



Atlas-Campaspe Mineral Sands Project Modification 6

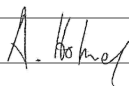
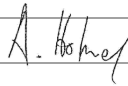
Biodiversity Development Assessment Report

Tronox Mining Australia Ltd

15 June 2026

➔ **The Power of Commitment**



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Declarations

i. Certification under clause 6.15 *Biodiversity Conservation Act 2016*

I, Arien Quin, certify that this report has been prepared based on the requirements of, and information provided under, the Biodiversity Assessment Method and clause 6.15 of the *Biodiversity Conservation Act 2016* (BC Act).

In preparing this assessment I have acted in accordance with the Accredited BAM assessor Code of Conduct.

I declare that I have considered the circumstances and there is not actual, perceived or potential conflict of interest.



Signature

Date 23/06/2026

BAM Assessor Accreditation no: BAAS17098

Executive summary

Tronox Mining Australia Limited (Tronox) is the proponent of the Atlas-Campaspe Mineral Sands Project (the Project) which includes the development of a mineral sands mining operation (the Atlas-Campaspe Mine), together with the construction and operation of the Ivanhoe Rail Facility (a rail outload facility), in Western New South Wales (NSW) (Figure 1-1).

Development Consent (SSD_5012) was granted for the Project in 2014, under Part 4 of the *NSW Environmental Planning and Assessment Act 1979* (EP&A Act). EPBC Approval 2012/6447 was also granted for the Project under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) in 2014.

Tronox has identified an opportunity to improve operational efficiency at the Atlas-Campaspe Mine by developing an optimised services corridor alignment between the Atlas and Campaspe deposits (Modification 6 to SSD_5012, hereafter referred to as 'the Modification').

Tronox is proposing to modify Development Consent (SSD_5012) under section 4.55(2) of the EP&A Act to allow for the proposed changes to the Atlas-Campaspe Mine component of the Project. The Modification would result in additional clearing of native vegetation within the optimised services corridor alignment (the Proposal), which is the subject of this Biodiversity Development Assessment Report (BDAR).

The Modification would include the following proposed changes to the Atlas-Campaspe Mine component of the approved Project:

- Development of an optimised services corridor between the Atlas and Campaspe deposits, including a haul road, pipelines, electricity transmission line, soil stockpiles and water management infrastructure
- Transport of pre-mineral concentrate and ore from the pre-concentrator plant to the primary gravity concentration unit via a pipeline and/or truck along the optimised transport route
- A supplementary biodiversity offset area to replace a small section of the approved biodiversity offset area that would be proportionate to the area temporarily impacted by the optimised services corridor
- Reincorporation of the optimised services corridor into the existing biodiversity offset area post-mining

The existing services corridor would remain to provide an alternative access between the Atlas and Campaspe deposits.

This BDAR has been prepared in accordance with the Biodiversity Assessment Method (BAM) (NSW Department of Planning, Industry and Environment [DPIE] 2020a) by GHD Pty Ltd (GHD) for the Modification. The purpose of the BDAR is to assess potential biodiversity impacts resulting from the construction and operation of the Modification, and where required, identify feasible and reasonable mitigation and management measures.

The Study area assessed for this BDAR includes an area of around 90 hectares (ha), of which 50.53 ha forms the 'Development footprint' that would accommodate the proposed services corridor (refer to Figure 1-1). The Development footprint is located between the approved Atlas and Campaspe deposits within Lot 616 DP 761603 and Lot 1 DP 1196290 and occurs within the existing biodiversity offset area for the Project.

A desktop assessment and staged field surveys within the Study area were conducted in accordance with the BAM and appropriate threatened species survey guidelines for targeted species between October and November 2024, and during October 2025.

Surveys recorded several threatened flora and fauna species listed as vulnerable or endangered species under the *NSW Biodiversity Conservation Act 2016* (BC Act) including:

- Cobar Greenhood (*Pterostylis cobarensis*)
- Jewelled Gecko (*Strophurus elderi*)
- Chestnut Quail-thrush (*Cinclosoma castanotum*)
- Hooded Robin (South-eastern) (*Melanodryas cucullata cucullata*)
- Pink Cockatoo (*Lophochroa leadbeateri*) and
- Southern Whiteface (*Aphelocephala leucopsis*)

In addition to their listings under the BC Act, the Southern Whiteface is also listed as a vulnerable species, and Pink Cockatoo and Hooded Robin (South-eastern) are listed as endangered species under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The Study area contains suitable habitat for the Mallee Birds Ecological Community, a threatened ecological community (TEC) listed under the EPBC Act. Although this TEC occurs within the Development footprint, surveys however did not observe any direct evidence of breeding or any important habitat resources to suggest that the Development footprint is of particular importance to local populations of bird species that comprise this TEC.

The Study area does not contain important habitat for any migratory species listed under the EPBC Act. The Development footprint contains habitat for the threatened species listed above and other fauna of semi-arid environments.

A nest tree census was conducted to identify hollow-bearing trees, stick nests or other signs of breeding activity of threatened fauna that could require calculation of species credits according to the BAM. There are no candidate nest trees in the Development footprint or likely to be affected by the Proposal.

The Study area contains four plant community types (PCTs) that range in condition from low quality cleared areas to good quality relatively intact patches:

- PCT 170 - Sandplain mallee of central NSW
- PCT 171 - Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion
- PCT 143 - Narrow-leaved Hopbush - Scrub Turpentine - Senna shrubland on semi-arid and arid sandplains and dunes
- PCT 58 - Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion

PCT 58 occurs in disturbed and cleared condition classes associated with areas that have been historically disturbed or cleared.

The Development footprint has been designed to avoid impacts to biodiversity values where possible, including:

- Minimising impacts to native vegetation by refining the proposed footprint and reducing the overall amount of disturbance that would be required for the Project with only 55 percent of the original Study area proposed to be disturbed
- Alignment with around 10 ha of disturbed or previously cleared native vegetation
- Successful avoidance of several Cobar Greenhood individuals by adjusting the disturbance area within the vicinity of Cobar Greenhood records

However, the location of the Development footprint is fundamentally constrained to the corridor between the Atlas and Campaspe deposits. This corridor is located within an extensive patch of similar vegetation types and condition classes and so completely avoiding higher value native vegetation and habitat resources in the Study area is not possible. The proponent aims to minimise ecological impacts through the implementation of the existing Biodiversity Management Plan (BMP), including a Vegetation Clearance Protocol, employed by Tronox in all vegetation clearing at the Atlas-Campaspe Mine. This BMP has been used successfully since 2018 to manage potential impacts to resident fauna, particularly microbats, Malleefowl (*Leipoa ocellata*), nesting raptors and cockatoos, and spinifex dependent reptiles and small mammals.

The Proposal would result in direct impacts to native vegetation and associated threatened species habitat through clearing of up to 50.41 ha of native vegetation for construction of the optimised service corridor.

The Development footprint does not contain any known or potential nest or roost sites or any other habitat resources that would be critical to the ecology of any threatened species.

The removal of vegetation and construction of the corridor would result in a minor increase in the degree of fragmentation between retained areas of habitat for threatened species and would result in the temporary isolation of an area of offset habitat to the east of the alignment. The reduction in extent of habitat would be minor. The Development footprint would create a gap in habitat connectivity about 100 m across which would not be sufficient to interrupt any ecological process such as migration or pollination. The Development footprint does not include the erection of any structures that would increase the risk or energy cost of movement of any threatened or migratory fauna and would not permanently isolate any areas of habitat.

Mitigation measures are currently in place in accordance with the approved BMP to minimise likely impacts on biodiversity values. These measures are clarified according to the hierarchy of avoidance and mitigation of impacts, and the identification of residual impacts of the Development footprint that cannot be avoided or mitigated. The Development footprint would include, as a minimum, industry-standard measures for the management of soil, surface water, weeds and pollutants, as well as site-specific measures for the management of flora and fauna.

The Proposal may result in residual indirect impacts through noise and vibration generation causing displacement of threatened species and other native fauna from habitat adjoining the Development footprint. The Proposal would result in residual prescribed impacts related to:

- Habitat connectivity, through the removal or modification of vegetation within habitat corridors
- Water bodies and hydrological processes, through minor changes to surface water flows
- Vehicle strikes, through a moderate risk of vehicle strike causing harm to threatened fauna species and other native fauna using habitats in the vicinity of the Development footprint

Following the implementation of mitigation measures, these residual impacts are likely to be minor in intensity and consequence and as such no additional offsets are proposed.

A BAM assessment and credit calculations have been performed in accordance with the methodology (DPIE 2020a) and using credit calculator version 1.5, incorporating version 1.2 'average year benchmarks. Ecosystem credits that would need to be retired to offset residual impacts of the Modification comprise:

- 97 ecosystem credits to offset the removal of 4.42 ha of PCT 171 Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion_intact
- 402 ecosystem credits to offset the removal of 16.26 ha of PCT 170 Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones_intact
- 186 ecosystem credits to offset the removal of 5.54 ha of PCT 143 Narrow-leaved Hopbush- Scrub Turpentine -Senna shrubland on semi-arid and arid sandplains and dunes_intact
- 438 ecosystem credits to offset the removal of 14.42 ha of PCT 58 Black Oak- western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion_intact
- 49 ecosystem credits to offset the removal of 4.42 ha of PCT 58 Black Oak- western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion_disturbed
- 55 ecosystem credits to offset the removal of 5.35 ha of PCT 58 Black Oak- western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion_cleared

In addition to the above ecosystem credits that are required to be retired to offset impacts on PCTs and associated threatened species habitat, 531 Cobar Greenhood (*Pterostylis cobarensis*) species credits will need to be retired to offset the removal of 20.68 ha of habitat for this species. None of the threatened fauna species recorded or affected by the Proposal require calculation of species credits.

Of the threatened biota of relevance to this assessment, no threatened species or ecological communities considered known or likely to occur are candidate serious and irreversible impact (SAIL) entities. The Proposal would not result in any impacts to known or potential SAIL entities or their habitat. Therefore, no further consideration of potential SAILs is required.

Impacts on the Mallee Birds Ecological Community of the Murray Darling Depression, Hooded Robin (South-eastern), Pink Cockatoo, Malleefowl, Southern Whiteface and other threatened species listed under the EPBC Act resulting from the Proposal have been assessed in accordance with the *Matters of National Environmental Significance: Significant impact guidelines 1.1* (Department of the Environment [DotE] 2013).

The outcome of these assessments is that the Proposal is unlikely to have a significant impact on any threatened or migratory species or TECs. No additional assessment or approval under the EPBC Act is likely to be required.

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1. Introduction

1.1 Overview

Tronox Mining Australia Limited (Tronox) is the proponent of the Atlas-Campaspe Mineral Sands Project (the Project) which includes the development of a mineral sands mining operation (the Atlas-Campaspe Mine), together with the construction and operation of the Ivanhoe Rail Facility (a rail outload facility), in Western New South Wales (NSW) (Figure 1-1).

Development Consent (SSD_5012) was granted for the Project under Part 4 of the *NSW Environmental Planning and Assessment Act 1979* (EP&A Act) in 2014.

EPBC Approval 2012/6447 was also granted for the Project under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) in 2014.

Tronox has identified an opportunity to improve operational efficiency at the Atlas-Campaspe Mine by developing an optimised services corridor alignment between the Atlas and Campaspe deposits (the Modification)

Tronox is proposing to modify Development Consent (SSD_5012) under section 4.55(2) of the EP&A Act to allow for proposed changes to the Atlas-Campaspe Mine component of the Project. The Modification would result in additional clearing of native vegetation within the optimised services corridor alignment (the Proposal).

1.2 Approved Atlas-Campaspe Mineral Sands Project

The Atlas-Campaspe Mine includes the sequential development of the Atlas and Campaspe deposits. Tronox is approved to extract up to 10 million tonnes per annum (Mtpa) of mineral sands ore and transport a maximum of 665,000 tonnes per annum (tpa) of mineral product from the Atlas-Campaspe Mine. Mineral product generated at the Atlas-Campaspe Mine is trucked to the Ivanhoe Rail Facility where it is loaded onto trains for transfer to Tronox's Broken Hill Mineral Separation Plant (MSP) for further processing.

At the Broken Hill MSP, the mineral product from the Atlas-Campaspe Mine is separated and treated to produce valuable minerals (e.g. leucoxene, sulphate ilmenite and non-magnetic concentrate products).

1.3 Description of the Modification

1.3.1 Background

The approved Atlas-Campaspe Mine includes the development of a pre-concentrator plant (PCP) at the Campaspe deposit to initially process Campaspe deposit ore to produce a pre-mineral concentrate that is approved to be pumped and/or trucked via the transport route to the existing primary gravity concentration unit (PGCU) at the Atlas deposit for further processing. The existing transport route follows the approved services corridor between the Atlas and Campaspe deposits (refer to Figure 1-2). The Modification would include the development of an optimised services corridor between the Atlas and Campaspe deposits to reduce the length of the transport route between the PCP and PGCU by approximately 7 km, which would improve operational efficiency and reduce greenhouse gas emissions at the Atlas-Campaspe Mine.

1.3.2 Location

The Atlas-Campaspe Mine is located approximately 80 kilometres (km) north of Balranald and 270 km south-east of Broken Hill, NSW. The Ivanhoe Rail Facility is located approximately 135 km north-east of the Atlas-Campaspe Mine and is approximately 4.5 km to the south-west of the township of Ivanhoe.

The Development footprint is located between the approved Atlas and Campaspe deposit within Lot 616, DP 761603 and Lot 1 DP 1196290 and occurs within the existing biodiversity offset area that was established for the Project in 2014.

The Study area assessed for this BDAR included an area of around 90 hectares (ha) of which 50.53 ha forms the 'Development footprint' that would accommodate the proposed services corridor (refer to Figure 1-1).

1.3.3 Key Features of the Modification

The Modification would include the following proposed changes to the Atlas-Campaspe Mine component of the approved Project:

- development of an optimised services corridor between the Atlas and Campaspe deposits, including haul road, pipelines, electricity transmission line, soil stockpiles and water management infrastructure;
- transport of pre-mineral concentrate and ore from the PCP to the PGCU via a pipeline and/or truck along the optimised transport route;
- a supplementary biodiversity offset area to replace a small section of the approved biodiversity offset area that would be impacted by the optimised services corridor; and
- rehabilitation of the optimised services corridor so that it can be incorporated into the existing biodiversity offset area post-mining.

The existing services corridor would remain to provide an alternative access between the Atlas and Campaspe deposits. An indicative layout of the proposed optimised services corridor is provided in Appendix A.

The optimised services corridor would be rehabilitated to be self-sustaining ecosystems with endemic native species so that it can be reincorporated into the approved biodiversity offset area at the end of the Project life. This includes permanent self-propagating vegetation cover including native species characteristic of vegetation communities cleared for the corridor but does not include replicating existing PCTs.

1.3.4 Construction methods

The services corridor would be approximately 5 km long and up to 100 meters (m) wide.

Haul roads within the optimised services corridor would be constructed to support the transport of ore and pre-concentrate. These haul roads would be designed with appropriate grades, drainage, and maintenance access to ensure safe and efficient vehicle movement.

Pipeline infrastructure would be installed to transport pre-concentrate and ore slurries. Pumping stations would be installed where required to maintain operational efficiency.

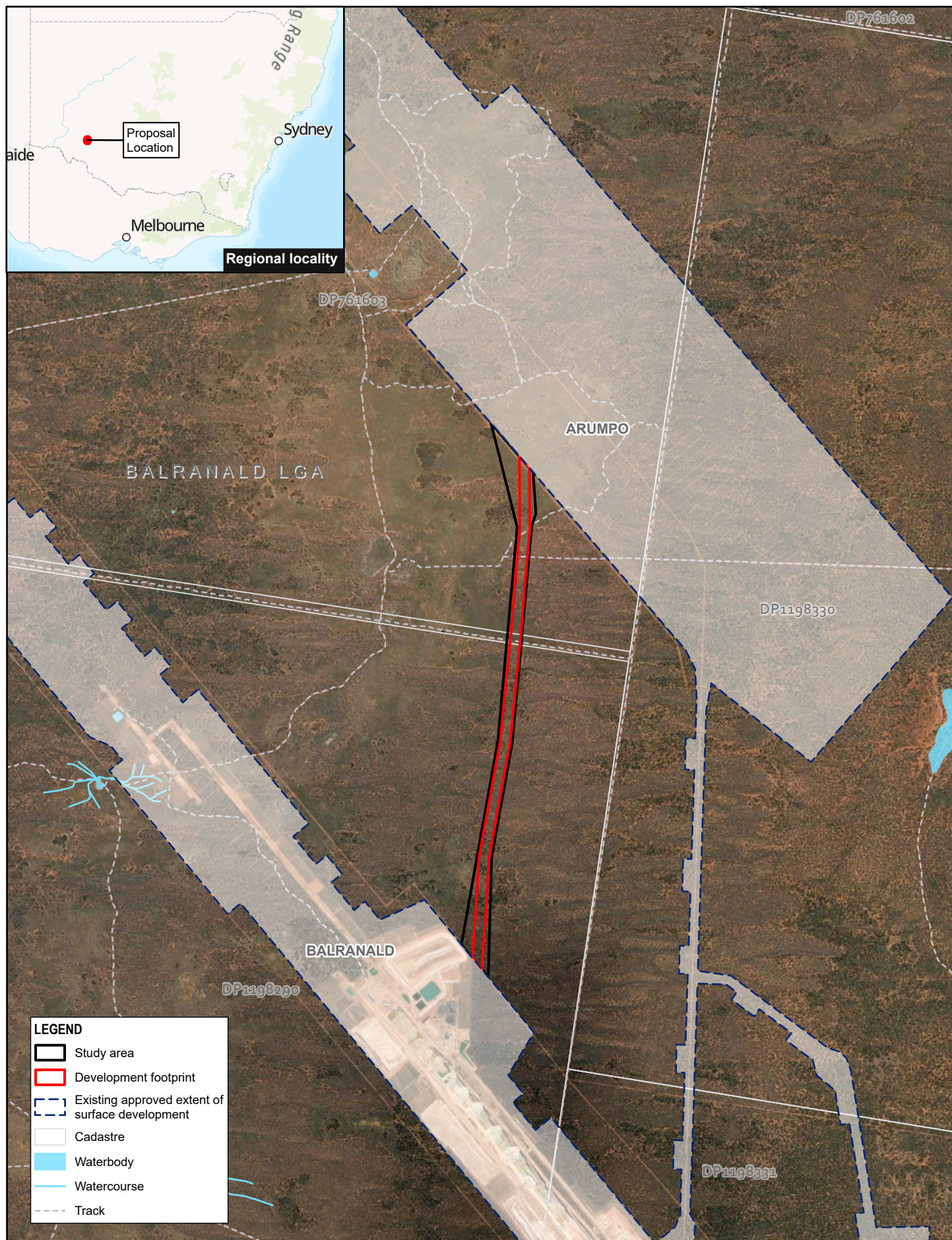
The optimised services corridor would also include electricity transmission lines to supply power to processing and supporting infrastructure. Areas within the optimised services corridor would be designated for vegetation and topsoil stockpiles. A conceptual layout of the optimised services corridor is provided on Figure 1.2.

