-shrike)			
Candelariaceae				
92.	<i>Candelariella spraguei</i>			
Caprimulgidae				
93.	24368 <i>Eurostopodus argus</i> (Spotted Nightjar)			
Carphodactylidae				
94.	24971 <i>Nephurus vertebralis</i>			
Casuariidae				
95.	24470 <i>Dromaius novaehollandiae</i> (Emu)			
Casuarinaceae				
96.	12658 <i>Casuarina pauper</i> (Black Oak)			
Celastraceae				
97.	4732 <i>Stackhousia megaloptera</i>			
Charadriidae				
98.	47937 <i>Eiseyornis melanops</i> (Black-fronted Dotterel)			
99.	24379 <i>Erythronys cinctus</i> (Red-kneed Dotterel)			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
100.	24386 <i>Vanellus tricolor</i> (Banded Lapwing)			
Chenopodiaceae				
101.	2451 <i>Atriplex bunburyana</i> (Silver Saltbush)			
102.	2453 <i>Atriplex codonocarpa</i> (Flat-topped Saltbush)			
103.	2478 <i>Atriplex spongiosa</i> (Pop Saltbush)			
104.	2479 <i>Atriplex stipitata</i> (Mallee Saltbush)			
105.	2481 <i>Atriplex vesicaria</i> (Bladder Saltbush)			
106.	2487 <i>Chenopodium curvispicatum</i>			
107.	2499 <i>Dissocarpus paradoxus</i> (Curious Saltbush)			
108.	33501 <i>Dysphania cristata</i> (Crested Goosefoot)			
109.	2502 <i>Dysphania kalpari</i> (Rat's Tail, Kalpari)			
110.	33597 <i>Dysphania melanocarpa forma melanocarpa</i> (Black Goosefoot)			
111.	12064 <i>Enchylaena tomentosa var. tomentosa</i> (Barrier Saltbush)			
112.	2513 <i>Eremophea spinosa</i>			
113.	2514 <i>Eriochiton sclerolaenoides</i> (Woolly Bindii)			
114.	2533 <i>Maireana amoena</i>			
115.	2538 <i>Maireana carnososa</i> (Cottony Bluebush)			
116.	2544 <i>Maireana georgei</i> (Satiny Bluebush)			
117.	2545 <i>Maireana glomerifolia</i> (Ball Leaf Bluebush)			
118.	2555 <i>Maireana pentatropis</i>			
119.	2556 <i>Maireana planifolia</i> (Low Bluebush)			
120.	2560 <i>Maireana pyramidata</i> (Sago Bush)			
121.	2566 <i>Maireana thesioides</i> (Lax Bluebush)			
122.	2569 <i>Maireana triptera</i> (Threewinged Bluebush)			
123.	2571 <i>Maireana villosa</i>			
124.	2581 <i>Rhagodia drummondii</i>			
125.	2582 <i>Rhagodia eremaea</i> (Thorny Saltbush)			
126.	30434 <i>Salsola australis</i>			
127.	2606 <i>Sclerolaena cuneata</i> (Yellow Bindii)			
128.	2607 <i>Sclerolaena densiflora</i>			
129.	2608 <i>Sclerolaena deserticola</i>			
130.	2609 <i>Sclerolaena diacantha</i> (Grey Copperburr)			
131.	2611 <i>Sclerolaena eriacantha</i> (Tall Bindii)			
132.	8877 <i>Sclerolaena gardneri</i>			
133.	2625 <i>Sclerolaena obliquicuspis</i> (Limestone Bindii)			
Cinclosomatidae				
134.	25580 <i>Cinclosoma castaneothorax</i> (Chestnut-breasted Quail-thrush)			
135.	24390 <i>Psophodes occidentalis</i> (Western Wedgebill, Chiming Wedgebill)			
Climacteridae				
136.	25581 <i>Climacteris affinis</i> (White-browed Treecreeper)			
137.	24393 <i>Climacteris affinis subsp. superciliosa</i> (White-browed Treecreeper)			
Colchicaceae				
138.	1392 <i>Wurmbea deserticola</i>			
Columbidae				
139.	24407 <i>Ocyphaps lophotes</i> (Crested Pigeon)			
140.	24409 <i>Phaps chalcoptera</i> (Common Bronzewing)			
Convolvulaceae				
141.	11167 <i>Bonamia erecta</i>			
142.	6612 <i>Convolvulus clementii</i>			
143.	31274 <i>Duperreya commixta</i>			
Corvidae				
144.	24416 <i>Corvus bennetti</i> (Little Crow)			
145.	25593 <i>Corvus orru</i> (Torresian Crow)			
Cracticidae				
146.	24420 <i>Cracticus nigrogularis</i> (Pied Butcherbird)			
147.	25595 <i>Cracticus tibicen</i> (Australian Magpie)			
148.	25596 <i>Cracticus torquatus</i> (Grey Butcherbird)			
149.	25597 <i>Strepera versicolor</i> (Grey Currawong)			
Crassulaceae				
150.	11709 <i>Crassula colorata var. acuminata</i>			
Cuculidae				
151.	42307 <i>Cacomantis pallidus</i> (Pallid Cuckoo)			
Cucurbitaceae				
152.	7369 <i>Citrullus colocynthis</i>			

Y

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
Cyperaceae				
153.	851 <i>Fimbristylis dichotoma</i> (Eight Day Grass)			
154.	<i>Fimbristylis</i> sp.			
Dasyuridae				
155.	24087 <i>Antechinomys laniger</i> (Kultarr)			
156.	24094 <i>Ningau ridei</i> (Wongai Ningau)			
157.	24106 <i>Pseudantechinus woolleyae</i> (Woolley's Pseudantechinus)			
158.	24109 <i>Sminthopsis dolichura</i> (Little long-tailed Dunnart)			
Dicaeidae				
159.	25607 <i>Dicaeum hirundinaceum</i> (Mistletoebird)			
Dicruridae				
160.	24443 <i>Grallina cyanoleuca</i> (Magpie-lark)			
161.	25614 <i>Rhipidura leucophrys</i> (Willie Wagtail)			
Diplodactylidae				
162.	24930 <i>Diplodactylus granariensis</i> subsp. <i>rex</i>			
163.	24923 <i>Strophurus assimilis</i> (Goldfields Spiny-tailed Gecko)			
164.	24946 <i>Strophurus strophurus</i>			
Echinosteliaceae				
165.	39027 <i>Echinostelium apitectum</i>			
166.	49060 <i>Echinostelium corynophorum</i>			Y
Elapidae				
167.	25301 <i>Furina ornata</i> (Moon Snake)			
168.	25254 <i>Parasuta monachus</i>			
169.	25266 <i>Simoselaps bertholdi</i> (Jan's Banded Snake)			
170.	25269 <i>Suta fasciata</i> (Rosen's Snake)			
Estrilidae				
171.	30870 <i>Taeniopygia guttata</i> (Zebra Finch)			
Euphorbiaceae				
172.	4591 <i>Bertya dimerostigma</i>			
173.	4626 <i>Euphorbia drummondii</i> (Caustic Weed, Piwi)			
174.	42869 <i>Euphorbia porcata</i>			
Fabaceae				
175.	3217 <i>Acacia aneura</i> (Mulga, Wanari)			
176.	37260 <i>Acacia aptaneura</i>			
177.	14622 <i>Acacia balsamea</i>			
178.	3248 <i>Acacia burkittii</i> (Sandhill Wattle)			
179.	36417 <i>Acacia caesaneura</i>			
180.	3264 <i>Acacia colletioides</i> (Wait-a-while)			
181.	3273 <i>Acacia craspedocarpa</i> (Hop Mulga)			
182.	16120 <i>Acacia donaldsonii</i>			
183.	44536 <i>Acacia doreta</i>			
184.	32118 <i>Acacia effusifolia</i>			
185.	36781 <i>Acacia fuscaneura</i>			
186.	3355 <i>Acacia grasbyi</i> (Miniritchie)			
187.	36418 <i>Acacia incurvaneura</i>			
188.	3392 <i>Acacia jamesiana</i>			
189.	3399 <i>Acacia kempeana</i> (Witchetty Bush, Ilykuwara)			
190.	3419 <i>Acacia ligulata</i> (Umbrella Bush, Watarka)			
191.	12952 <i>Acacia minyura</i>			
192.	36416 <i>Acacia mulganeura</i>			
193.	3452 <i>Acacia murrayana</i> (Sandplain Wattle)			
194.	3473 <i>Acacia oswaldii</i> (Miljee, Nelia)			
195.	36800 <i>Acacia pteraneura</i>			
196.	3507 <i>Acacia quadrimarginea</i>			
197.	3510 <i>Acacia ramulosa</i> (Horse Mulga)			
198.	19483 <i>Acacia ramulosa</i> var. <i>linophylla</i>			
199.	19499 <i>Acacia ramulosa</i> var. <i>ramulosa</i>			
200.	3545 <i>Acacia sibina</i>			
201.	18424 <i>Acacia</i> sp. Marshall Pool (G. Cockerton 3024)		P3	
202.	13070 <i>Acacia synchronicia</i>			
203.	3577 <i>Acacia tetragonophylla</i> (Kurara, Wakalpuka)			
204.	29531 <i>Acacia thoma</i>			
205.	3595 <i>Acacia victoriae</i> (Bramble Wattle, Ngatunpa)			
206.	3938 <i>Glycine canescens</i> (Silky Glycine)			
207.	3974 <i>Indigofera georgei</i> (Bovine Indigo)			
208.	4043 <i>Kennedia prorepens</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
209.	4055 <i>Leptosema chambersii</i>			
210.	17645 <i>Senna artemisioides</i>			
211.	12276 <i>Senna artemisioides</i> subsp. <i>filifolia</i>			
212.	17558 <i>Senna artemisioides</i> subsp. <i>x artemisioides</i>			
213.	12283 <i>Senna artemisioides</i> subsp. <i>x sturtii</i>			
214.	18444 <i>Senna charlesiana</i>			
215.	12305 <i>Senna glutinosa</i> subsp. <i>chatelainiana</i>			
216.	18440 <i>Senna manicula</i>			
217.	14577 <i>Senna</i> sp. <i>Meekatharra</i> (E. Bailey 1-26)			
218.	18446 <i>Senna stowardii</i>			
219.	4217 <i>Swainsona beasleyana</i>			
220.	13590 <i>Swainsona halophila</i>			
221.	4230 <i>Swainsona incei</i>			
222.	4231 <i>Swainsona kingii</i>			
223.	4233 <i>Swainsona leeana</i>			
224.	4238 <i>Swainsona oroboides</i> (Variable <i>Swainsona</i>)			
225.	13581 <i>Swainsona paradoxa</i>			
226.	12357 <i>Swainsona purpurea</i>			
227.	13585 <i>Swainsona tenuis</i>			
228.	4316 <i>Trigonella suavissima</i> (Sweet Fenugreek)			