Construction is likely to be daytime only and would involve clearing of the site using dozers and excavators. Vegetation and topsoil cleared as part of the preparation works would be stockpiled within the disturbance footprint, likely adjacent to the haul road for use in rehabilitation at the end of the mine life. Earthworks would include grading and excavations to achieve the appropriate grades, drainage and maintenance access to ensure safe and efficient vehicle movement.

Plant and equipment used in construction of the Proposal would include typical civil works construction fleet, which may include excavators, dozers, graders and haul trucks.

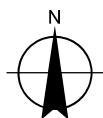
1.3.5 Timing

Construction of the services corridor is proposed to commence in March 2027 for a period of approximately six months. The corridor is expected to be operational from October 2027 through to the end of project life which is anticipated to be June 2034. Following decommissioning, the optimised services corridor would be rehabilitated consistent with the rehabilitation objectives outlined in Condition 32, Schedule 3 of Development Consent (SSD_5012).



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0 0.5 1 1.5
Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 54

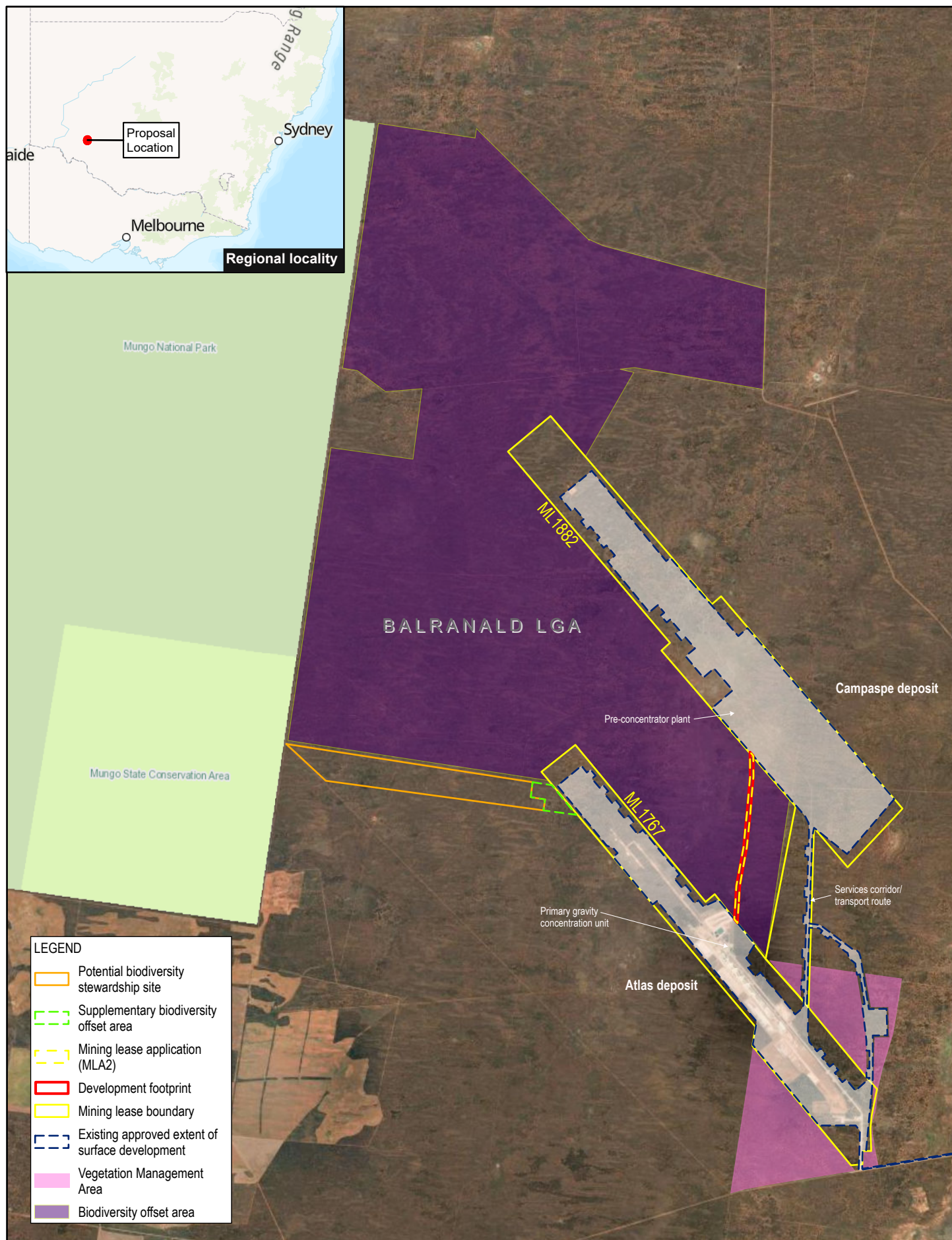


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Atlas-Campaspe Mineral Sands Project Modification 6

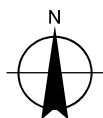
Project No. 12628564
Revision No. B
Date 30/10/2025

Site map

FIGURE 1.1



Paper Size ISO A4
0 0.5 1 1.5 2 2.5 3 3.5 4 4.5 5 5.5
Kilometres



Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 54



Tronox Mining Australia Ltd
Atlas-Campaspe Mine Ecological Services
Atlas-Campaspe Mineral Sands Project Modification 6

Project No. 12628564
Revision No. A
Date 30/10/2025

Atlas-Campaspe project site

FIGURE 1.2

1.4 Purpose and Scope of this Report

This BDAR has been prepared in accordance with the Biodiversity Assessment Method (BAM) (NSW Department of Planning, Industry and the Environment [DPIE] 2020a) by GHD Pty Ltd (GHD) for the Proposal.

The purpose of this report is to assess potential biodiversity impacts resulting from the construction and operation of the Proposal, and where required, identify feasible and reasonable mitigation and management measures. This report:

- Describes the existing environment of the Study area and Development footprint, including the results of the desktop assessment and site surveys
- Assesses the value and conservation significance of native vegetation and habitats at the Development footprint and the potential for threatened biota listed under the NSW *Biodiversity Act 2016* (BC Act) and Matters of National Environmental Significance (MNES) listed under the EPBC Act. to occur or be affected by the Proposal
- Provides a description of the Proposal, including potential impacts on biodiversity values and measures that have been or will be implemented to avoid or mitigate impacts
- Assesses the significance of impacts of the Proposal on threatened biota and MNES
- Presents the data used to perform the BAM credit calculations for the Proposal
- Calculates the number and type of biodiversity credits that would be required to offset residual impacts of the Proposal in accordance with the BAM
- Recommends measures to mitigate and manage the impacts identified including decommissioning and rehabilitation of the Development footprint after use

1.5 Structure of this Report

The structure of this BDAR is as follows:

- Section 1 – Provides an introduction to the Proposal and the assessment
- Section 2 – Describes the methodology for the assessment
- Section 3 – Describes the context for the site and landscape-scale inputs to the biodiversity assessment
- Section 4 – Describes the existing environment of the Development footprint including vegetation and threatened ecological communities and site-scale inputs to the biodiversity assessment
- Section 5 – Describes the extent and quality of habitat for threatened and migratory species at the Development footprint
- Section 6 – Identifies prescribed impacts that are relevant to the assessment
- Section 7 – Outlines steps taken to avoid and minimise potential impacts on biodiversity values
- Section 8 – Assesses the impacts of the construction and operation of the Proposal
- Section 9 – Describes measures that would be undertaken to mitigate and manage potential impacts
- Section 10 – Presents a summary of impacts pursuant to the assessment and offsetting thresholds set out in the BAM and described the biodiversity credits required as offsets for residual impacts on threatened biota and their habitats under the BAM
- Section 11 – Presents conclusions of the assessment pursuant to the key requirements of the BAM and related legislation and policy

1.6 Key terms, acronyms and abbreviations

Term	Definition
%	Percent
Accredited assessor	An individual trained and accredited under Section 6.10 of the BC Act to apply the Biodiversity Assessment Method.
ALA	Atlas of Living Australia
AOBV	Areas of outstanding biodiversity value
Assessment area	The area of land within the 1,500-metre buffer area surrounding the subject land
Atlas-Campaspe Mine	The development of a minerals sands mining operation (included in the Atlas-Campaspe Mineral Sands Project).
BAM	Biodiversity Assessment Method The rules for biodiversity assessment established under the BC Act that determine credits created, credits required and the circumstances that improve or maintain biodiversity values.
BAM-C	Biodiversity Assessment Method Calculator
BC Act	NSW <i>Biodiversity Conservation Act 2016</i>
BC Amendment Act	NSW <i>Biodiversity Conservation Amendment (Biodiversity Offsets Scheme) Act 2024</i>
BC Regulation	NSW <i>Biodiversity Conservation Regulation 2017</i>
BDAR	Biodiversity Development Assessment Report
Biodiversity credit	A unit of biodiversity value to measure specific development impacts or conservation gains in accordance with the BAM. Includes ecosystem credits and species credits.
Biodiversity credit report	Specifies the number and type of biodiversity credits: required to offset the impacts of a development to obtain a Biodiversity Certification Agreement; or that would be generated through conservation and management of a Stewardship site under a Biodiversity Stewardship site agreement.
Biodiversity offsets	Specific measures that are put in place to compensate for impacts on biodiversity values
Biodiversity values	The composition, structure, and function of ecosystems, including threatened species, populations and ecological communities, and their habitats
BMP	Biodiversity Management Plan
BOAMS	Biodiversity Offsets and Agreement Management System
BOS	Biodiversity Offset Scheme
CEMP	Construction Environmental Management Plan
cm	Centimetre
Commonwealth DCCEEW	Commonwealth Department of Climate Change, Energy, the Environment and Water
Controlled Action	Actions that the Minister decides have, will have, or are likely to have a significant impact on one or more MNES and therefore require assessment and approval under the EPBC Act.
DAWE	Commonwealth Department of Agriculture, Water and the Environment
DBH	Diameter at breast height (1.3m above ground)
DEC	NSW Department of Environment and Conservation
DECC	NSW Department of Environment and Climate Change

Term	Definition
Development footprint	The area that would be directly impacted by construction and operation of the Proposal. Encompasses the layout shown on in Appendix A. This area also comprises the 'Subject Land' as referenced in the BAM.
DEWHA	Commonwealth Department of the Environment, Water, Heritage and the Arts
DoEE	Commonwealth Department of the Environment and Energy
DotE	Commonwealth Department of the Environment
DPE	NSW Department of Planning and Environment
DPHI	NSW Department of Planning, Housing and Infrastructure
DPI	NSW Department of Primary Industries
DPIE	NSW Department of Planning, Industry and Environment
DSEWPaC	Commonwealth Department of Sustainability, Environment, Water, Population and Communities
Ecosystem credit	A credit that relates to a vegetation type and the threatened species that are reliably predicted by that vegetation type (as a habitat surrogate).
EEC	Endangered ecological community
EP&A Act	NSW <i>Environmental Planning and Assessment Act 1979</i>
EPBC Act	Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i>
FM Act	NSW <i>Fisheries Management Act 1994</i>
GHD	GHD Pty Ltd
GIS	Geographic Information System
GPS	Global positioning system
ha	Hectares
HTE	High Threat Exotic Plant
IBRA	Interim Biogeographic Regionalisation for Australia
km	Kilometre
km/h	kilometres per hour
KTP	Key Threatened Processes
LGA	Local Government Area
Migratory species	Species listed under listed under international agreements i.e. Ramsar, JAMBA, CAMBA, Bonn and ROKAMBA conventions to which Australia is a party
m	Metre
MNES	Matters of National Environmental Significance
NSW	New South Wales
NSW DCCEEW	NSW Department of Climate Change, Energy, the Environment and Water
OEH	The former Office of Environment and Heritage
OTG	Offset Trading Group
PCP	Pre-concentrator plant
PCT	Plant community type
PGCU	Primary gravity concentration unit
PMST	Protected Matters Search Tool

Term	Definition
Priority weeds	Plants that have the potential to pose a biosecurity risk to human health, the economy, the liveability of a community and the environment, listed under the NSW <i>Biosecurity Act 2015</i> .
Residual impact	The remaining impact after all reasonable measures are made to avoid and minimise the impacts and mitigate the impacts of the project. These impacts are subject to calculation of ecosystem and species credits.
SAII	Serious and irreversible impact
SAII entity	Species and ecological communities that are at risk of serious and irreversible impacts (SAIIs)
SEAR	Secretary's Environmental Assessment Requirements
SEED	NSW Sharing and Enabling Environmental Data
SIS	Species Impact Statement
SMART	specific, measurable, achievable, relevant, and time-bound
Species credit	A credit that relates to an individual threatened species that cannot be reliably predicted based on habitat surrogates. Threatened species that require species credits are identified in the Threatened Biodiversity Data Collection.
Study area	The area that was subject to a site survey and assessed for direct or indirect impacts arising from construction and operation of the Proposal. A buffer of 1,500 metres has been used in desktop assessments in accordance with the requirements for a site-based assessment in the BAM.
SPRAT	Species profile and threats database, online profiles
SVTM	NSW State Vegetation Type Map
TBDC	Threatened Biodiversity Data Collection
TEC	Threatened Ecological Community
The Modification	Refers to the Modification of Development Consent (SSD_5012) under section 4.55(2) of the EP&A Act to allow for the changes identified during detailed planning for the development of the Campaspe deposit at the Atlas-Campaspe Mine
The Project	the Atlas-Campaspe Mineral Sands Project
The Proposal	Refers to the construction and operation of an optimised services corridor located between the Atlas and Campaspe deposits as part of Modification 6 to Development Consent (SSD_5012).
Threatened biota	Threatened species, populations or ecological communities listed under the BC Act, FM Act and/or the EPBC Act
Tronox	Tronox Mining Australia Limited
VI	Vegetation integrity
VQA	Vegetation Quality Assessment
WMP	Water Management Plan

1.7 Scope and limitations

This report has been prepared by GHD for Tronox Mining Australia Ltd and may only be used and relied on by Tronox Mining Australia Ltd for the purpose agreed between GHD and Tronox Mining Australia Ltd as set out in section 1 of this report.

GHD otherwise disclaims responsibility to any person other than Tronox Mining Australia Ltd arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report (refer section 1.2 of this report). GHD disclaims liability arising from any of the assumptions being incorrect.

2. Methods

2.1 Legislative and Policy Context to the Assessment

2.1.1 Biodiversity Conservation Act 2016

The NSW BC Act provides legal protection for biota of conservation significance in NSW. The BC Act aims to, amongst other things, ‘maintain a healthy, productive and resilient environment for the greatest well-being of the community, now and into the future, consistent with the principles of ecologically sustainable development’. It provides for the listing of threatened species and communities, establishes a framework to avoid, minimise and offset the impacts of proposed development using the Biodiversity Offsets Scheme (BOS), and establishes a scientific method for assessing the likely impacts on biodiversity values and calculating measures to offset those impacts using the BAM (DPIE 2020a). These are discussed further below.

As of 7 March 2025, certain provisions of the *Biodiversity Conservation Amendment (Biodiversity Offsets Scheme) Act 2024* (the BC Amendment Act) commenced. The BC Amendment Act removes the ability for proponents to seek approval to use the variation rules in securing biodiversity credits as offsets. Proponents may purchase like-for-like credits, make a payment into the Biodiversity Conservation Fund or fund a conservation action. Other provisions of the BC Amendment Act, including those related to nature positive outcomes and the assessment of genuine measures taken to avoid and minimise biodiversity impacts, are yet to commence as they require supporting regulations to be developed.

The BC Act and the BC Amendment Act have been considered in this assessment through the application of the BAM as described below.

Biodiversity Offset Scheme and Biodiversity Assessment Methodology

The BC Act, together with the NSW *Biodiversity Conservation Regulation 2017* (BC Regulation), provides a mechanism to address impacts on biodiversity from land clearing associated with development, clearing or conferral of biodiversity certification. Under this legislation, there are provisions for a BOS, which includes a framework to avoid, minimise and offset impacts of development on biodiversity.

The aim of the BOS is to provide a transparent, consistent, and scientifically based approach to biodiversity assessment and offsetting, to ensure that the impacts of development, clearing or biodiversity certification will result in no net loss of biodiversity. The scheme creates a market framework for the conservation of biodiversity values and the offsetting of development impacts, by establishing the mechanisms to offset impacts of development, clearing or biodiversity certification through biodiversity credit trading such that there is no net loss of biodiversity values. The scheme also allows for the establishment of biodiversity stewardship agreements, which are in-perpetuity agreements entered into by landholders, to secure offset sites and generate biodiversity credits, which can be used to offset impacts of development.