Falconidae

229.	25621 <i>Falco berigora</i> (Brown Falcon)			
230.	24471 <i>Falco berigora</i> subsp. <i>berigora</i> (Brown Falcon)			
231.	25622 <i>Falco cenchroides</i> (Australian Kestrel, Nankeen Kestrel)			

Frankeniaceae

232.	5209 <i>Frankenia pauciflora</i> (Seaheath)			
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Gekkonidae

233.	24959 <i>Gehyra variegata</i>			
234.	24961 <i>Heteronotia binoei</i> (Bynoe's Gecko)			

Geraniaceae

235.	4331 <i>Erodium aureum</i>	Y		
236.	4334 <i>Erodium crinitum</i> (Corkscrew)			
237.	4335 <i>Erodium cygnorum</i> (Blue Heronsbill)			

Goodeniaceae

238.	7413 <i>Brunonia australis</i> (Native Cornflower)			
239.	7433 <i>Dampiera dentata</i>			
240.	7469 <i>Dampiera roycei</i>			
241.	7527 <i>Goodenia mimuloides</i>			
242.	7528 <i>Goodenia modesta</i>		P3	
243.	7529 <i>Goodenia mueckeana</i>			
244.	7533 <i>Goodenia peacockiana</i>			
245.	7558 <i>Goodenia triodiophila</i>			
246.	7644 <i>Scaevola spinescens</i> (Currant Bush, Maroon)			
247.	7656 <i>Velleia cynopotamica</i>			

Haloragaceae

248.	6143 <i>Glischrocaryon aureum</i> (Common Popflower)			
249.	6180 <i>Haloragis trigonocarpa</i>			

Hirundinidae

250.	47909 <i>Cheramoeca leucosterna</i> (White-backed Swallow)			
251.	24491 <i>Hirundo neoxena</i> (Welcome Swallow)			
252.	48061 <i>Petrochelidon nigricans</i> (Tree Martin)			

Idiopidae

253.	<i>Anidiops villosus</i>			
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Juncaceae

254.	1176 <i>Juncus aridicola</i>			
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Lamiaceae

255.	6753 <i>Dicrasyllis brunnea</i>			
256.	6759 <i>Dicrasyllis flexuosa</i>			
257.	6774 <i>Dicrasyllis sessilifolia</i>			
258.	6853 <i>Hemigenia exilis</i>		P4	
259.	12707 <i>Prostanthera albiflora</i>			
260.	15822 <i>Prostanthera althoferi</i> subsp. <i>althoferi</i>			
261.	48603 <i>Teucrium teucriiflorum</i>			

Lecideaceae

262.	<i>Lecidea</i> sp.			
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Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
Liceaceae				
263.	49063 <i>Licea denudescens</i>			Y
264.	39041 <i>Licea kleistobolus</i>			
265.	49061 <i>Licea scyphoides</i>			
Limnodynastidae				
266.	25422 <i>Neobatrachus aquilonius</i> (Northern Burrowing Frog)			
267.	25425 <i>Neobatrachus kunapalari</i> (Kunapalari Frog)			
268.	25427 <i>Neobatrachus sutor</i> (Shoemaker Frog)			
Loranthaceae				
269.	2379 <i>Amyema microphylla</i>			
270.	2382 <i>Amyema nestor</i>			
271.	2396 <i>Lysiana casuarinae</i>			
272.	2398 <i>Lysiana murrayi</i> (Mistletoe, Parka-Parka)			
Maluridae				
273.	25652 <i>Malurus leucopterus</i> (White-winged Fairy-wren)			
274.	25654 <i>Malurus splendens</i> (Splendid Fairy-wren)			
Malvaceae				
275.	4896 <i>Abutilon leucopetalum</i> (Desert Chinese Lantern)			
276.	4907 <i>Alyogyne pinoniana</i> (Sand Hibiscus)			
277.	40917 <i>Androcalva loxophylla</i>			
278.	40910 <i>Androcalva luteiflora</i> (Yellow-flowered Rulingia)			
279.	17722 <i>Hannafordia bissillii</i> subsp. <i>bissillii</i>			
280.	4956 <i>Lawrenzia helmsii</i> (Dunna Dunna)			
281.	46816 <i>Seringia elliptica</i> (Showy fire-bush)			
282.	46824 <i>Seringia velutina</i> (Velvet firebush)			
283.	31759 <i>Sida ectogama</i>			
284.	31854 <i>Sida</i> sp. <i>Excedentifolia</i> (J.L. Egan 1925)			
285.	19712 <i>Sida</i> sp. <i>dark green fruits</i> (S. van Leeuwen 2260)			
286.	16924 <i>Sida spodochroma</i>			
Megapodiidae				
287.	24557 <i>Leipoa ocellata</i> (Malleefowl)		T	
Meliphagidae				
288.	24559 <i>Acanthagenys rufogularis</i> (Spiny-cheeked Honeyeater)			
289.	24561 <i>Anthochaera carunculata</i> (Red Wattlebird)			
290.	24570 <i>Epthianura tricolor</i> (Crimson Chat)			
291.	42314 <i>Gavicalis virescens</i> (Singing Honeyeater)			
292.	25661 <i>Lichmera indistincta</i> (Brown Honeyeater)			
293.	24583 <i>Manorina flavigula</i> (Yellow-throated Miner)			
294.	42344 <i>Purnella albifrons</i> (White-fronted Honeyeater)			
Montiaceae				
295.	2844 <i>Calandrinia balonensis</i> (Broadleaf Parakeelya)			
296.	2860 <i>Calandrinia polyandra</i> (Parakeelya)			
297.	30396 <i>Calandrinia translucens</i>			
Muridae				
298.	24223 <i>Mus musculus</i> (House Mouse)	Y		
299.	24237 <i>Pseudomys hermannsburgensis</i> (Sandy Inland Mouse)			
Myobatrachidae				
300.	25434 <i>Pseudophryne occidentalis</i> (Western Toadlet)			
Myrtaceae				
301.	14473 <i>Baeckea</i> sp. <i>Sandstone</i> (C.A. Gardner s.n. 26 Oct. 1963)		P3	
302.	5451 <i>Calytrix desolata</i>			
303.	5456 <i>Calytrix erosipetala</i>			
304.	12373 <i>Calytrix uncinata</i>			
305.	19846 <i>Enekbatus eremaeus</i>			
306.	35345 <i>Eucalyptus camaldulensis</i> subsp. <i>obtusa</i> (Blunt-budded River Red Gum)			
307.	5583 <i>Eucalyptus carnei</i> (Came's Blackbutt)			
308.	48436 <i>Eucalyptus clelandiorum</i>			
309.	5636 <i>Eucalyptus eremicola</i>			
310.	20300 <i>Eucalyptus eremicola</i> subsp. <i>peeneri</i>			
311.	5660 <i>Eucalyptus gongylocarpa</i> (Marble Gum, Baarla)			
312.	18057 <i>Eucalyptus gypsophila</i>			
313.	5684 <i>Eucalyptus kingsmillii</i> (Kingsmill's Mallee)			
314.	5703 <i>Eucalyptus lucasii</i> (Barlee Box)			
315.	5725 <i>Eucalyptus oldfieldii</i> (Oldfield's Mallee)			
316.	5779 <i>Eucalyptus striatocalyx</i> (Cue York Gum)			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
317.	29733 <i>Eucalyptus trivalva</i> (Victoria Spring Mallee)			
318.	5803 <i>Eucalyptus youngiana</i> (Large-fruited Mallee, Yarldarba)			
319.	16722 <i>Euryomyrtus maidenii</i>			
320.	5815 <i>Homalocalyx thryptomenoides</i>			
321.	48648 <i>Hysterobaeckea occlusa</i>			
322.	19486 <i>Melaleuca hamata</i>			
323.	20288 <i>Melaleuca interioris</i>			
324.	5991 <i>Melaleuca xerophila</i>			
325.	29554 <i>Micromyrtus chrysodema</i>		P1	Y
326.	5995 <i>Micromyrtus flaviflora</i>			
327.	6054 <i>Thryptomene decussata</i>			
328.	6062 <i>Thryptomene nealensis</i>		P3	
329.	20826 <i>Thryptomene</i> sp. <i>Leinster</i> (B.J. Lepschi & L.A. Craven 4362)		P3	
330.	6092 <i>Verticordia jamiesonii</i>		P3	
Nyctaginaceae				
331.	2774 <i>Boerhavia repleta</i>			
Ophioglossaceae				
332.	17 <i>Ophioglossum lusitanicum</i> (Adders Tongue)			
Pachycephalidae				
333.	25675 <i>Colluricincla harmonica</i> (Grey Shrike-thrush)			
334.	24618 <i>Oreoica gutturalis</i> (Crested Bellbird)			
335.	25680 <i>Pachycephala rufiventris</i> (Rufous Whistler)			
Pardalotidae				
336.	25682 <i>Pardalotus striatus</i> (Striated Pardalote)			