The BAM underpins the BOS and establishes a standard method to address the loss of biodiversity and threatened species. The BAM sets out how biodiversity values will be assessed, prescribes requirements to avoid and minimise impacts and establishes rules for calculating the number and class of credits required for unavoidable impacts. The methodology includes a software package known as the Biodiversity Assessment Method Calculator (BAM-C) which processes site survey and assessment data. The credit calculator specifies the type and extent of surveys required for a Biodiversity assessment and then processes survey data to calculate the number and type of biodiversity credits that are either required at a development site or will be generated at a stewardship site. The BAM must be applied by a person accredited under the BC Act.

The BC Act and BOS have been addressed through the preparation and certification of this BDAR by an accredited assessor in accordance with the BAM and associated guidelines and policy.

2.1.2 Fisheries Management Act 1994

The objects of the *Fisheries Management Act 1994* (FM Act) are to conserve, develop and share the fishery resources of the State for the benefit of present and future generations. It provides for the listing of threatened species, populations and ecological communities, listing of 'Key Threatening Processes' (KTPs), and the requirements or otherwise for the preparation of a Species Impact Statement (SIS).

One of the objectives of the FM Act is to 'conserve key fish habitats ' which includes aquatic habitats that are important to the maintenance of fish populations generally and the survival and recovery of threatened aquatic species. To assist in the protection of key fish habitats, DPI has produced the Policy and guidelines for fish habitat conservation and management (DPI 2013). This policy applies to the following developments, works or activities, each of which can impact on key fish habitat:

- Dredging or reclamation
- Impeding fish passage
- Damaging marine vegetation
- De-snagging

The FM Act has been considered in this assessment through desktop assessment and high-level habitat assessment only. There is no key fish habitat or other aquatic habitat for biota protected under the FM Act in the Development footprint or likely to be affected and so the requirements of the FM Act are not considered in further detail.

2.1.3 Biosecurity Act 2015

The NSW *Biosecurity Act 2015* provides for risk-based management of biosecurity in NSW. It provides a statutory framework to protect the NSW economy, environment and community from the negative impact of pests, diseases and weeds.

The primary object of the Act is to provide a framework for the prevention, elimination and minimisation of biosecurity risks posed by biosecurity matter, dealing with biosecurity matter, carriers and potential carriers, and other activities that involve biosecurity matter, carriers or potential carriers.

In NSW, all plants are regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable.

No priority weeds were recorded in the Study area. Legal requirements to minimise the potential for the introduction and/or spread of weeds as a result of the Proposal are discussed in Section 9.

2.1.4 Environment Protection and Biodiversity Conservation Act 1999

The purpose of the Commonwealth EPBC Act is to ensure that actions likely to cause a significant impact on MNES undergo an assessment and approval process. Under the EPBC Act, an action includes a project, a development, an undertaking, an activity or a series of activities, or an alteration of any of these things. An action that 'has, will have or is likely to have a significant impact on a MNES' is deemed to be a 'controlled action' and may not be undertaken without prior approval from the Australian Minister for the Environment. MNES relevant to this report include threatened species and ecological communities and migratory species.

Specific consideration of the approval and offsetting requirements for MNES is only required for controlled actions. The NSW Government and Australian Government finalised amendments to the Assessment Bilateral Agreement after changes to NSW legislation, and the Amending Agreement no. 1 was signed on 24 March 2020. The Australian Government formally endorsed the NSW BOS through the EPBC Act Condition-setting Policy (Commonwealth Department of Agriculture, Water and the Environment [DAWE] 2020). The EPBC Act condition setting policy (DAWE 2020) notes that where a Proposal demonstrates compliance with an endorsed state or territory policy, the proponent will not be required to simultaneously comply with the corresponding Australian Government policy. As such, a proponent for a controlled action is not required to calculate offsets separately using the EPBC Act offsets policy (Australian Government Department of Sustainability, Environment, Water,

Population and Communities [DSEWPac] 2012) and associated calculator, unless offsets are required for a matter not considered by the BAM.

The EPBC Act has been considered in this assessment through:

- Desktop review to determine the listed biodiversity matters that are predicted to occur within the locality of the Proposal and hence could occur, subject to the habitats present
- Targeted field surveys for listed threatened biota and migratory species
- Identification of suitable impact mitigation and environmental management measures for threatened and migratory biota, where required
- Consideration of the potential significance of impacts on MNES pursuant to the *Matters of National Environmental Significance Significant impact guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999* (Department of the Environment [DotE] 2013)
- Consideration of the need or otherwise for offsets for significant residual impacts on protected matters

The Proposal is not likely to result in a significant impact on any MNES (Section 8.5, Appendix F).

2.2 Definitions

For the purposes of the assessment the construction footprint and operation footprint for the proposed modification have been defined as follows:

- **The Proposal** – The construction and operation of the optimised services corridor between the Atlas and Campaspe deposits as part of Modification 6 to Development Consent (SSD_5012)
- **Development footprint** – the area that would be directly affected by construction and the location of operational infrastructure. The Development footprint includes additional surface disturbance within the Project area to allow for the construction of the optimised services corridor and includes haul road, pipelines, electricity transmission line, soil stockpiles, and water management infrastructure (refer to Figure 1-1). The indicative Development footprint layout is shown in Appendix A.
- **Study area** – the area investigated which includes the Development footprint and surrounding area, with the potential to be directly or indirectly affected by the Proposal. The area of investigation covered by this biodiversity assessment comprised approximately 90 ha of land as shown in Figure 1-1.
- **Assessment area** – is the area investigated in accordance with the BAM, encompassing the Development footprint and Study area plus the 1,500 metre (m) buffer area surrounding the Development footprint, patch size polygon and surrounding land included in the assessment of site context as shown in Figure 3-1
- **Locality** – the area within a 10 km radius of the Development footprint

2.3 Desktop Assessment

2.3.1 Data review

A desktop data review was undertaken to identify threatened flora and fauna species, populations and ecological communities (threatened biota) listed under the BC Act and MNES listed under the EPBC Act, that could be expected to occur in the Development footprint, based on previous records, known distribution ranges, and habitats present. The desktop assessment was also used to help describe vegetation and habitat, determine landscape characteristics and to obtain the necessary site data to perform BAM calculations.

Information sources used in the preparation of this report include:

- NSW Department of Climate Change, Energy, the Environment and Water (NSW DCCEEW) BioNet Atlas (NSW DCCEEW 2025a), for
 - Records of threatened biota previously recorded in a 10 km radius around the Development footprint
 - Threatened Biodiversity Data Collection (TBDC) profiles of threatened species listed under the BC Act
 - NSW Vegetation Classification to help confirm plant community types (PCTs) in the Study area and PCT to threatened ecological community (TEC) associations

- A list of candidate species credit-type species and predicted species accessed via the BAM-C
- The NSW State Vegetation Type Map (SVTM) (NSW DCCEEW 2025b) to identify candidate PCTs in the Study area and to map native vegetation extent
- NSW *BioNet Vegetation Classification* (NSW DCCEEW 2025c) to help confirm PCTs in the Study area and potential PCT to TEC associations
- NSW Sharing and Enabling Environmental Data (SEED) database to determine mapping of Mitchell Landscapes and Interim Biogeographic Regionalisation for Australia [IBRA] regions and bioregions within the Development footprint (NSW DCCEEW 2025d)
- NSW DCCEEW threatened biodiversity profile search online database for threatened ecological communities and species listed under the BC Act (NSW DCCEEW 2025e)
- Commonwealth DCCEEW (2025a) EPBC Act Protected Matters Search Tool (PMST) – for a 10 km radius around the Development footprint (searched 11 September 2025)
- EPBC Act Species profile and threats database, online profiles (SPRAT) (Commonwealth DCCEEW 2025b) and Register of Critical Habitat (Commonwealth DCCEEW 2025c)
- Department of Planning Industry and Environment (DPIE) Espade, for information relating to soils and land systems within the Study area (DPIE 2025)
- Department of Primary Industries (DPI) freshwater threatened species distribution maps (DPI 2025)

The threatened biota and migratory species identified in the desktop assessment are presented in Appendix B. Following collation of database records and threatened species and community profiles, a list of threatened species requiring assessment was compiled according to the 'steps for identifying habitat suitability for threatened species' in the BAM. This was further refined following field surveys, and identification and assessment of habitat present within the Development footprint. A likelihood of occurrence ranking was attributed to biota based on this information and used to compile lists of 'predicted threatened species' (that is, ecosystem credit species) and 'candidate threatened species' (that is, species credit entities requiring targeted survey) according to Step 2 'assessment of habitat constraints' of the BAM.

2.3.2 Background research

Background research was conducted to identify:

- Landscape-scale features of the Study area in accordance with Subsection 3.1.3 of the BAM (DPIE 2020a)
- Site context of the Study area that includes assessing vegetation cover and patch size as required under Section 3.2 and Subsections 4.3.2 of the BAM
- The likely distribution of native vegetation and threatened ecological communities, based on previous mapping and aerial photograph interpretation, for targeted field verification as required under Section 4 of the BAM
- A list of predicted and candidate threatened species and populations of flora and fauna to assess the habitat suitability and TBDC as required under Section 5 of the BAM
- Availability of baseline information to determine whether additional surveys, mapping and reporting is required to support project approval

The background research included analysis of the following information sources:

- NSW (Mitchell) Landscapes mapping Version 3.1 (DPIE 2016) and Descriptions for NSW (Mitchell) Landscapes Version 2 (Department of Environment and Climate Change [DECC] 2002)
- Interim Biogeographic Regionalisation of Australia (IBRA version 7.0) mapping (Department of the Environment and Energy [DoEE] 2018)
- Initial BAM credit calculations
- Previous ecological surveys completed for the Atlas-Campaspe mine (GHD 2018a, GHD 2019a, GHD 2019b, GHD 2019c, GHD 2019c, GHD 2020a, GHD 2020b, GHD 2022a, GHD 2022b, GHD 2023a, GHD 2023b, GHD 2024a, GHD 2024b, GHD 2024c, GHD 2025 and GHD 2026).
- Aerial photograph imagery of the Study area and Development footprint

2.4 Field surveys

2.4.1 Survey overview

Staged surveys within the Study area were conducted with reference to the BAM and appropriate threatened species survey guidelines for targeted species.

Survey effort that has directly contributed to this BDAR is summarised in Table 2.1 and is described in detail below. Section 5.1.2 provides a summary of the candidate threatened species (i.e. species credit matters) that were considered during field surveys and section 5.2 presents targeted survey effort and results. Figure 2-1 and Figure 2-2 show survey effort for candidate threatened species. Scanned field data sheets and Global Positioning System (GPS) tracklogs demonstrating survey effort and coverage of the Study area have been submitted in the Biodiversity Offsets and Agreement Management System (BOAMS) for approval along with this BDAR.

Table 2.1 Overview of survey techniques and timing

Survey stage	Date	Survey Technique
Preliminary investigation of biodiversity values across entire Atlas-Campaspe Mine footprints by Australian Museum Business Services for Cristal Mining (now Tronox)	Between May 2011 and September 2012	Vegetation zone mapping Floristic plots Threatened flora traverses Habitat assessment Diurnal bird survey, Malleefowl (<i>Leipoa ocellata</i>) search transects Microbat harp trapping and Anabat recording; pitfall, Elliot and funnel trapping; hair tubes; remote cameras; aural visual frog surveys, call playback, nocturnal spotlighting
Spring targeted flora species credit surveys	9-11 and 14-15 October 2024	Systematic threatened flora traverses across the Study area spaced 5-10 m apart
Vegetation integrity (VI) assessment	15-16 October 2024 18-20 November 2024	Vegetation zone mapping BAM VI plots Threatened flora traverses
Targeted threatened fauna species credit surveys	19-22 November 2024	Habitat assessment including systematic candidate nest tree census Diurnal bird survey Fauna pitfall / funnel trapping, Elliott trapping Nocturnal spotlighting and call playback surveys
Nest tree census	15-16 October and 20 November 2024	Systematic nest tree census conducted twice over the entire Study area
Supplementary VI assessment	9 July 2025 10 October 2025	BAM VI plots
Supplementary targeted flora species credit surveys	10 October 2025	Systematic threatened flora traverses spaced 5-10 m apart within small areas included within an alignment change.

2.4.2 Vegetation and flora surveys

Vegetation mapping

The NSW SVTM (NSW DCCEEW 2025b) was ground-truthed in the field to verify PCT boundaries, floristic and structural homogeneity within patches and to update mapping as required. Vegetation mapping was undertaken via systematic walked transects across the entire Development footprint and by walking the boundary of vegetation units. The overall condition of vegetation was assessed through general observation and comparison against the PCT condition benchmark data as well as using parameters such as species diversity, history of disturbance, and canopy health.

Native vegetation communities in the Study area were assigned to the closest equivalent PCT described in the BioNet Vegetation Classification database (NSW DCCEE 2025c). The closest equivalent PCT for each vegetation community was determined through a comparison of the floristic descriptions of PCTs in the database with the VI plot data collected from the site. In addition to floristic and structural similarity, the landscape position, soil type and other diagnostic features of the vegetation communities on the sites were also compared to the descriptions in the database to determine the most suitable PCT.

The native vegetation in the Development footprint was then stratified into vegetation zones in accordance with the BAM (DPIE 2020a). A vegetation zone is defined in the BAM as a relatively homogenous area that is the same PCT and has the same broad condition state. Vegetation condition states were defined through general observation and comparison against the PCT condition benchmark data as well as using parameters such as species diversity, history of disturbance, weed invasion and canopy health. Each vegetation zone was assigned a patch size in accordance with subsection 4.3.2 of the BAM. Justification for selected PCTs and condition classes is provided in section 4.3.2.

Vegetation integrity survey plots (assessing site condition)

BAM VI plots were sampled at random locations within each of the vegetation zones by walking a random distance into the vegetation zone and then locating the plot on a randomly generated compass bearing, this was then repeated for subsequent plots within the vegetation zone. Where possible, plots were not located near ecotones, tracks and their edges or other locally disturbed areas. Due to a reduction in the Development footprint as part of efforts to avoid impacts to biodiversity values, a small number of plots were not located entirely within the final footprint. As these plots are close to, contiguous with, and representative of the equivalent vegetation zones in the Development footprint they have contributed to the description of vegetation zones for the assessment. Only plots sampled within the Development footprint were included in BAM-C calculations and contributed directly to the calculation of VI or the quantum of biodiversity credits. VI plots were sampled on the 16-18 October 2024, 18-19 November 2024, 9 July 2025 and 10 October 2025. The locations of the survey plots are shown in Figure 2-1.

VI was determined by assessing ten attributes used to assess function, composition and structure of vegetation within a 50 metre by 20 metre plot. These attributes were then assessed against benchmark values. Benchmarks are quantitative measures of the range of variability in condition in vegetation with relatively little evidence of alteration, disturbance or modification by humans since European settlement (DECC, 2002).

Attributes assessed within each plot are listed in Table 2.2. All flora species within a 20 m by 20 m quadrat nestled within the 50 m by 20 m plot were identified according to the nomenclature of the Royal Botanic Gardens and Domain Trust. Each species identified was allocated a growth form group¹ and designated as either native, exotic or high threat exotic in accordance with the lists accessed by assessors via the BAM-C.

The survey effort undertaken to address the minimum plot sampling required by the BAM is summarised in Section 4.4.1.