Petroicidae				
337.	47997 <i>Melanodryas cucullata</i> (Hooded Robin)			
338.	24659 <i>Petroica goodenovii</i> (Red-capped Robin)			
Phyllanthaceae				
339.	17619 <i>Phyllanthus baeckeoides</i>		P3	
340.	29098 <i>Poranthera leioperma</i>			
Physaraceae				
341.	39031 <i>Fuligo cinerea</i>			
342.	39068 <i>Physarum decipiens</i>			
343.	39074 <i>Physarum pusillum</i>			
Pittosporaceae				
344.	19744 <i>Pittosporum angustifolium</i>			
Poaceae				
345.	207 <i>Aristida contorta</i> (Bunched Kerosene Grass)			
346.	218 <i>Aristida obscura</i> (Brush Threeawn)			
347.	17237 <i>Austrostipa elegantissima</i>			
348.	17238 <i>Austrostipa eremophila</i>			
349.	17246 <i>Austrostipa nitida</i>			
350.	17247 <i>Austrostipa platychaeta</i>			
351.	17251 <i>Austrostipa scabra</i>			
352.	17255 <i>Austrostipa trichophylla</i>			
353.	290 <i>Dactyloctenium radulans</i> (Button Grass)			
354.	311 <i>Digitaria ciliaris</i> (Summer Grass)	Y		
355.	357 <i>Enneapogon caeruleus</i> (Limestone Grass)			
356.	365 <i>Enneapogon polyphyllus</i> (Leafy Nineawn)			
357.	378 <i>Eragrostis dielsii</i> (Mallee Lovegrass)			
358.	380 <i>Eragrostis eriopoda</i> (Woollybutt Grass, Wangurnu)			
359.	391 <i>Eragrostis parviflora</i> (Weeping Lovegrass)			
360.	392 <i>Eragrostis pergracilis</i>			
361.	408 <i>Eriachne flaccida</i> (Claypan Grass)			
362.	411 <i>Eriachne helmsii</i> (Buck Wanderrie Grass)			
363.	417 <i>Eriachne pulchella</i> (Pretty Wanderrie)			
364.	490 <i>Monachather paradoxus</i>			
365.	10975 <i>Paspalidium basicladum</i>			
366.	518 <i>Paspalidium clementii</i> (Clements Paspalidium)			
367.	519 <i>Paspalidium constrictum</i> (Knottybutt Grass)			
368.	546 <i>Perotis rara</i> (Comet Grass)			
369.	613 <i>Setaria verticillata</i> (Whorled Pigeon Grass)	Y		
370.	673 <i>Themeda triandra</i>			
371.	675 <i>Thyridolepis multiculmis</i> (Soft Wanderrie Grass)			
372.	680 <i>Triodia basedowii</i> (Lobed Spinifex)			
373.	48319 <i>Tripogonella loliiformis</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
Podargidae				
374.	25703 <i>Podargus strigoides</i> (Tawny Frogmouth)			
Polygalaceae				
375.	4572 <i>Polygala isingii</i>			
Polygonaceae				
376.	44508 <i>Duma florulenta</i>			
377.	46434 <i>Rumex hypogaeus</i>	Y		
Pomatostomidae				
378.	24683 <i>Pomatostomus superciliosus</i> (White-browed Babbler)			
379.	25706 <i>Pomatostomus temporalis</i> (Grey-crowned Babbler)			
Portulacaceae				
380.	2884 <i>Portulaca oleracea</i> (Purslane, Wakati)			
Primulaceae				
381.	36375 <i>Lysimachia arvensis</i> (Pimpernel)	Y		
Proteaceae				
382.	2019 <i>Grevillea inconspicua</i> (Cue Grevillea)		P4	
383.	19542 <i>Grevillea nematophylla</i> subsp. <i>supraplana</i>			
384.	12822 <i>Grevillea sarissa</i> subsp. <i>bicolor</i>			
385.	16921 <i>Hakea leucoptera</i> subsp. <i>sericipes</i>			
386.	2182 <i>Hakea minyma</i>			
387.	2196 <i>Hakea preissii</i> (Needle Tree, Dandjin)			
Psittacidae				
388.	<i>Barnardius zonarius</i>			
389.	24725 <i>Cacatua roseicapilla</i> subsp. <i>assimilis</i> (Galah)			
390.	24736 <i>Melopsittacus undulatus</i> (Budgerigar)			
391.	24737 <i>Neophema bourkii</i> (Bourke's Parrot)			
392.	<i>Neopsephotus bourkii</i>			
393.	24742 <i>Nymphicus hollandicus</i> (Cockatiel)			
394.	24748 <i>Platycercus varius</i> (Mulga Parrot)			
Pteridaceae				
395.	37 <i>Cheilanthes lasiophylla</i> (Woolly Cloak Fern)			
Ptilonorhynchidae				
396.	<i>Ptilonorhynchus guttatus</i>			
Pygopodidae				
397.	24997 <i>Delma butleri</i>			
Recurvirostridae				
398.	25734 <i>Himantopus himantopus</i> (Black-winged Stilt)			
Rhamnaceae				
399.	13471 <i>Cryptandra connata</i>			
Rutaceae				
400.	18506 <i>Philotheca tomentella</i>			
Santalaceae				
401.	10977 <i>Exocarpos aphyllus</i> (Leafless Ballart)			
402.	2402 <i>Korthalsella leucothrix</i>		P1	
403.	2357 <i>Santalum lanceolatum</i> (Northern Sandalwood, Yarnguli)			
404.	2359 <i>Santalum spicatum</i> (Sandalwood, Wilarak)			
Sapindaceae				
405.	4752 <i>Dodonaea adenophora</i>			
406.	4773 <i>Dodonaea petiolaris</i>			
407.	4779 <i>Dodonaea rigida</i>			
408.	11674 <i>Dodonaea viscosa</i> subsp. <i>mucronata</i>			
409.	11202 <i>Dodonaea viscosa</i> subsp. <i>spatulata</i> (Sticky Hop-bush)			
Scincidae				
410.	25025 <i>Ctenotus ariadnae</i>			
411.	25041 <i>Ctenotus grandis</i> subsp. <i>grandis</i>			
412.	25052 <i>Ctenotus leonhardii</i>			
413.	25094 <i>Egernia formosa</i>			
414.	25130 <i>Lerista desertorum</i>			
415.	42411 <i>Lerista timida</i>			
416.	25190 <i>Morethia butleri</i>			
Scrophulariaceae				