Table 2.2 Site data collected within each vegetation integrity plot

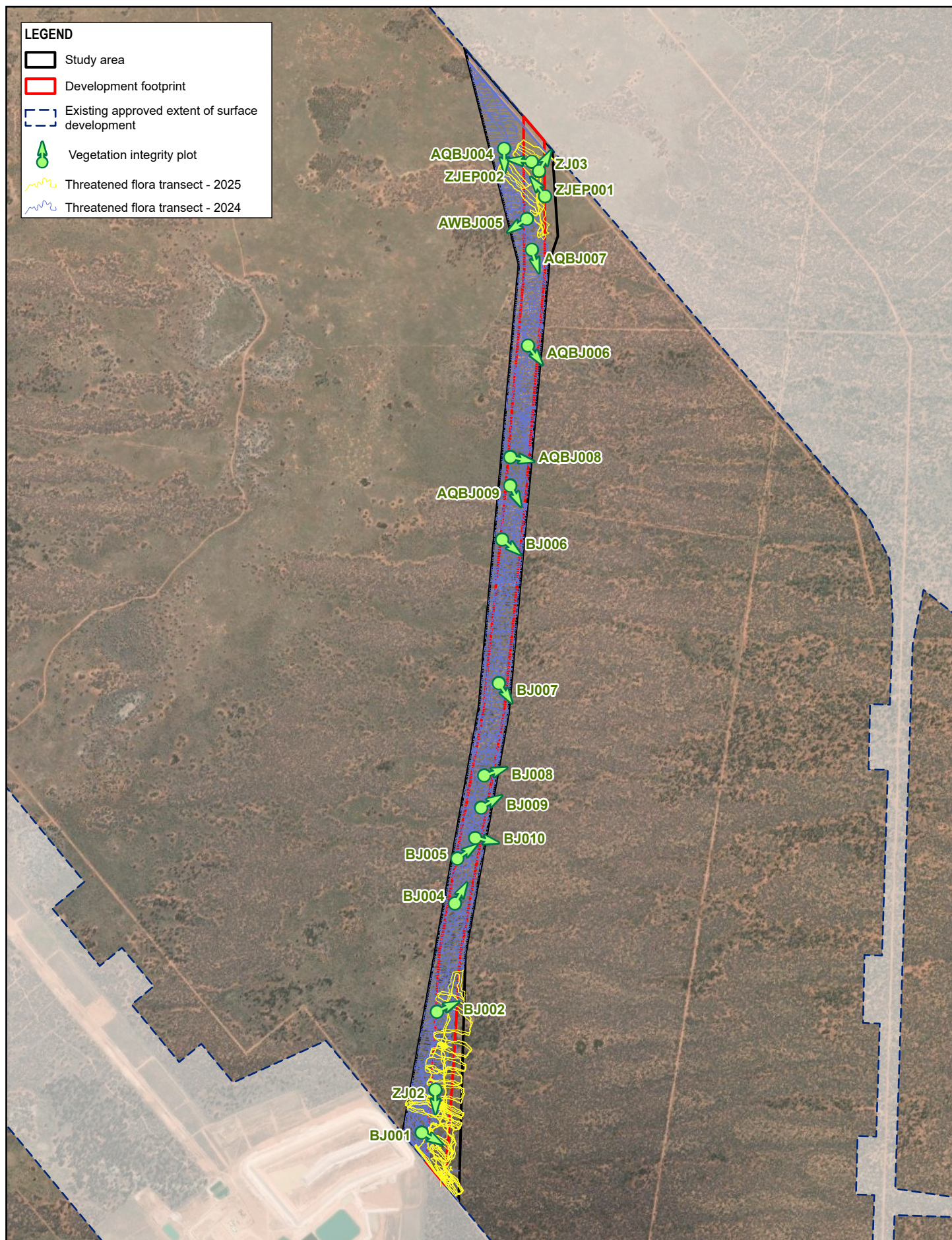
Attribute	Area assessed
Native plant species richness	20 X 20 m plot
Percentage foliage cover for each species	20 X 20 m plot
Estimated number of individuals for each species	20 X 20 m plot
Number of large trees	50 X 20 m plot
Tree regeneration (presence/absence)	50 X 20 m plot
Tree stem size class	50 X 20 m plot
Total length of fallen logs	50 X 20 m plot
Litter cover	5 X 1 m plot
High threat exotic vegetation cover	50 X 20 m plot
Hollow bearing trees	50 X 20 m plot

¹ TG – tree, SG – shrub, GG – grass/grasslike, FG – forb, EG – fern, OG – other (Table 2 of the BAM, DPIE 2020)

Threatened flora traverses

Potential candidate species credit entities for the Proposal site were identified and assessed in accordance with Section 5.2 and Section 5.3 of the BAM (DPIE 2020a). All threatened plants are classified under the BAM as species credit entities as their occurrence cannot be reliably predicted based on vegetation type. The suite of threatened plants with potential to occur in the Study area was identified based on the desktop assessment results and the species credit entities identified by preliminary BAM Calculations (see Appendix B). Habitat for these species was identified and assessed based on threatened species database records and threatened species profiles (NSW DCCEEW 2025a; e) and the experience and judgement of GHD ecologists.

Following the habitat assessment for threatened flora species, targeted searches were undertaken for threatened flora species that were predicted to occur at the site by the BAM-C. No additional flora species were identified during the desktop review as having potential to occur within the Study area given known distributions, previous records in the locality and habitat requirements for each species. Habitat within the Study area was inspected with reference to threatened species survey guidelines (DPIE 2020b). Searches were undertaken with due consideration of threatened species survey guidelines (DPIE 2020b), by completing traverses throughout the entire Development footprint. Traverses typically involved two to four staff walking in parallel transects spaced approximately 5-10 m apart. Surveyors walked at a slow pace so as to be able to identify any target species, or individuals in the genus or family that were being targeted for checking against identifying characteristics of the target species if needed. Traverses were conducted in the appropriate season for all candidate species as specified by the TBDC (NSW DCCEEW 2025a). Section 5.1.2 provides a summary of the candidate threatened flora species that were considered during field surveys and section 5.2 presents targeted survey effort and results. Figure 2-1 shows the survey efforts completed for candidate threatened flora species.

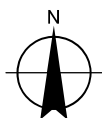


LEGEND

- Study area
- Development footprint
- Existing approved extent of surface development
- Vegetation integrity plot
- Threatened flora transect - 2025
- Threatened flora transect - 2024

Paper Size ISO A4
0 200 400 600 800
Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 54



Tronox Mining Australia Ltd
Atlas-Campaspe Mineral Sands Project Modification 6
Biodiversity Development Assessment Report

Flora survey effort
(October 2024 and October 2025)

Project No. 12628564
Revision No. A
Date 05/11/2025

FIGURE 2.1

2.4.3 Terrestrial fauna surveys

All fauna field surveys completed were undertaken in accordance with BAM survey guidelines, including targeted surveys and trapping. For the EPBC Act listed Corben's Long-eared Bat (*Nyctophilus corbeni*) - targeted surveys were not completed as the species is known to occur across the MLA, with 54 Corben's Long-eared Bats trapped across the MLA between 2018 and 2025 (GHD 2019a, GHD 2020a, GHD 2022a, GHD 2023a, GHD 2024a, GHD 2026) and therefore has been assumed present within the Development footprint due to the presence of suitable habitat.

Nest tree census

A 'systematic nest tree census' was conducted twice over the entire Study area to help determine the presence of threatened species nest trees to inform the assessment of species credits. This survey was completed in October 2024 to meet the BAM requirements for candidate species, and again during November 2024 while additional fauna surveys were completed. All mature trees were inspected for the presence of stick nests and/or hollows. Any large stick nests and hollow bearing trees were mapped and data collected on tree species, diameter at breast height, number of hollows in the size classes >20 centimetre (cm), 15 to 20 cm, 5-15 cm and <5 cm, height of hollows above ground and orientation of hollows.

Nest tree census surveys included targeted effort within the late breeding season to detect evidence of nesting birds as noted in the TBDC profiles for candidate species such as the presence of a male and female; or any adult with nesting material; or an individual on a large stick nest in the top half of the tree canopy; or pairs displaying (soaring, diving, engaging in chases, or a male observed calling in flight with a female begging from tree) (NSW DCCEE 2025a). Additional surveys were conducted outside the breeding season for target species, aligned with diurnal bird survey effort, habitat searches and all other time spent on site. These additional survey periods contributed to the overall effort for species credit matters through observation of candidate nest trees with suitable large stick nests or hollows that could be used for breeding at other times of year.

Diurnal bird surveys

Targeted surveys for diurnal birds were undertaken throughout the Study area in October and November 2024. Surveys followed the 500 m area search method, comprising walked random meander-traverses through an area of habitat within up to 500 m of a central point over approximately one hour per survey round. The pace and location of traverses was guided by observed bird activity with a view to maximising the chances of detecting target species and the overall species richness recorded rather than collecting data according to a repeatable methodology. Birds were identified by observation with binoculars and/or call identification. Diurnal bird surveys also included searches for signs indicative of particular threatened species, including searching for evidence of feeding, foraging and signs of bird presence, such as pellets, whitewash, nests etc. All opportunistic observations of birds were recorded during all field surveys and travel within the site. Diurnal bird surveys were also repeated at each of the six pitfall survey sites.

Pitfall, Funnel and Elliot Trapping Surveys for Reptiles, Amphibians and Small Mammals

Trapping was undertaken at six survey sites targeting ground dwelling fauna (predominantly reptiles, amphibians and small mammals) with methods outlined in Department of Environment and Conservation (DEC) (2004) and McLaughlin and Val (2008). This involves the use of a 30 m pitfall trap line comprising six plastic buckets (each 40 cm deep by 30 cm wide), spaced 5m apart in an approximately straight line, and buried such that the top of each open bucket is flush with the ground. A 30 cm high, 30-35 m long canvacon fence ('drift fence') was erected along each transect to direct animals into the pitfall traps, and pairs of 'funnel traps' placed at each end of each fence. Approximately 3cm of soil, shelters of plastic 'hides', a small square of heat reflecting flashing, wet sponges and leaf litter were placed in each bucket to provide shelter for captured animals from predators and climatic conditions such as hot and cold weather during the survey period. Funnel traps were covered with a 40x40cm sheet of heat reflecting flashing and contained a wet sponge. These additions provide shelter and refuge for small reptiles and mammals that are trapped during the program, to reduce stress and assist in temperature regulation. Ten Elliot traps were placed 15 to 20 m away parallel to each pitfall line.

The pitfall traps were open for four consecutive nights of trapping, comprising a total of 36 buckets per night, and giving a total of 144 pitfall trap nights for the survey, two funnel traps at each site for a total of 48 funnel trap nights, and ten Elliotts traps at each site for a total of 240 Elliot trap nights.

Terrestrial Fauna Habitat and Diurnal Active Searches

Habitat and diurnal active surveys were conducted with a particular focus on the threatened diurnal reptile species listed in Section 5.1.2 and with reference to the *Threatened reptiles Biodiversity Assessment Method survey guide* (Department of Planning and Environment [DPE] 2022). Twenty diurnal active searches were completed across the Study area.

Habitat surveys involved walking slowly through suitable habitat observing for both active and non-active individuals, whilst stopping at least every 10 m to observe for moving animals. Surveys were concentrated in areas of the landscape where reptiles may be basking or partially hiding. Active searches of microhabitats including shrubs, grasses, rock outcrops, human debris such as corrugated iron sheeting, cracking soil, woody debris and other ground litter were conducted throughout the Study area. Potential shelter sites were carefully inspected including lifting and replacement of shelter sites where possible.

Spotlight surveys

Spotlight survey transects were conducted on foot for a minimum of eight person hours on each of three nights in November 2024, with a particular focus on the threatened nocturnal reptile species listed in Section 5.1.2 and with reference to the *Threatened reptiles Biodiversity Assessment Method survey guide* (DPE 2022).

Also targeted were nocturnally active mammals, birds and frogs, including dedicated listening periods for fauna vocalisations. Mammals and nocturnal birds were identified by observation under spotlight or by vocalisations heard whilst spotlighting by walking slowly and quietly through potential habitat. Surveyors carried headtorches/hand-held torches with an adjustable >300 lumen output.

Call playback

Nocturnal call playback surveys were conducted on three nights in the November 2024 survey period targeting the Bush Stone-curlew (*Burhinus grallarius*) and the Barking Owl (*Ninox connivens*).

Surveys involved an initial listening period of five minutes, followed by call playing for three minutes, followed by a listening period of five minutes (undertaken separately for each species), with a final listening period of approximately 10 minutes. Calls were played through a 45 watt megaphone. All potential habitat in the immediate area was then scanned for at least 10 minutes using spotlights. Additional spotlighting and listening for target species was conducted for the duration of each nocturnal survey round.

Fauna habitat assessment

Fauna habitat assessments were undertaken throughout the Study area, including an assessment of potential shelter, basking, roosting, nesting and/or foraging sites. Specific habitat features and resources were noted during dedicated traverses as well generally during all time spent on site.

Indicative habitat criteria for targeted threatened species (i.e. those determined as having the potential to occur within the Study area following the desktop review) were identified prior to fieldwork occurring with particular focus on species credit matters. Habitat criteria were based on information provided in NSW DCCEW and Commonwealth DCCEW threatened species profiles, field guides, and the local knowledge and experience of GHD field ecologists, who have been involved in ecological surveys of the Atlas-Campaspe Mine area since 2015.

Habitat assessments were conducted with the presence of the following noted:

- Soil and landscape type
- Vegetation structure, presence of food trees, the density of understorey vegetation
- Rock outcrops, ground debris and leaf litter
- Burrows, dens and warrens
- Evidence of fauna occupation such as: distinctive scats or latrine sites; whitewash and regurgitated pellets under roost sites; tracks or animal remains

- Evidence of activity such as feeding scars, scratches and diggings

The locations and quantitative descriptions of significant habitat features were captured with a handheld GPS unit and photographed where appropriate.

Opportunistic observations

Opportunistic and incidental observations of fauna species were recorded during field surveys. This included a conscious focus on suitable areas of habitat during flora surveys, for instance fallen timber was scanned and/or turned for reptiles/frogs and mature trees and stags were scanned for roosting birds.

Aquatic habitat survey

There is no intermittent or permanent aquatic habitat or drainage lines at the Study area that would require specialist aquatic survey.

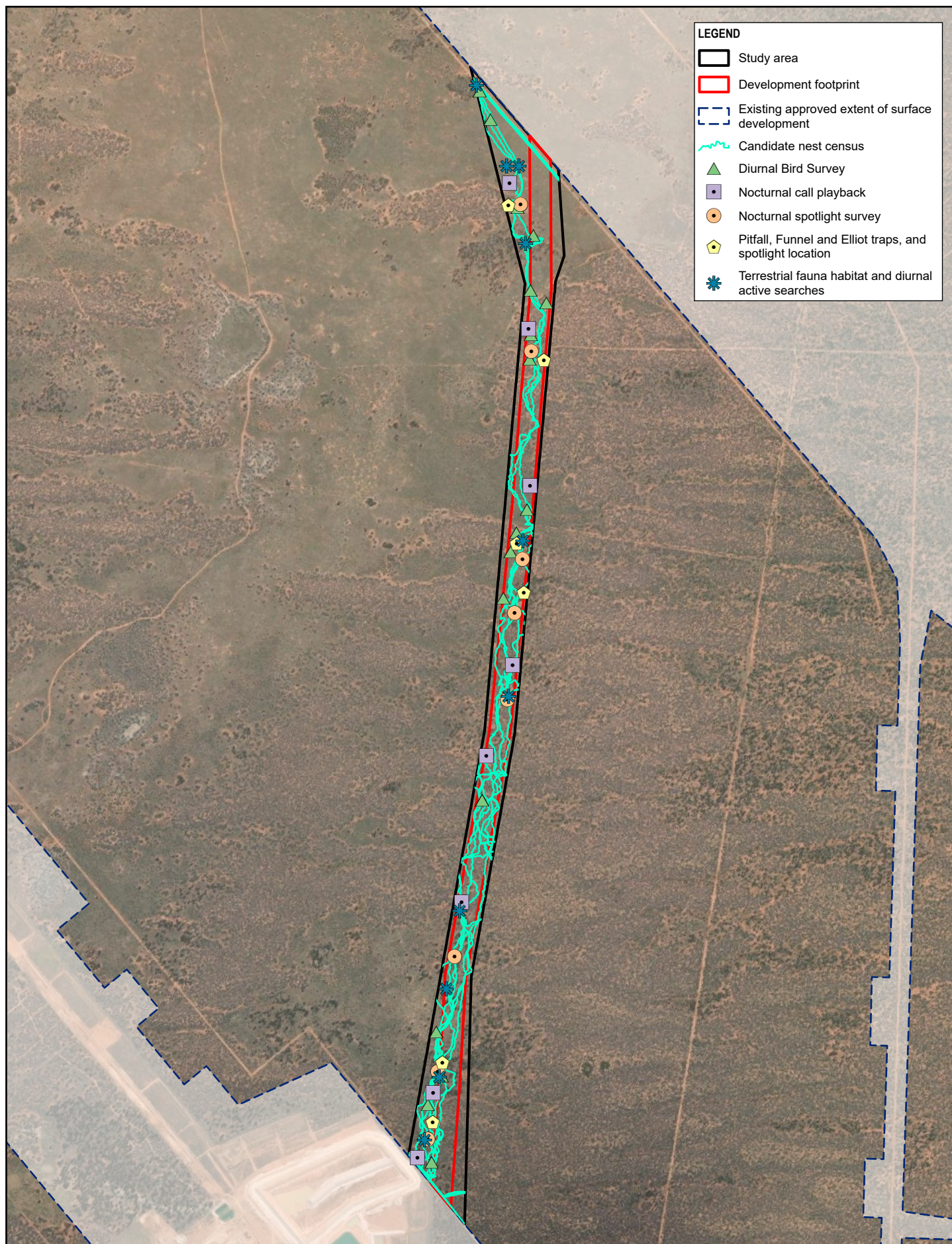
2.4.4 Targeted survey effort

A summary of the type and total effort of the targeted surveys completed for this BDAR is provided in Table 2.3 along with an assessment of the suitability of conditions for targeted survey based on the species targeted and associated survey guidelines. Daily details of weather conditions throughout survey periods are provided in Section 2.5.

Table 2.3 Targeted survey techniques and effort

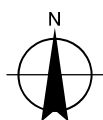
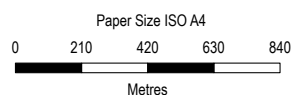
Survey type	Survey timing and effort	Suitability of conditions for targeted surveys
Systematic threatened flora traverses	Targeting threatened flora Seasonal systematic parallel walking traverses for threatened flora in suitable habitat throughout the Study area: 5 m to 10 m spaced traverses conducted by four people over three days (9 to 11 October 2024) 5 m to 10 m spaced traverses conducted by four people over two days (14 to 15 October 2024) 5 m to 10 m spaced traverses conducted by two people over one day (10 October 2025)	Overall: Good Average rainfall during the two months proceeding the survey led to good survey conditions for the October surveys in each year. Visibility was good across the Study area, and the entire footprint was accessible
Pitfall, Funnel and Elliot trapping	Targeting threatened reptiles, amphibians and small mammals Six survey sites, with five days and four nights of trapping between the 18-22 November 2024. Each pitfall site with six buckets along a 30 m canvacon fence (144 pitfall trap nights). Two funnel traps on each fence (48 funnel trap night). Ten Elliot traps at each site spaced 10 m apart (240 Elliot trap nights). Total effort = 144 pitfall trap nights, 48 funnel trap nights, 240 Elliot trap nights.	Overall: Good On-ground temperatures during trapping surveys varied between 27.1 and 36.3 degrees Celsius (°C) maximum and 10.8 and 24.4°C for minimum, which is suitable for these techniques and for detecting the target species. Moon cycles varied from full moon to a 3 rd quarter present during the survey. Visibility was good, with no fog, winds and/ or rain hampering detection.
Spotlight surveys for reptile, amphibian and small mammal species	Targeting threatened geckoes, snakes, amphibians and small mammals One night by eight ecologists and three nights of spotlighting active searches through areas of suitable habitat by four ecologists over at least two hours each from 18 to 22 November 2024 were conducted between the hours of 9 pm – 12:30 am. Total effort = >480-960 person minutes each night across three survey replicates = >1,920 person minutes of spotlighting.	Overall: Good On-ground temperatures during spotlighting surveys varied between 15 and 27°C, which is suitable for this technique and for detecting target species. Moon cycles varied from full moon to a 3 rd quarter present during the survey. Visibility was good, with no fog, winds and/ or rain hampering detection.
Call playback	Targeting threatened owls and Bush-Stone-curlew	Overall: Good

Survey type	Survey timing and effort	Suitability of conditions for targeted surveys
	One session of call playback per night over three separate nights from 18-22 November 2024 was conducted between the hours of 8 – 11 pm. Total effort = >1,440 person minutes of spotlighting. Three call playback sessions on separate nights.	On-ground temperatures during spotlighting surveys varied between 15 and 27°C, which is suitable for this technique and for detecting target species. Moon cycles varied from full moon to a 3rd quarter phase during the survey. Visibility was good, with no fog, winds and/ or rain hampering detection.
Reptile habitat surveys	Targeting threatened skinks and snakes Four consecutive days of active searches through areas of suitable reptile habitat in mid-morning or late afternoon, by four ecologists over at least one hour each day, from 18 to 22 November 2024 Total effort = >480 person minutes each night across four survey replicates = >1,920 person-minutes of diurnal searches.	Overall: Good Warm to hot daily temperatures. Morning surveys potentially conducive to basking individuals. Afternoon surveys conducive to active searches under refuge habitat. Suitability confirmed by direct observation of multiple individuals of non-target skink, dragon and snake species during survey rounds.
Nest tree census	Targeting threatened birds / general biodiversity survey Dedicated searches of the Study area and a 300 m buffer area over the period 14-16 October and 18-22 November 2024 including dedicated survey rounds at least 30 days apart. Total effort = Systematic coverage of the entire Study area and buffer area at least twice.	Overall: Good Visibility was good, with no fog, winds and/ or rain hampering detection. Open woodland allows easy visual access to all trees along alignment while walking the centreline.
Diurnal bird surveys	Targeting threatened birds Timed area searches in suitable habitat throughout the Study area. At least six separate bird surveys (of sixty minutes each) conducted on five separate days in mid-October and late November 2024 across the Study area including dedicated survey rounds at least 30 days apart. Total effort = six person-hours of area searches on five separate days = total 30 hours surveys.	Overall: Good Visibility was good, with no fog, winds and/ or rain hampering detection or bird activity.