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
417.	7180 <i>Eremophila alternifolia</i> (Poverty Bush)			
418.	7189 <i>Eremophila clarkei</i> (Turpentine Bush)			
419.	18054 <i>Eremophila conglomerata</i>			
420.	14895 <i>Eremophila decipiens</i> subsp. <i>decipiens</i>			
421.	7204 <i>Eremophila eriocalyx</i> (Desert Pride)			
422.	7205 <i>Eremophila exilifolia</i>			
423.	7207 <i>Eremophila foliosissima</i>			
424.	15052 <i>Eremophila forrestii</i> subsp. <i>forrestii</i>			
425.	29532 <i>Eremophila galeata</i>			
426.	7219 <i>Eremophila granitica</i> (Thin-leaved Poverty Bush)			
427.	7221 <i>Eremophila homoplastica</i>			
428.	17169 <i>Eremophila latrobei</i> subsp. <i>glabra</i>			
429.	17576 <i>Eremophila latrobei</i> subsp. <i>latrobei</i>			
430.	7234 <i>Eremophila longifolia</i> (Berrigan, Tulypurpa)			
431.	16363 <i>Eremophila maculata</i> subsp. <i>brevifolia</i> (Native Fuchsia)			
432.	7239 <i>Eremophila margarethae</i> (Sandbank Poverty Bush)			
433.	7240 <i>Eremophila metallicorum</i>			
434.	15003 <i>Eremophila oldfieldii</i> subsp. <i>angustifolia</i>			
435.	18570 <i>Eremophila oppositifolia</i> subsp. <i>angustifolia</i>			
436.	7250 <i>Eremophila pantonii</i>			
437.	48949 <i>Eremophila platycalyx</i> subsp. <i>Granites</i> (D.J. Edinger & G. Marsh DJE 4782)			
438.	48951 <i>Eremophila platycalyx</i> subsp. <i>Leonora</i> (J. Morrissey 252)			
439.	15055 <i>Eremophila platythamnus</i> subsp. <i>platythamnus</i>			
440.	16793 <i>Eremophila pungens</i>		P4	
441.	7269 <i>Eremophila serrulata</i> (Serrate-leaved Eremophila)			
442.	15163 <i>Eremophila shonae</i> subsp. <i>shonae</i>			
443.	<i>Eremophila</i> sp.			
444.	17163 <i>Eremophila spectabilis</i> subsp. <i>brevis</i>			
445.	15168 <i>Eremophila spuria</i>			