LEGEND

- Study area
- Development footprint
- Existing approved extent of surface development
- ~~~~~ Candidate nest census
- ▲ Diurnal Bird Survey
- Nocturnal call playback
- Nocturnal spotlight survey
- ⬠ Pitfall, Funnel and Elliot traps, and spotlight location
- ✱ Terrestrial fauna habitat and diurnal active searches



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Project No. 12628564
Revision No. B
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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 54

Reptile habitat search

FIGURE 2.2

2.5 Survey conditions

Fauna surveys were undertaken in late spring and early summer. Conditions were generally warm. There was no rainfall during the 14 to 16 October or 18 to 22 November 2024 survey period.

Temperatures throughout all rounds of targeted survey were favourable for the detection of both diurnal and nocturnal reptiles potentially present within the Study area as summarised in Table 2.3. Wind during bird surveys was generally light to moderate and so would not have hampered the detection of bird species.

The dates and climatic conditions of surveys are summarised below in Table 2.4. Weather observations were recorded from the Atlas automated weather station.

As summarised in Table 2.3 conditions during each dedicated fauna survey round were suitable for the detection of target species. Notably:

- On-ground temperatures during spotlighting surveys were suitable for detecting target species as confirmed by direct observation of multiple individuals of non-target gecko and snake species during survey rounds
- Temperatures, wind and visibility during diurnal bird surveys and nest tree census were suitable for detecting target species as confirmed by observation of a high species richness and abundance of non-threatened native bird species

Prolonged dry conditions may, in general, have a negative effect on the ability to accurately detect target threatened flora species or calculate VI, particularly in semi-arid regions.

Cumulative rainfall recorded the Atlas Mine site automated weather station for the 12 months prior to mapping PCTs and sampling the majority of vegetation integrity plots in October and November 2024 was compared with wet or dry rainfall year thresholds to reflect climatic variation in accordance with the *Guidance for assessors and decision-makers in applying modified benchmarks to assessments of vegetation integrity* (DPIE 2020c) and section 1.4.2(3) of the BAM. As shown in Table 2.5, cumulative rainfall within the locality in the year proceeding the targeted flora surveys as within the range to apply the average year benchmarks for PCTs 171, 170, 143 and 58 (NSW DCCEEW 2025g).

Table 2.4 Daily weather observations during the survey period (Atlas Minesite automated weather station)

Date	Max Temp (°C)	Min Temp (°C)	Rainfall (mm)	Average wind direction	Average wind speed (km/h)	Max wind gust speed (km/h)
09/10/2024	20.0	5.3	0	S	9.5	34.3
10/10/2024	23.6	8.0	0	SE	5.2	21.3
11/10/2024	32.0	10.7	0	WSW	12.3	33.1
14/10/2024	30.0	14.5	0	SSE	5.4	30.8
15/10/2024	32.6	15.3	0	S	6.8	28.4
16/10/2024	29.9	14.9	0	E	9.9	39.0
11/11/2024	29.8	18.7	0	109.2	7	18.2
12/11/2024	29	16.9	0	29	6.7	22.3
13/11/2024	30.8	16	6.8	100.9	9.5	25.5
14/11/2024	27.3	12.7	0	208.4	11.7	25.1
15/11/2024	27.6	11.3	0	190.2	9	20.9
16/11/2024	30.8	14.9	0	103.6	7.2	18.2
17/11/2024	38.2	22.6	0.4	352.1	13.8	35.6
18/11/2024	28.3	10.8	0	SW	14.5	53.3
19/11/2024	27.1	12.8	0	SSW	10.1	31.9
20/11/2024	28.5	12.8	0	S	9.2	30.8
21/11/2024	31.6	17.7	0	SSE	7.7	22.5
22/11/2024	36.3	24.4	0	ESE	9.4	34.3

Table 2.5 Benchmark classes based on cumulative rainfall in year proceeding collection of BAM vegetation integrity plot data

PCT ID	Wet rainfall year threshold (cumulative total over 12 months mm) (NSW DCCEEW 2025d)	Average rainfall year threshold (cumulative total over 12 months mm) (NSW DCCEEW 2025d)	Dry rainfall year threshold (cumulative total over 12 months mm) (NSW DCCEEW 2025d)	Cumulative rainfall from October 2023-October 2024 (mm) (Atlas Minesite automated weather station)	Confirmed benchmark class
170	>357	207-357	<207	302	Average year
171	>318	186-318	<186	302	Average year
143	>334	186-334	<186	302	Average year
58	>328	198-328	<189	302	Average year

2.6 Credit calculations

BAM credit calculations were completed by Arien Quin (accredited assessor number BAAS17098) in accordance with the BAM and using the Credit calculator Version 1.5 (BAM-C) and version 1.2 'average rainfall year' benchmark data.

The credit calculations Parent case ID for the Proposal is 00051304. The assessment case is 00051304/BAAS17098/24/00051305 Revision 3.

The biodiversity credit report and threatened species reports are included in Appendix E.

2.6.1 Predicted threatened species (Ecosystem Credit Entities)

Based on the bioregional context for the assessment and the PCTs, patch size, vegetation cover and habitat resources present at the project site, the BAM-C generates a list of threatened fauna species that are predicted to utilise the Development footprint (that is, potential 'predicted threatened species', or potential 'ecosystem credit entities'). The potential for these predicted threatened species to occur within the site were further refined based on the desktop assessment, habitat resources observed during field surveys, records during the surveys, and the knowledge and experience of the assessor. Targeted surveys are not required under the BAM for these species.

Targeted surveys may, however, be required if the predicted species are also listed under the EPBC Act, to assess the significance of impacts in accordance with the *MNES Significant impact guidelines 1.1 – Environment Protection and Biodiversity Conservation Act 1999* (DotE 2013). A range of methods were employed to ensure appropriate survey effort for EPBC Act threatened species including diurnal bird surveys and nest tree census for threatened and migratory bird species; and spotlighting and reptile habitat searches for threatened reptiles (see section 2.4.2).

2.6.2 Candidate threatened species (Species Credit Entities)

Threatened species that cannot reliably be predicted to occur on a development site based on PCT, distribution and habitat criteria are identified by the TBDC (NSW DCCEEW 2025a) as 'species credit' entities. In some circumstances, the particular habitat components of species assessed for ecosystem credit species, such as the breeding habitat of a cave roosting bat, are also assessed for species credits.

The credit calculator references geographic, vegetation and habitat data for the project site to generate a list of the species credit entities that are predicted to occur (i.e. the 'potential candidate threatened species'). Searches of threatened species databases were also completed to identify any additional potential candidate threatened species (to those generated by the credit calculator) that are known or predicted to occur in the locality. The likelihood of occurrence of potential candidate threatened species were reviewed, giving consideration to the habitats available in the Study area (refer to likelihood of occurrence tables in Appendix B).

2.7 Assumptions

A 'Development footprint' polygon (that is, direct and indirect disturbance footprint) was prepared for the Proposal based on proposed infrastructure layout, design data and project description provided by Tronox. It is assumed that the description and spatial data accurately represent the extent of direct impacts arising from the Proposal and so these data have been used to calculate the extent of removal of vegetation and habitat arising from the Proposal using Geographic Information System (GIS). These calculations have in turn been relied upon in the BAM-C calculations and the determination of key thresholds such as whether the Proposal would have a direct impact on a threatened species, whether biodiversity offsets are required for a particular impact and whether a particular impact is likely to be significant. The assessment conclusions may change as a result of the provision of an updated site layout, project description and/or spatial data.

2.8 Staff qualifications

This BDAR and associated credit calculations has been prepared and certified by Arien Quin (accredited assessor number BAAS 17098). The credit calculator and BDAR were peer reviewed by Ben Harrington (accredited assessor number BAAS17023).

Qualifications of GHD ecologists who completed field surveys and contributed to report inputs are presented in Table 2.6.

Table 2.6 *Staff qualifications and project roles*

Name	Position/Project role	Qualifications	Relevant experience
Arien Quin	Technical director - Biodiversity / accredited assessor, lead author of BDAR, BAM VI plots, targeted threatened flora surveys, credit calculations	BSc (Botany) /BA (Anthropology/Development Studies) BAM Assessor Accreditation (BAAS 17098)	18+ years
Ben Harrington	Technical director- Biodiversity / technical review of report and credit calculations	BSc, MSc (Physical Geography) BAM Assessor Accreditation (BAAS 17023)	20 + years
Alex Holmes	Principal ecologist / targeted fauna surveys	BSc (Hons) Zoology	25+ years
Dan Eyles	Senior ecologist / lead zoologist, targeted fauna surveys, BDAR contributor	BSc (Hons) Zoology, BForSc. Grad Dip Ornithology.	17+ years
Zoe Jellie	Senior ecologist / BAM VI plots, targeted threatened flora surveys	BSc (Botany) VQA Accredited Assessor	17+ years
Brendan Janissen	Botanist / BAM VI plots, targeted threatened flora surveys	PhD, BSc (Botany) VQA Accredited Assessor	5+ years
Kelly Dalton	Senior ecologist / fauna surveys	BSc (Hons) Zoology	17+ years
Armando Gillado	Botanist / targeted flora surveys	BSc, VQA Accredited Assessor	4+ years
Lukas Fellows	Ecologist / fauna surveys	BSc, MSc (BioSciences).	5+ years
Emma Pacholli	Ecologist / fauna surveys	BSc (Zoology)	3 + years

Stage 1: Biodiversity Assessment

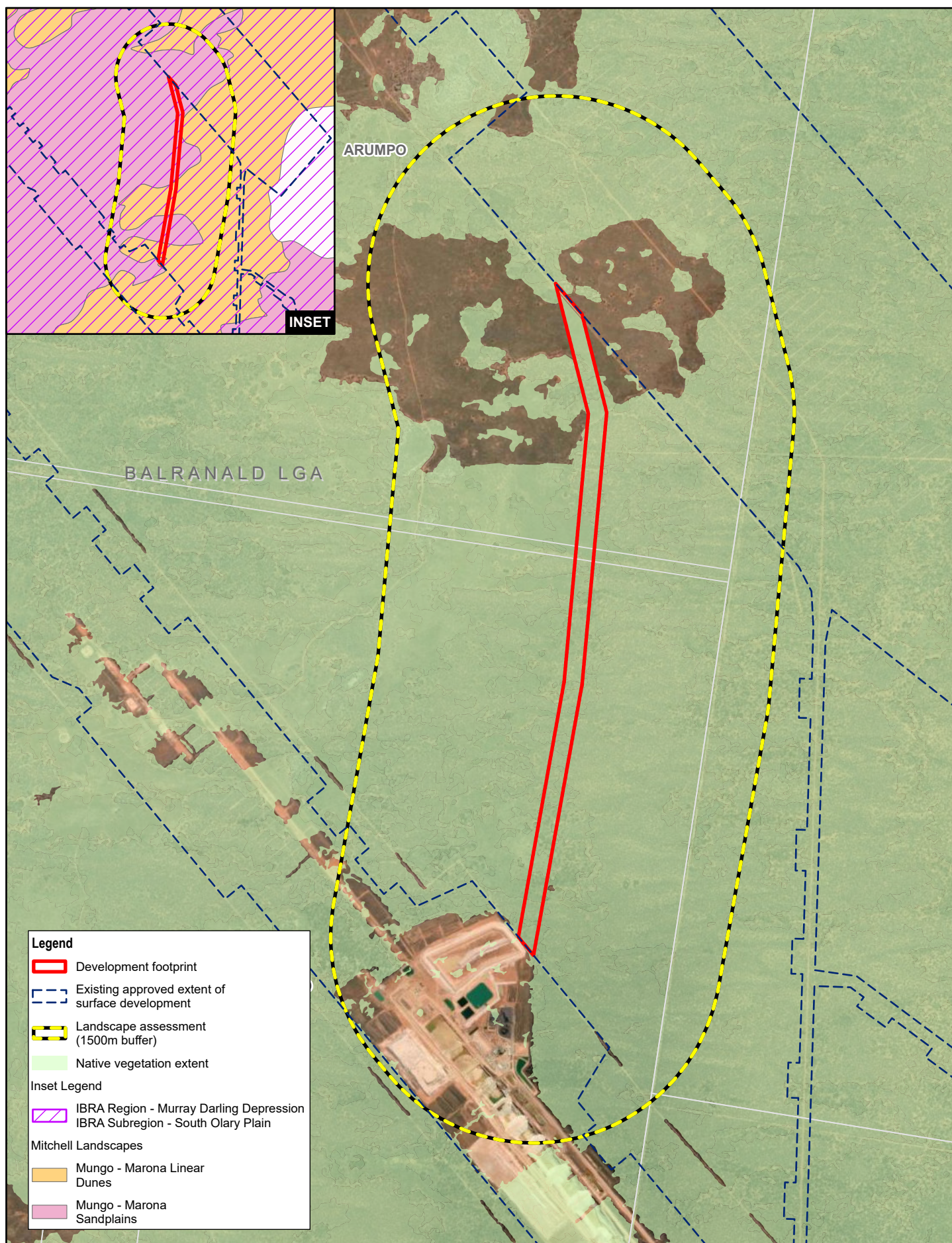
3. Site context

3.1 Assessment area

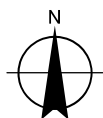
Landscape features identified within the Development footprint and Assessment Area are shown on Figure 3-1. A summary of the Assessment Area and landscape features is provided in Table 3.1 below. Individual landscape features are described in the sections below including justification for the data entered in the BAM-C.

Table 3.1 Summary of landscape features at the Study area

Landscape features	Study area
Method applied for site context components	Site-based
Lot / DPs	Lot 616 DP 761603 and Lot 1 DP 1196290
IBRA bioregion (DoEE 2018)	Murray Darling Depression
IBRA subregion (DoEE 2018)	South Olary Plain
Local Government Area (LGA)	Balranald Shire Council
Mitchell landscape (DPIE 2016)	Mungo-Marona Linear Dunes and Mungo-Marona Sandplains (for the purpose of the BAM-C calculations Mungo Marona Sandplains was entered as this is the dominant Mitchell landscape within the Development footprint)
Percentage native vegetation extent within buffer area	Greater than 78
Rivers, streams and estuaries	None
Wetlands	None
Connectivity features	Habitat within the Study area is connected to extensive areas of similar semi-arid woodland habitat in the surrounding locality. All vegetation zones have a patch size of >101 ha.
Areas of geological significance	The Study area does not contain any areas of geological significance
Soil hazard features	Soil landscapes and profiles for the Development footprint and surrounding buffer area indicate that the soils have low erosional risk and low acid sulphate potential. Localised mitigation measures such as sediment fences during site earthworks are likely to be sufficient to mitigate the risk of soil hazards.
Areas of outstanding biodiversity value (AOBV)	There are no areas identified under the BC Act as being of outstanding biodiversity value at the Study area or in the surrounding area.
Other landscape features	Nil



Paper Size ISO A4
0 0.3 0.6 0.9 1.2
Kilometres



Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 54



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Revision No. A
Date 20/11/2024

Location map

FIGURE 3.1

3.2 Landscape features

3.2.1 Rivers, streams, estuaries and wetlands

The Study area is located around 60 km to the north-west of the episodically inundated Box Creek, and more than 80 km from the Lachlan River – the nearest seasonal river to the site. The flat open areas surrounding the Study area have no significant drainage channels, with localised heavy rainfall draining into localised depressions containing Black Box woodlands or anthropogenically created dams for livestock, the nearest of which is just over 3 km to the north-west of the site.

3.2.2 Habitat connectivity

Native vegetation extent was mapped across the Study area using the SVTM (NSW DCCEEW 2025b) and adjusted based on the field assessment which included walking along the edges and mapping boundaries between vegetation zones using a hand held GPS unit. Patch size polygons were mapped in accordance with the BAM to include native vegetation in the Study area that has a gap of less than 100 m from the next area of native vegetation (or ≤ 30 m for non-woody ecosystems). Native vegetation and patch size polygons are shown on Figure 3-1.

Habitat within the Development footprint is extensively connected to areas of similar semi-arid woodland habitat in the surrounding locality and includes vegetation within the mine sites dedicated biodiversity offset area. There are a small number of unformed vehicle tracks running through the Development footprint. There are also two larger unformed roads that run through the northern and southern extent of the Development footprint.

The remainder of the Assessment Area and broader surrounding region are unpopulated and undeveloped. The nearest inhabited location is the associated Atlas-Campaspe Mine camp, located south of the Development footprint. The nearest areas cleared of vegetation are located immediately south of the Development footprint and are associated with the Atlas mine site deposit and haul road. Habitat connectivity is maintained across and beyond the Assessment Area other than gaps the width of a single lane vehicle track. All vegetation zones at the Development footprint have a patch size of >101 ha.

3.2.3 Geological features of significance

The Development footprint is located on a gently undulating sandplain and does not contain any mesas, substantial rock outcrops, karst, caves, crevices, cliffs or other significant geological features.

3.2.4 NSW (Mitchell) landscapes

NSW (Mitchell) landscapes within the Development footprint and Study area are shown on a Figure 3-1 and described in Table 3.2.

The majority of the Development footprint falls within the Mungo-Marona Sandplains Mitchell Landscapes. Parts of the corridor also intersect the Dunes and Mungo-Marona Linear Dunes Mitchell Landscape (NSW DCCEEW 2025d). The presence of both the Mungo-Marona Sandplain and Mungo-Marona Linear Dunes Mitchell landscapes within the Study area were confirmed during the site inspection. The Development footprint falls across both the Mungo-Marona Sandplains and Mungo-Marona Linear Dunes Mitchell Landscapes (NSW DCCEEW 2025d). For the purpose of the BAM calculations Mungo-Marona Sandplains Mitchell landscape was entered into the BAM-C consistent with the BAM Stage 1 Operational Manual (p.12) *If the subject land is located within more than one NSW (Mitchell) landscape, the assessor should select the NSW (Mitchell) landscape in which the largest proportion of impact or improvement will occur.*

Table 3.2 NSW (Mitchell) landscapes

Landscape name (DPIE 2016)	Description (DECC 2002)
Mungo-Marona Sandplains	This landscape includes parts of the Mandleman, Bulgamurra, Overnewton and Wikurra land systems. It consists of quaternary aeolian sands formed into sandplains with of a relief of 3-8 m. It includes scattered depressions and swamps to 500 m in diameter. Soils are brown sands, red sandy earths and solonized brown soils. Vegetation is described as White Cypress Pine (<i>Callitris glaucophylla</i>), Belah (<i>Casuarina cristata</i>), Western Rosewood (<i>Alectryon oleifolius</i>) and Mallee (<i>Eucalyptus</i> sp.). Scattered clumps of Narrow-leaved Hopbush (<i>Dodonaea viscosa</i> subsp <i>angustissima</i>) Turpentine Bush (<i>Eremophila sturtii</i>) and Black Bluebush (<i>Maireana pyramidata</i>) with variable speargrass (<i>Austrostipa variabilis</i>), Copperburrs (<i>Sclerolaena</i> sp.) and forbs.
Mungo-Marona Linear Dunes	Mungo-Marona Linear Dunes landscape is made up of part of the Arumpo land system. It comprises parallel east-west trending dunes and sandplain of Quaternary aeolian sands with deep loamy sand to sandy red soils with a relief to 7 m. Vegetation is characterised by dense Mallee (<i>Eucalyptus</i> sp.) and areas of Hard Spinifex (<i>Triodia irritans</i>) on dunes and sandplain. Narrow swales of calcareous loamy red earths with Belah (<i>Casuarina cristata</i>), Western Rosewood (<i>Alectryon oleifolius</i>), scattered shrubs, Variable Speargrass (<i>Austrostipa variabilis</i>), Copperburr (<i>Sclerolaena</i> sp.) and forbs.

3.2.5 Areas of outstanding biodiversity value

There are no AOBV listed under the NSW BC Regulation associated with the Study area.

3.2.6 Native vegetation cover

Native vegetation cover was mapped across the 1500 m buffer area surrounding the Development footprint using the SVTM (NSW DCCEE 2025b). The 'Existing approved extent of surface development' has been retained as native vegetation cover reflecting the situation at time of preparation of this BDAR. Based on ground truthing of the Development footprint (see section 3.2.6 below) and general observations in the locality, the SVTM appears to underestimate the native vegetation cover by assigning some areas that contain derived grassland vegetation as cleared. However, as the extent mapped (78 percent [%]) is greater than 70% which is the highest cover class mapping this number has been retained for the purposes of the assessment. Figure 3-1 shows native vegetation cover within the Development footprint and surrounding assessment area. Table 3.3 summarises the extent of native vegetation cover within the Assessment Area.

Table 3.3 Native vegetation cover

1500m buffer area (ha)	Native vegetation cover (ha)	Cover class
2,517	1,973 (78%)	>70%

3.2.7 Additional landscape features

There are no additional landscape features identified in Secretary's Environmental Assessment Requirements (SEARs), as no SEARs have been issued for the Modification.

4. Native vegetation, threatened ecological communities and vegetation integrity

4.1 Native vegetation extent

The following section describes the extent of native vegetation at the Development footprint that requires assessment according to Chapter 4 of the BAM (DPIE 2020a). Native vegetation extent was initially mapped across the Development footprint using modelled PCTs provided by the SVTM (NSW DCCEEW 2025b). High-resolution aerial photographs were also reviewed and ground-truthed during the GHD site surveys. Other than some small areas of disturbance associated with access tracks, the Development footprint was confirmed as containing native vegetation cover across its entire extent consistent with the SVTM (refer to Figure 4-1). There were some discrepancies with the SVTM vegetation mapping and GHD site observations which are discussed below. Descriptions of native vegetation within the Development footprint are provided in sections 4.3 and 4.4.

4.2 Existing information on native vegetation