Solanaceae

446.	6952 <i>Anthotroche pannosa</i> (Felted Anthotroche)			
447.	6966 <i>Duboisia hopwoodii</i> (Pituri, Kundugu)			
448.	6967 <i>Lycium australe</i> (Australian Boxthorn)			
449.	11734 <i>Nicotiana rosulata</i> subsp. <i>rosulata</i>			
450.	<i>Solanum chrysotrichum</i>			Y
451.	6998 <i>Solanum cleistogamum</i>			
452.	7018 <i>Solanum lasiophyllum</i> (Flannel Bush, Mindjulu)			
453.	7022 <i>Solanum nigrum</i> (Black Berry Nightshade)	Y		
454.	7023 <i>Solanum nummularium</i> (Money-leaved Solanum)			
455.	7026 <i>Solanum orbiculatum</i> (Wild Tomato)			

Stemonitidaceae

456.	38986 <i>Comatricha elegans</i>			
457.	38987 <i>Comatricha ellae</i>			

Stylidiaceae

458.	7740 <i>Stylidium induratum</i> (Desert Triggerplant)			
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Theraphosidae

459.	<i>Selenotholus foelschei</i>			
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Thymelaeaceae

460.	5256 <i>Pimelea microcephala</i> (Shrubby Riceflower, Banjine)			
461.	11185 <i>Pimelea microcephala</i> subsp. <i>microcephala</i>			
462.	5267 <i>Pimelea subvillifera</i>			
463.	5271 <i>Pimelea trichostachya</i> (Spiked Riceflower)			

Trichiaceae

464.	39059 <i>Perichaena vermicularis</i>			
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Tytonidae

465.	25762 <i>Tyto alba</i> (Barn Owl)			
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Urodacidae

466.	<i>Urodacus armatus</i>			
467.	<i>Urodacus hoplurus</i>			

Varanidae

468.	25211 <i>Varanus caudolineatus</i>			
469.	25212 <i>Varanus eremius</i> (Pygmy Desert Monitor)			
470.	25223 <i>Varanus panoptes</i> subsp. <i>rubidus</i>			

Zygophyllaceae

471.	4374 <i>Tribulus astrocarpus</i>			
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Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
472.	4380 <i>Tribulus occidentalis</i> (Perennial Caltrop)			
473.	4383 <i>Tribulus terrestris</i> (Caltrop)	Y		

Conservation Codes

- T - Rare or likely to become extinct
- X - Presumed extinct
- IA - Protected under international agreement
- S - Other specially protected fauna
- 1 - Priority 1
- 2 - Priority 2
- 3 - Priority 3
- 4 - Priority 4
- 5 - Priority 5

¹ For NatureMap's purposes, species flagged as endemic are those whose records are wholly contained within the search area. Note that only those records complying with the search criterion are included in the calculation. For example, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the query area.

Appendix 6: EPBC Protected Matters Search (40km buffer)



EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about [Environment Assessments](#) and the EPBC Act including significance guidelines, forms and application process details.

Report created: 31/03/21 00:20:09

[Summary](#)

[Details](#)

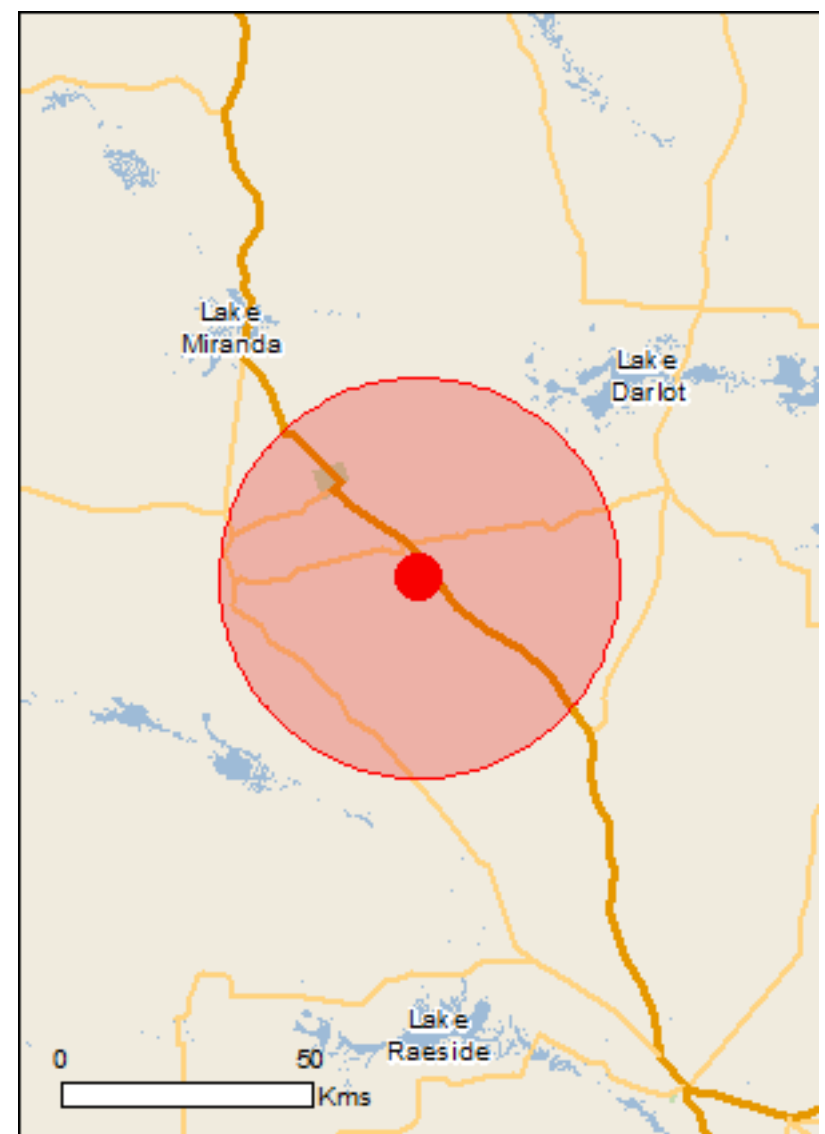
[Matters of NES](#)