The SVTM indicates that four PCTs occur within the Study area, one area mapped as “PCT not defined” is also mapped by the SVTM in the north of the Development footprint (NSW DCCEEW 2025b). PCTs modelled on the SVTM to occur within the Development footprint comprise:

- PCT 170 - Sandplain mallee of central NSW
- PCT 171 - Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion
- PCT 143 - Narrow-leaved Hopbush - Scrub Turpentine - Senna shrubland on semi-arid and arid sandplains and dunes
- PCT 58 - Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion

4.3 Plant community types

4.3.1 Overview

Field surveys confirmed the occurrence of PCTs 170, 171, 143 and 58 within the Development footprint although the boundaries observed on the ground differed to those mapped by the SVTM. Areas mapped on the SVTM as “PCT not defined” were determined to be a highly disturbed form of PCT 58 that has been subject to historic clearing.

A summary of the extent of each of these PCTs within the Development footprint is provided in Table 4.1 and vegetation zones based on these PCTs are mapped on Figure 4-1.

Table 4.1 *Plant community types in the Development footprint*

PCT Number	PCT Name	Condition	BC Act status	EPBC Act status	Extent in Development footprint (ha)
171	Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion	Intact	Not listed	Not listed	4.42
170	Sandplain mallee of central NSW	Intact	Not listed	Not listed	16.26
143	Narrow-leaved Hopbush – Scrub Turpentine- Senna shrubland on semi-arid and arid sandplains and dunes	Intact	Not listed	Not listed	5.54
58	Black-Oak -Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion.	Intact	Not listed	Not listed	14.42

PCT Number	PCT Name	Condition	BC Act status	EPBC Act status	Extent in Development footprint (ha)
58	Black-Oak -Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion.	Disturbed	Not listed	Not listed	4.42
58	Black-Oak -Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion.	Cleared	Not listed	Not listed	5.35

4.3.2 Justification of PCT Selection

A review of the SVTM indicates that the following candidate PCTs occur within the Study area (NSW DCCEEW 2025b):

- PCT 171 – Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion
- PCT 170 – Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones
- PCT 143 - Narrow-leaved Hopbush - Scrub Turpentine - Senna shrubland on semi-arid and arid sandplains and dunes
- PCT 58 - Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion

Plot data and other site observations were considered against these candidate PCTs. Characteristic species, vegetation structure, soil type and landscape position were evaluated and compared with descriptions of candidate PCTs in the BioNet vegetation classification database (NSW DCCEEW 2025c). The evidence used to confirm the selection of the best matching PCTs within the Study area is provided below.

PCT 171 Spinifex Linear Dune Mallee Mainly of the Murray Darling Depression Bioregion

Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion (PCT 171) is a good floristic match for areas of spinifex dominated shrubland at the Study area and is the best match for the vegetation composition, structure and landscape position of this vegetation zone within the Study area.

PCT 171 is described as a Mallee shrubland or open shrubland approximately five metres tall and most often as multiple thin stems emerging from a single base. Dominant species described that were also commonly observed within plots include White Mallee (*Eucalyptus dumosa*), Red Mallee (*Eucalyptus socialis*) and Ridge-fruited Mallee (*Eucalyptus costata*). The understorey of this community is described as dominated by Porcupine Grass (*Triodia scariosa*) (NSW DCCEEW 2025c) which was present as the dominant ground layer species in all of the four plots sampled within this vegetation zone.

Other floristically similar PCTs that were considered were PCT 170 and 173. Both of these PCTs were discounted as they are not characteristically dominated by Porcupine Grass and instead have an understorey characterised by Chenopod and/or grass species. The community attributes for PCT 173 describe Porcupine Grass as being only a minor component of the community and this species is absent from the species listed for PCT 170. Further, PCTs 170 and 173 are typically associated with sandplains and interdune swales rather than the east-west linear sand dune systems that are present where this community occurs at the Study area.

The BioNet Vegetation Classification PCT Filter Tool was used to provide a quantitative assessment of candidate PCTs to confirm the best PCT match (NSW DCCEEW 2025h). The following search criteria were entered in the PCT Filter Tool:

- IBRA region – ‘Murray-Darling Depression’
- IBRA subregion – ‘South Olary Plain’
- Vegetation Formation – ‘Semi-Arid Woodlands (Shrubby sub-formation)’
- Species – 23 characteristic plant species, that featured the highest cover, abundance, or frequency in the VI plots sampled within areas initially mapped as PCT 171

This assessment indicates that Spinifex Linear dune Mallee (PCT 171) is the best fit for this community as it has the largest number of positive matches for characteristic plant species (20 of the 43 listed on the vegetation classification database) as well as positive matches for vegetation formation, IBRA region and subregion. PCT 171 is also associated with the linear dune systems where it occurs on calcareous brown-red sand or loamy sand matching the landform and soils where this community occurs within the Study area.

Although there are no diagnostic species listed for the PCT within the vegetation classification database, 46% of the species listed in the description of PCT 171 were recorded in plots, opposed to just 30% of those listed for PCT 170 and 26% of those listed for PCT 173 (NSW DCCEEW 2025c).

PCT 170 Chenopod Sandplain Mallee Woodland/Shrubland of the Arid and Semi-Arid (Warm) Zones

PCT 170 – ‘Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones’ was confirmed as occurring on sand plains within the Study area although in different parts of the Study area than have been modelled on the SVTM.

The observed landscape position of the vegetation closely matches the descriptions for this PCT, which is known to occur on aeolian sandplains on inter dune plains and swales in the South Olary IBRA subregion of the Murray-Darling Depression IBRA region.

The vegetation structure and floristic composition closely fit the descriptive attributes of PCT 170, which describe the community as a Mallee shrubland or open shrubland typically eight metres tall, dominated by several mallee species including White Mallee (*Eucalyptus dumosa*), Red Mallee (*Eucalyptus socialis*), Glossy-leaved Red Mallee (*Eucalyptus oleosa*) and Snap and Rattle (*Eucalyptus gracilis*). The understorey of this community is described as dominated by Chenopod shrubs compared to mallee on sand dunes (i.e. the surrounding PCT 171) which is typically dominated by Porcupine Grass, or the mallee communities of the slightly wetter areas in the east (i.e. PCTs 173 and 175) which have an understorey dominated by forbs and grasses.

Other floristically similar PCTs which were considered based on interrogation of the vegetation classification database were PCTs 171, 172 and 173. As described above PCT 171 was discounted as it occurs on sand dunes as opposed to sandplains and has an understorey dominated by Porcupine Grass, which was not recorded within this vegetation zone. Similarly, PCT 172 was discounted as it also has a ground layer dominated by Porcupine Grass, is described as having a dense shrub layer which was not observed within this community and is mapped as occurring south-east of Pooncarie.

An analysis of the PCT filter tool supports the finding that the vegetation on sandplains within the Study area more closely aligns with PCT 170 than PCT 173 or PCT 172, with 16 matched attributes for PCT 170 as opposed to only 11 for both PCTs 173 and 172.

PCT 143 Narrow-leaved Hopbush - Scrub Turpentine - Senna shrubland on semi-arid and arid sandplains and dunes

Areas mapped as PCT 143 Narrow-leaved Hopbush – Scrub Turpentine – Senna shrubland on semi-arid and arid sandplains and dunes occur in discrete patches through the Development footprint. It is possible that within the site this community has formed due to previous vegetation disturbance and/or overgrazing, with Narrow-leaved Hopbush (*Dodonaea viscosa* subsp. *angustissima*) and Turpentine Bush (*Eremophila sturtii*) both being prolific colonisers and typically unpalatable to stock. Areas of shrubland dominated by Narrow-leaved Hopbush and Scrub Turpentine fit the descriptive attributes provided for this PCT in the vegetation classification database (NSW DCCEEW 2025c). This is supported by the presence of a large number of associated species including *Senna artemisioides*, Pimelea Daisy Bush (*Olearia pimeleoides*), Thorny Saltbush (*Rhagodia spinescens*) *Sclerolaena obliquicuspis*, *Sclerolaena diacantha*, Ruby Saltbush (*Enchylaena tomentosa*), *Austrostipa nitida*, and *Salsola australis*. The SVTM also has this PCT mapped throughout the Study area (although the boundaries varied slightly to those observed in the field).

Other floristically similar PCTs which were considered based on interrogation of the vegetation classification database were PCTs 170, 171, 172, 23, 153, 128, 154 and 58.

PCTs 170, 171 and 172 were primarily discounted due to the absence of Mallee eucalypts within this community.

PCT 23 was discounted due to the absent of Yarran (*Acacia homophylla*).

PCT 153 and 154 were discounted as the community was not dominated by Bluebush and PCT 58 was discounted due to the absence of Black Oak (*Casuarina pauper*) and Western Rosewood (*Alectryon oleifolius* subsp *canescens*).

An analysis of the PCT filter tool supports the finding that this vegetation zone corresponds with PCT 143 with 19 of the dominant species matching to this PCT.

PCT 58 Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion

Within the Development footprint areas of open woodland dominated by Black Oak and Western Rosewood (*Alectryon oleifolius* subsp *canescens*) best fit the PCT description for PCT 58 Black Oak- Western Rosewood open woodland on deep sandy loams. This vegetation is typically 7-10 m tall with a patchy understorey that includes areas of thick shrubs as well as more open grassy areas. The PCT occurs on level to undulating sandplains, sandy rises and interdune swales composed of calcareous earths of red to re-brown loam and sandy soils. The SVTM also has this PCT mapped throughout the Study area (although the boundaries varied slightly to those observed in the field).

Other similar PCTs considered but discounted were PCT 57 Belah/Black Oak -Western Rosewood – Wilga woodland of central NSW including the Cobar Peneplain Bioregion and PCT 59 Belah/Black Oak -Western Rosewood – Leopardwood low open woodland on sandplain and sandy flats in semi-arid (hot) and arid climate zones. PCT 57 was discounted based on the absence of Belah (*Casuarina cristata*) and Wilga. Further PCT 57 is typically associated with clay soils or claypans of siltclay and is mapped as occurring on the eastern and Northern edges of the Hay Plain.

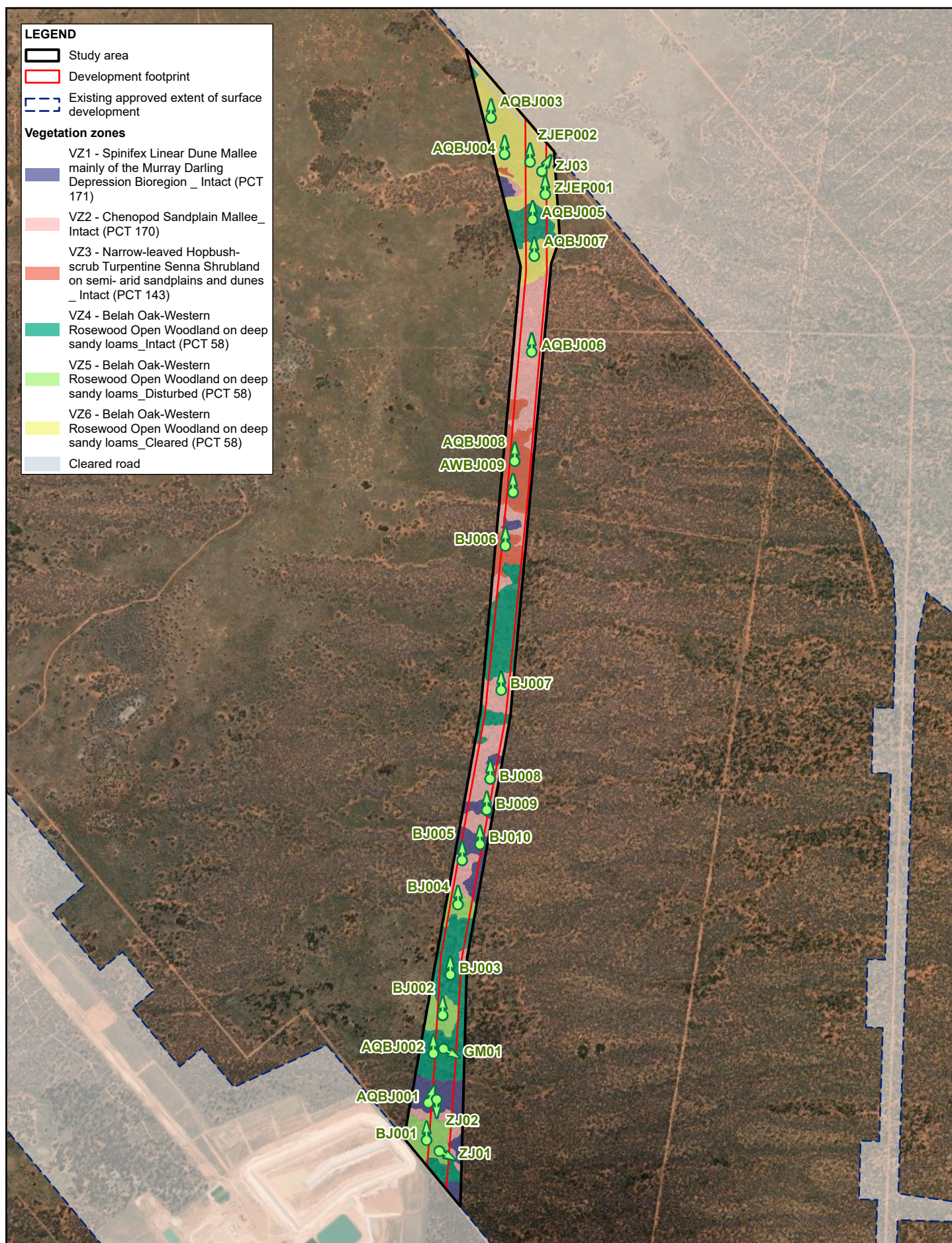
PCT 59 was discounted as although it has several floristic similarities to PCT 58, this PCT is not known to occur in the South Olary Plain subregion and none of the upper stratum associated species listed in the BioNet vegetation classification database were present within the site (i.e Leopardwood [*Flindersia maculosa*], Bimble Box [*Eucalyptus populnea* subsp *bimbi*], Whitewood [*Atalaya hemiglauca*], Gum Coolibah [*Eucalyptus intertexta*], Gidgee [*Acacia cambagei*] Belah (*Casuarina cristata*) or Beefwood [*Grevillea striata*]).

4.4 Vegetation zones

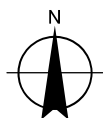
4.4.1 Overview

Each of the PCTs identified within the Study area was assigned to a separate vegetation zone. PCT 58 occurs in three different broad condition states (intact, disturbed and cleared) as such this PCTs was split into three separate vegetation zones based on condition classes. All references to condition are relative to version 1.2 'average year' benchmark data as stated in section 2.6, reflecting the average rainfall in the year preceding field surveys as described in section 1.1. The Development footprint occurs as part of an extensive patch of native vegetation that extends for thousands of hectares and so for each vegetation zone the patch size was entered in the BAM-C as 101 reflecting the highest patch size class in the BAM (>100 ha). PCTs and associated vegetation zones mapped within the Study area are shown in Figure 4-1 and summarised in Table 4.2.

The structure, species composition and condition of the vegetation zones within the Study area are described below. Plant species lists are provided in Appendix C and plot data is provided in Appendix D along with benchmark values for each PCT.



Paper Size ISO A4
0 200 400 600 800
Metres



Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 54



Tronox Mining Australia Ltd
Atlas-Campaspe Mineral Sands Project Modification 6
Biodiversity Development Assessment Report

Project No. 12628564
Revision No. B
Date 05/11/2025

Vegetation Zones

FIGURE 4.1

Table 4.2 **Vegetation zones and other vegetation in the Development Footprint**

Zone ID	PCT ID	PCT name	Condition	Area (ha) in Development footprint	Vegetation class	Patch size class	Number of VI plots required	VI plots sampled
1	171	Spinifex linear dune mallee mainly of the Murray darling Depression Bioregion	Intact	4.42	Dune Mallee Woodlands	☒ >100 ha	2	4 plots (including 3 within and 1 outside Development footprint) – ZJ02 – BJ009 – BJ010 – AQB001 (outside Development footprint not included in BAM-C)
2	170	Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zone	Intact	16.26	Sand Plain Mulga Shrublands	☒ >100 ha	3	4 plots (all within Development footprint) – BJ005 – AQB006 – BJ008 – BJ007
3	143	Narrow-leaved Hopbush – Scrub Turpentine- Senna shrubland on semi-arid and arid sandplains and dunes	Intact	5.54	Sand Plain Mulga Shrublands	☒ >100 ha	3	3 plots (all within Development footprint) – BJ006 – AQB009 – AQB008
4	58	Black-Oak -Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion.	Intact	14.42	Semi-arid Sand Plain Woodlands	☒ >100 ha	3	4 plots (including 3 within and 1 outside Development footprint) – BJ003 – AQB005 – GM01 – AQB002 (outside of Development footprint, not included in BAM-C)

Zone ID	PCT ID	PCT name	Condition	Area (ha) in Development footprint	Vegetation class	Patch size class	Number of VI plots required	VI plots sampled
5	58	Black-Oak -Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion.	Disturbed	4.42	Semi-arid Sand Plain Woodlands	☑ >100 ha	2	4 plots (including 3 within and 1 outside Development footprint) – ZJ01 – BJ002 – BJ004 – BJ001 (outside Development footprint, not included in BAM-C)
	58	Black-Oak -Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion.	Cleared	5.35	Semi-arid Sand Plain Woodlands	☑ >100 ha	3	6 plots (including 4 within and 3 outside Development footprint) – AQBJ007 – ZJ03 – ZJEP02 – AQBJ03, AQBJ04(outside Development footprint not included in BAM-C) – ZJEP01 (outside Development footprint ,not included in BAM-C)

4.4.2 Vegetation Integrity (vegetation condition)

Vegetation integrity (VI) scores calculated for the vegetation zones in the Development footprint are presented in Table 4.3 below.

Table 4.3 *Vegetation integrity scores*

Zone ID	Vegetation zone	Composition condition score	Structure condition score	Function condition score	VI score	Hollow bearing trees present
1	171_Intact	98.9	54.2	37.5	58.6	Yes
2	170_Intact	92.4	29.6	44.3	49.5	Yes
3	143_Intact	85.7	93.8	N/A	89.7	N/A
4	58_Intact	95.1	41.2	85.4	69.4	Yes
5	58_Disturbed	78.6	29.1	7	25.2	Yes
6	58_Cleared	76.3	9.9	17.4	23.6	No

4.4.3 Vegetation zone descriptions

Vegetation zone descriptions and representative site photographs are provided in Table 4-4.

Table 4.4 *Vegetation zone descriptions*

Zone 1 – PCT 171- Spinifex linear dune mallee mainly of the Murray darling Depression Bioregion – good	
PCT (NSW DCCEE 2025c)	Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion
PCT ID	171
Photo	
Survey effort	Three plots - ZJ02, BJ009, BJ010 (plus one plot AQB001 within Study area adjacent to Development footprint)

Zone 1 – PCT 171- Spinifex linear dune mallee mainly of the Murray darling Depression Bioregion – good	
Conservation significance	Native vegetation, not a TEC
Patch size	>100 ha
Condition	Intact – Overall, shrub, forb and fern composition met or was above the benchmark – Tree composition was slightly below the benchmark – Shrub, grass and forb cover was highly variable but overall above benchmark – Tree cover was slightly below benchmark – Length of fallen logs were significantly below benchmark – Leaf litter cover was slightly below benchmark – No high threat exotic plant (HTE) cover was recorded in plots – Hollow-bearing trees were recorded – Tree stem classes between 0 to 20 cm present
Current VI score	58.6
Landscape position	Occurs on east-west sand dunes
Structure	Open woodland to five metres tall dominated by Mallee eucalypts with a sparse shrub layer and understorey of mainly spinifex, chenopod shrubs, perennial grasses and annual herbs.
Over-storey	Dominated by a mix of Ridge-fruited Mallee (<i>Eucalyptus costata</i> subsp. <i>murrayana</i>), Red Mallee (<i>Eucalyptus socialis</i>) and White Mallee (<i>Eucalyptus dumosa</i>).
Mid-storey	Sparse mid-storey with approximately 20 percent cover. Common species include Narrow-leaved Hop Bush (<i>Dodonaea viscosa</i> subsp. <i>angustissima</i>), Tar Bush (<i>Eremophila glabra</i>), Sugarwood (<i>Myoporum platycarpum</i>), Spike Wattle (<i>Acacia oxycedrus</i>), Spinebush (<i>Acacia colletioides</i>) and <i>Senna artemisioides</i> subsp. <i>zygophylla</i> .
Groundcover	Dominated by Porcupine Grass (<i>Triodia scariosa</i>) and chenopod shrubs. Common species include: Shrubs: Grey Copperburr (<i>Sclerolaena diacantha</i>), Rough Halgania (<i>Halgania cyanea</i>), Slit-wing Bluebush (<i>Maireana georgei</i>), <i>Sclerolaena parviflora</i>, <i>Maireana pentatropis</i>, <i>Maireana trichoptera</i>, <i>Maireana appressa</i>, Ruby Saltbush (<i>Enchylaena tomentosa</i>), Desert Goosefoot (<i>Chenopodium desertorum</i> subsp. <i>desertorum</i>) and Pimelea Daisy-bush (<i>Olearia pimeleoides</i>). Forbs: <i>Vittadinia dissecta</i> var. <i>hirta</i>, Tall Mulla Mulla (<i>Ptilotus exaltatus</i> var. <i>exaltatus</i>) and Mallee Fringe Lily (<i>Thysanotus baueri</i>). Grasses and sedges Porcupine Grass (<i>Triodia scariosa</i>), Speargrass (<i>Austrostipa</i> spp), Panic (<i>Panicum</i> spp), <i>Paspalidium</i> spp, Woolly Matt-rush (<i>Lomandra leucocephala</i>) and Desert Bog-rush (<i>Schoenus subaphyllus</i>).
Exotic species	None recorded

Zone 2 – PCT 170- Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones

PCT (NSW DCCEE 2025c)	Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones
PCT ID	170
Photo	
Survey effort	Four plots - BJ005, AQB006, BJ008, BJ007
Conservation significance	Native vegetation, not a TEC
Patch size	>101 ha
Condition	Intact – Overall, shrub, forb and fern composition met or was above the benchmark – Tree composition was slightly below the benchmark – Shrub cover was substantially below benchmark – Grass and forb cover close to benchmark – Tree cover was below benchmark – Length of fallen logs was slightly below benchmark – Leaf litter cover was at benchmark – No HTE cover was recorded in plots – Hollow-bearing trees were recorded – Tree stem classes between 0-20 cm present
Current VI score	49.5
Landscape position	Occurs on sand plains and interdune swales