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

[Extra Information](#)

[Caveat](#)

[Acknowledgements](#)



This map may contain data which are
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[Coordinates](#)

Buffer: 40.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the [Administrative Guidelines on Significance](#).

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	5
Listed Migratory Species:	7

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at <http://www.environment.gov.au/heritage>

A [permit](#) may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	10
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	10
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Species [\[Resource Information \]](#)

Name	Status	Type of Presence
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Birds

Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat may occur within area
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Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area
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Pezoporus occidentalis Night Parrot [59350]	Endangered	Species or species habitat may occur within area
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Polytelis alexandrae Princess Parrot, Alexandra's Parrot [758]	Vulnerable	Species or species habitat may occur within area
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Mammals

Dasyurus geoffroii Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat may occur within area
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Listed Migratory Species [\[Resource Information \]](#)

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
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Migratory Marine Birds

Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
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Migratory Terrestrial Species

Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
---	--	--

Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
---	--	--

Migratory Wetlands Species

Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
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Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
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Name	Threatened	Type of Presence
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [\[Resource Information \]](#)

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area
Chrysococcyx osculans Black-eared Cuckoo [705]		Species or species habitat likely to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area

Extra Information

Invasive Species

[[Resource Information](#)]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resources Audit, 2001.

Name	Status	Type of Presence
Mammals		
Camelus dromedarius Dromedary, Camel [7]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Equus asinus Donkey, Ass [4]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Carrichtera annua Ward's Weed [9511]		Species or species habitat may occur within area
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat may occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-28.07677 120.8537

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

- [-Office of Environment and Heritage, New South Wales](#)
- [-Department of Environment and Primary Industries, Victoria](#)
- [-Department of Primary Industries, Parks, Water and Environment, Tasmania](#)
- [-Department of Environment, Water and Natural Resources, South Australia](#)
- [-Department of Land and Resource Management, Northern Territory](#)
- [-Department of Environmental and Heritage Protection, Queensland](#)
- [-Department of Parks and Wildlife, Western Australia](#)
- [-Environment and Planning Directorate, ACT](#)
- [-Birdlife Australia](#)
- [-Australian Bird and Bat Banding Scheme](#)
- [-Australian National Wildlife Collection](#)
- [-Natural history museums of Australia](#)
- [-Museum Victoria](#)
- [-Australian Museum](#)
- [-South Australian Museum](#)
- [-Queensland Museum](#)
- [-Online Zoological Collections of Australian Museums](#)
- [-Queensland Herbarium](#)
- [-National Herbarium of NSW](#)
- [-Royal Botanic Gardens and National Herbarium of Victoria](#)
- [-Tasmanian Herbarium](#)
- [-State Herbarium of South Australia](#)
- [-Northern Territory Herbarium](#)
- [-Western Australian Herbarium](#)
- [-Australian National Herbarium, Canberra](#)
- [-University of New England](#)
- [-Ocean Biogeographic Information System](#)
- [-Australian Government, Department of Defence Forestry Corporation, NSW](#)
- [-Geoscience Australia](#)
- [-CSIRO](#)
- [-Australian Tropical Herbarium, Cairns](#)
- [-eBird Australia](#)
- [-Australian Government – Australian Antarctic Data Centre](#)
- [-Museum and Art Gallery of the Northern Territory](#)
- [-Australian Government National Environmental Science Program](#)
- [-Australian Institute of Marine Science](#)
- [-Reef Life Survey Australia](#)
- [-American Museum of Natural History](#)
- [-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania](#)
- [-Tasmanian Museum and Art Gallery, Hobart, Tasmania](#)
- [-Other groups and individuals](#)

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the [Contact Us](#) page.

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