Structure	Tall woodland to eight metres, with occasional taller <i>Acacia</i> spp. and <i>Senna</i> spp. over a sparse, patchy understorey dominated by low chenopod shrubs, perennial grasses and annual herbs.
Over-storey	Dominated by a mix of White Mallee (<i>Eucalyptus dumosa</i>), Ridge-fruited Mallee (<i>Eucalyptus costata</i> subsp. <i>murrayana</i>) and Snap and Rattle (<i>Eucalyptus gracilis</i>).
Mid-storey	Sparse shrub layer with occasional Turpentine Bush (<i>Eremophila sturtii</i>), Narrow-leaved Hopbush (<i>Dodonaea viscosa</i> subsp. <i>angustissima</i>), Sugarwood (<i>Myoporum platycarpum</i>), Pimelea Daisy-bush (<i>Olearia pimeleoides</i>), <i>Senna artemisioides</i> subsp. <i>x zygophylla</i> and <i>Senna artemisioides</i> subsp. <i>x coriacea</i>

Zone 2 – PCT 170- Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones

Groundcover	Dominated by chenopod shrubs and perennial grasses. Characteristic species include: Shrubs: <i>Maireana pentatropis</i>, <i>Maireana triptera</i>, <i>Maireana trichoptera</i>, <i>Maireana appressa</i>, Slit-wing Bluebush (<i>Maireana georgei</i>), Grey Copperburr (<i>Sclerolaena diacantha</i>), <i>Sclerolaena parviflora</i>, Rough Halgania (<i>Halgania cyanea</i>), Desert Goosefoot (<i>Chenopodium desertorum</i> subsp. <i>desertorum</i>), Berry Saltbush (<i>Rhagodia spinescens</i>) and Mallee Saltbush (<i>Atriplex stipitata</i>). Forbs: <i>Vittadinia cervicalis</i>, Invisible Plant (<i>Podolepis capillaris</i>), Veined peppergrass (<i>Lepidium phlebopetalum</i>), Mallee Fringe Lily (<i>Thysanotus baueri</i>), <i>Stenopetalum sphaerocarpum</i> and Twinleaf (<i>Roepera</i> spp). Grasses: Speargrass (<i>Austrostipa</i> spp), Scented Mat-rush (<i>Lomandra effusa</i>), <i>Paspalidium</i> spp and <i>Austrostipa nitida</i>.
Exotic species	Burr Medic (<i>Medicago polymorpha</i>) recorded in low densities throughout vegetation zone.

Vegetation Zone 3 – PCT 143 Narrow-leaved Hopbush – Scrub Turpentine - Senna shrubland on semi-arid and arid sandplains and dunes

PCT (NSW DCCEEW 2025c)	Narrow-leaved Hopbush – Scrub Turpentine- Senna shrubland on semi-arid and arid sandplains and dunes
PCT ID	143
Photo	
Survey effort	Three plots - BJ006, AQB009, AQB008
Conservation significance	Native vegetation, not a TEC
Patch size	>101 ha

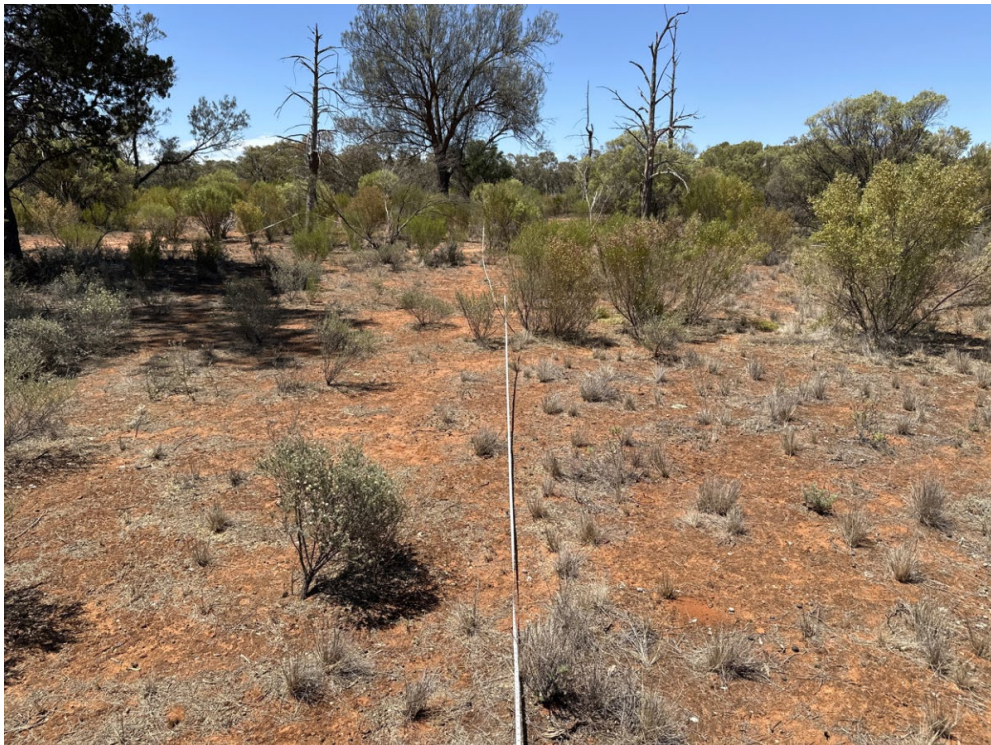
Vegetation Zone 3 – PCT 143 Narrow-leaved Hopbush – Scrub Turpentine - Senna shrubland on semi-arid and arid sandplains and dunes

Condition	Intact although community that is thought to have resulted through colonisation of Hopbush and Senna following past disturbance. – Tree composition is below benchmark – Shrub, grass and forb composition is close to benchmark – Shrub and forb cover is close to benchmark – Grass cover is above benchmark – One HTE recorded at just 0.1 cover in one plot
Current VI score	89.7
Landscape position	Occurs on previously disturbed dunes
Structure	Tall open shrubland to 3 meters
Over-storey	Absent
Mid-storey	Dominated by Narrow-leaved Hopbush (<i>Dodonaea viscosa</i> subsp. <i>angustissima</i>) and Turpentine Bush (<i>Eremophila sturtii</i>). Other common species include Dune Wattle (<i>Acacia ligulata</i>), <i>Exocarpos aphyllus</i>, Woody Cassia (<i>Senna artemisioides</i> subsp. <i>x petiolaris</i>), <i>Senna artemisioides</i> subsp. <i>x zygomphylla</i> and Leafless Ballart (<i>Exocarpos aphyllus</i>).
Groundcover	Sparse layer of chenopod shrubs with scattered forbs and perennial grasses. Common species include: Shrubs: <i>Maireana sclerolaenoides</i>, <i>Maireana trichoptera</i>, Three-winged Bluebush (<i>Maireana triptera</i>), Berry Saltbush (<i>Rhagodia spinescens</i>), Grey Copperburr (<i>Sclerolaena diacantha</i>), Desert Broombush (<i>Templetonia egeana</i>), Saltbush (<i>Enchylaena tomentosa</i>), Ruby Saltbush (<i>Enchylaena tomentosa</i>), <i>Maireana appressa</i>, Three-wing Bluebush (<i>Maireana triptera</i>), Pimelea Daisy-bush (<i>Olearia pimeleoides</i>), <i>Sclerolaena obliquicuspis</i> and Kidney Saltbush (<i>Atriplex stipitata</i>). Forbs: Variable daisy (<i>Brachyscome ciliaris</i>), Hard-headed Daisy (<i>Brachyscome lineariloba</i>), Orange Immortelle (<i>Waitzia acuminata</i>), <i>Goodenia</i> spp, Native Leek (<i>Bulbine semibarbata</i>), Variable Sida (<i>Sida corrugata</i>), Slit-wing Bluebush (<i>Maireana georgei</i>), <i>Convolvulus remotus</i>, Flannel Cudweed (<i>Actinobole uliginosum</i>), <i>Vittadinia cervicalis</i>, New Holland Daisy (<i>Vittadinia</i> spp.), <i>Oxalis</i> (<i>Oxalis perennans</i>), Climbing Saltbush (<i>Einadia nutans</i> subsp. <i>nutans</i>), <i>Harmsiodoxa brevipes</i> and Veined Peppergrass (<i>Lepidium phlebopetalum</i>). Grasses: Speargrass (<i>Austrostipa</i> spp.), <i>Austrostipa nitida</i>, Straw Wallaby-grass (<i>Rytidosperma richardsonii</i>) and Knottybutt Grass (<i>Paspalidium constrictum</i>)
Exotic species	Low cover of exotic species present within this PCT. Exotic species observed include, Burr Medic (<i>Medicago polymorpha</i>), Woolly Burr Medic (<i>Medicago minima</i>), Flax-leaf Alyssum (<i>Alyssum linifolium</i>), Vervain (<i>Salvia verbenaca</i>), <i>Rorippa</i> spp, Wards Weed (<i>Carrichtera annua</i>) (HTE) and Palestine Marigold (<i>Calendula palaestina</i>).

Vegetation Zone 4– PCT 58 - Black-Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion_Intact

PCT (NSW DCCEEW 2025c)	Black-Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion_Intact
PCT ID	58
Photo	
Survey effort	Three plots - AQB005, BJ003, GM01 (plus one plot AQB002 adjacent to Development footprint)
Conservation significance	Native vegetation, not a TEC
Patch size	>101 ha
Condition	Intact – Overall, shrub, forb and fern composition met or was above the benchmark – Tree composition was slightly below the benchmark – Shrub cover was substantially below benchmark – Grass and forb cover close to benchmark – Tree cover was slightly below benchmark – Length of fallen logs was slightly above benchmark – Leaf litter cover slightly above benchmark – No HTE cover was recorded in plots – Hollow-bearing trees were recorded – Tree stem classes between 0-30 cm present
VI Score	69.4
Landscape position	Occurs on calcareous soils on plains
Structure	Low open woodland to 10 meters,
Over-storey	Canopy dominated by Black Oak (<i>Casuarina pauper</i>) and Western Rosewood (<i>Alectryon oleifolius</i> subsp. <i>oleifolius</i>) with occasional Sugarwood (<i>Myoporum platycarpum</i> subsp. <i>platycarpum</i>).

Vegetation Zone 4– PCT 58 - Black-Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion_Intact	
Mid-storey	Sparse shrub layer with occasional Tar Bush (<i>Eremophila glabra</i>), Turpentine Bush (<i>Eremophila sturtii</i>), Pimelea Daisy-bush (<i>Olearia pimeleoides</i>), Narrow-leaved Hopbush (<i>Dodonaea viscosa</i> subsp. <i>angustissima</i>), Silver Cassia (<i>Senna artemisioides</i> X <i>artemisioides</i>) and Yarran (<i>Acacia homalophylla</i>).
Groundcover	Dominated by chenopod shrubs with scattered perennial grasses. Common species include: Shrubs: Three-wing Bluebush (<i>Maireana triptera</i>), <i>Maireana sclerolaenoides</i>, Grey Copperburr (<i>Sclerolaena diacantha</i>), <i>Sclerolaena obliquicuspis</i>, Cannonball Burr (<i>Dissocarpus paradoxus</i>), Ruby Saltbush (<i>Enchylaena tomentosa</i>), Kidney Saltbush (<i>Atriplex stipitata</i>), Berry Saltbush (<i>Rhagodia spinescens</i>), <i>Maireana appressa</i>, Desert Goosefoot (<i>Chenopodium desertorum</i> subsp. <i>desertorum</i>), Climbing Saltbush (<i>Einadia nutans</i> subsp. <i>nutans</i>), Slit-wing Bluebush (<i>Maireana georgei</i>), Black Bluebush (<i>Maireana pyramidata</i>) and Downy Bluebush (<i>Maireana trichoptera</i>) Forbs: New Holland Daisy (<i>Vittadinia</i> spp), Twinleaf (<i>Roepera</i> spp), <i>Lepidium leptopetalum</i>, Native Leek (<i>Bulbine semibarbata</i>), Flannel Cudweed (<i>Actinobole uliginosum</i>), Common White Sunray (<i>Rhodanthe floribunda</i>), Variable Daisy (<i>Brachyscome ciliaris</i>), Smooth Heliotrope (<i>Heliotropium curassavicum</i>), <i>Goodenia</i> spp., <i>Convolvulus remotus</i>, Pin Sida (<i>Sida fibulifera</i>), <i>Minuria cunninghamii</i>, Hard-headed Daisy (<i>Brachyscome lineariloba</i>) and <i>Rorippa</i> spp. Grasses: <i>Austrostipa nitida</i>, Speargrass (<i>Austrostipa</i> spp.), <i>Paspalidium constrictum</i> and <i>Rytidosperma</i> spp.
Exotic species	Exotic species recorded include Woolly Burr Medic (<i>Medicago minima</i>), Burr Medic (<i>Medicago polymorpha</i>), Mallee Catchfly (<i>Silene apetala</i>), Common Sowthistle (<i>Sonchus oleraceus</i>), <i>Arabidella nasturtium</i> , Wards Weed (<i>Carrichtera annua</i>) (HTE) and Flax-leaf Alyssum (<i>Alyssum linifolium</i>).

Vegetation Zone 4– PCT 58 - Black-Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion_Disturbed	
PCT (NSW DCCEEW 2025c)	Black-Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion_Disturbed
PCT ID	58
Photo	
Survey effort	Three plots - ZJ01, BJ002, BJ004 (plus one plot BJ001 within Study area adjacent to Development footprint)
Conservation significance	Native vegetation, not a TEC

Vegetation Zone 4– PCT 58 - Black-Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion_Disturbed

Patch size	>101 ha
Condition	Moderate- this vegetation zone has a disturbed canopy in poor health and an understorey with lower species richness and structural diversity when compared to vegetation zone 3. – Overall, shrub, forb and fern composition was slightly below the benchmark – Tree composition was below the benchmark – Tree and shrub cover was substantially below benchmark – Grass and forb cover close to benchmark – Number of large trees was below benchmark – Length of fallen logs was substantially below benchmark – Leaf litter cover was below benchmark – No HTE cover was recorded in plots – No hollow-bearing trees were recorded – Tree stem classes between 10-20 cm, 30-40 cm and 50-80 cm present
VI Score	25.2
Landscape position	Occurs on calcareous soils on plains
Structure	Low open woodland to 10 meters,
Over-storey	<i>Canopy</i> – Includes scattered Black Oak (<i>Casuarina pauper</i>) and Western Rosewood (<i>Alectryon oleifolius</i> subsp. <i>oleifolius</i>) with occasional Sugarwood (<i>Myoporum platycarpum</i> subsp. <i>platycarpum</i>) and Wilga (<i>Geijera parviflora</i>).
Mid-storey	Sparse shrub layer with occasional Tar Bush (<i>Eremophila glabra</i>), Turpentine Bush (<i>Eremophila sturtii</i>), Pimelea Daisy-bush (<i>Olearia pimeleoides</i>) and Narrow-leaved Hopbush (<i>Dodonaea viscosa</i> subsp. <i>angustissima</i>).
Groundcover	Dominated by chenopod shrubs with scattered perennial grasses. Common species include: Shrubs: Three-wing Bluebush (<i>Maireana triptera</i>), <i>Maireana sclerolaenoides</i>, Grey Copperburr (<i>Sclerolaena diacantha</i>), <i>Sclerolaena obliquicuspis</i>, Cannonball Burr (<i>Dissocarpus paradoxus</i>), Ruby Saltbush (<i>Enchylaena tomentosa</i>), Kidney Saltbush (<i>Atriplex stipitata</i>), Berry Saltbush (<i>Rhagodia spinescens</i>), Marsilea spp., (<i>Oxalis perennans</i>), Ballard (<i>Exocarpos</i> spp), <i>Maireana appressa</i>, Climbing Saltbush (<i>Einadia nutans</i> subsp. <i>nutans</i>), Slit-wing Bluebush (<i>Maireana georgei</i>) and Prickly Fan Flower (<i>Scaevola spinescens</i>). Forbs: <i>Vittadinia cervicalis</i>, Variable Daisy (<i>Brachyscome ciliaris</i>) and Hard-headed Daisy (<i>Brachyscome lineariloba</i>). Grasses: <i>Austrostipa nitida</i>, Speargrass (<i>Austrostipa</i> spp.) and <i>Paspalidium</i> spp.
Exotic species	Exotic species recorded include Salvia spp, Woolly Burr Medic (<i>Medicago minima</i>), Burr Medic (<i>Medicago polymorpha</i>) and Flax-leaf Alyssum (<i>Alyssum linifolium</i>).

Vegetation Zone 4– PCT 58 - Black-Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion_Cleared

PCT (NSW DCCEE 2025c)	Black-Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion_Cleared
PCT ID	58
Photo	
Survey effort	Three Plots AQB07, ZJ03, ZJEP02 (plus three plots within Study area adjacent to the Development footprint AQB03, AQB04 and ZJEP01).
Conservation significance	Native vegetation, not a TEC
Patch size	>101 ha
Condition	Poor – this community has been previously cleared. The community lacks a canopy and comprises a sparse shrub layer over a diverse ground layer. – Overall, shrub, forb and fern composition was below the benchmark – Trees and logs absent – Shrub cover was substantially below benchmark – Grass and forb cover close to benchmark – Length of fallen logs was substantially below benchmark – Leaf litter cover was below benchmark – One HTE recorded in plots – NO tree stem size classes present
VI Score	23.6
Landscape position	Occurs on calcareous soils on plains
Structure	Disturbed low open woodland to 10 meters,
Over-storey	Absent
Mid-storey	Sparse shrub layer with occasional Tar Bush (<i>Eremophila glabra</i>), Turpentine Bush (<i>Eremophila sturtii</i>), Pimelea Daisy-bush (<i>Olearia pimeleoides</i>), Narrow-leaved Hopbush (<i>Dodonaea viscosa</i> subsp. <i>angustissima</i>), Woody Cassia (<i>Senna artemisioides</i> subsp. <i>x petiolaris</i>), Silver Cassia (<i>Senna artemisioides</i> X <i>artemisioides</i>) and Yarran (<i>Acacia homalophylla</i>).

Vegetation Zone 4– PCT 58 - Black-Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion_Cleared

Groundcover	Dominated by chenopod shrubs with scattered perennial grasses. Common species include: Shrubs: Three-wing Bluebush (<i>Maireana triptera</i>), <i>Maireana sclerolaenoides</i>, Grey Copperburr (<i>Sclerolaena diacantha</i>), <i>Sclerolaena obliquicuspis</i>, Cannonball Burr (<i>Dissocarpus paradoxus</i>), <i>Salsola australis</i>, Ruby Saltbush (<i>Enchylaena tomentosa</i>), Kidney Saltbush (<i>Atriplex stipitata</i>), Berry Saltbush (<i>Rhagodia spinescens</i>), <i>Maireana appressa</i>, Desert Goosefoot (<i>Chenopodium desertorum</i> subsp. <i>desertorum</i>), Climbing Saltbush (<i>Einadia nutans</i> subsp. <i>nutans</i>), Slit-wing Bluebush (<i>Maireana georgei</i>), Black Bluebush (<i>Maireana pyramidata</i>), Downy Bluebush (<i>Maireana trichoptera</i>). Forbs: New Holland Daisy (<i>Vittadinia</i> spp), Native Leek (<i>Bulbine semibarbata</i>), Common White Sunray (<i>Rhodanthe floribunda</i>), <i>Goodenia</i> spp. and <i>Convolvulus remotus</i>, Grasses: <i>Austrostipa nitida</i>, Speargrass (<i>Austrostipa</i> spp.), <i>Paspalidium constrictum</i> and <i>Rytidosperma</i> spp.
Exotic species	Exotic species recorded include Vervain (<i>Salvia verbenaca</i>), Woolly Burr Medic (<i>Medicago minima</i>), Burr Medic (<i>Medicago polymorpha</i>), Barrel Medic (<i>Medicago truncatula</i>), Common Sowthistle (<i>Sonchus oleraceus</i>), Stemless Thistle (<i>Onopordum acaulon</i>), Horehound (<i>Marrubium vulgare</i>), Wards Weed (<i>Carrichtera annua</i>) (HTE) and Flax-leaf Alyssum (<i>Alyssum linifolium</i>).

4.5 Threatened ecological communities

The TBDC indicates that there is potential for PCTs that occur within the Study area to be associated with several TECs. PCTs, potential TEC associations and a summary of their occurrence within the Development footprint is provided in Table 4.5. Further detail regarding TEC attributes and assessment against PCT characteristics are provided below.

Table 4.5 Summary of PCTs within the Development footprint and their TEC associations

PCT ID	PCT Name	Potentially associated TECs (TBDC 2024)	Present within Study area
171	Spinifex linear dune mallee mainly of the Murray darling Depression Bioregion	Mallee Birds Ecological Community of the Murray Darling Depression Bioregion, listed as an EEC under the EPBC Act.	Yes
170	Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zone	<i>Acacia loderi</i> shrublands, listed as an EEC under the BC Act <i>Acacia melvillei</i> shrubland in the Riverina and Murray-Darling Depression Bioregion, listed as an EEC under the BC Act Plains mallee box woodlands of the Murray Darling Depression, Riverina and Naracoorte Coastal Plain Bioregions, listed as a critically endangered ecological community (CEEC) under the EPBC Act Mallee Birds Ecological Community of the Murray Darling Depression Bioregion, listed as an EEC under the EPBC Act.	No No No Yes
143	Narrow-leaved Hopbush – Scrub Turpentine-Senna shrubland on semi-arid and arid sandplains and dunes	<i>Acacia loderi</i> shrublands, listed as an EEC under the BC Act	No

PCT ID	PCT Name	Potentially associated TECs (TBDC 2024)	Present within Study area
58	Black-Oak -Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion.	<i>Acacia loderi</i> shrublands, listed as an EEC under the BC Act <i>Acacia melvillei</i> shrubland in the Riverina and Murray-Darling Depression Bioregion, listed as an EEC under the BC Act	No No

4.5.1 Mallee Bird Ecological Community of the Murray Darling Depression Bioregion

The Mallee Bird Ecological Community of the Murray Darling Depression Bioregion (the Mallee Bird Community) is listed as an EEC under the EPBC Act. The community comprises an assemblage of 20 bird species that rely on mallee habitats to varying degrees for their continued persistence within the Murray Darling Depression bioregion, with some species considered *mallee specialists*; bird species found almost exclusively in mallee habitats, especially within the Murray Darling Depression bioregion, and which the loss of suitable mallee habitats can potentially lead to their extinction at a local or regional scale (DAWE 2021a). *Mallee dependent* species are a suite of bird species dependent on mallee where it is present, but have a wider range extending into non-mallee woodland and shrubland habitats, and loss of suitable mallee habitats for these species may not lead to extinction but result in substantial declines in abundance in the Murray Darling Depression, as well as loss of ecological diversity (DAWE 2021a).

This EEC was recorded within the Development footprint and is associated with both PCT 170 and 171.

The Development footprint is located within the geographic boundary of the Mallee Bird Community and contains mallee habitat (PCT 171) Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion (4.42 ha) and PCT 170 Sandplain mallee of central NSW (16.26 ha) that would be removed or modified by the Project. Surveys undertaken across the broader Atlas-Campaspe Mine over several years, including targeted fauna surveys for this BDAR, have recorded at least two of the eight mallee specialist species (Chestnut Quail-thrush [*Cinclosoma castanotum*] and Malleefowl [*Leipoa ocellata*] in the broader area), and at least seven of the 12 mallee dependent bird species (Appendix C). These findings are considered sufficient to consider the Mallee Bird Community as being present at this site, and of condition category A – high number of Mallee Bird Community species as defined in the approved conservation advice (DAWE 2021a).

The Mallee Bird Community is threatened primarily by the clearing of mallee habitats and their fragmentation into smaller, degraded remnants that are more susceptible to invasive species, fire impacts and climate change and hence less suitable to sustain a diverse assemblage of birds and the other flora and fauna on which they depend. The conservation advice for this EEC lists altered fire regimes, fragmentation legacies, clearing, climate change and severe weather, pest animals and grazing, and weeds as the key threats to this bird community (DAWE 2021a).

4.5.2 Plains Mallee Box Woodlands of the Murray Darling Depression, Riverina and Naracoorte Coastal Plain Bioregions

Although PCT 170 has some of the key diagnostic characteristics associated with Plains Mallee Box Woodlands of the Murray Darling Depression, Riverina and Naracoorte Coastal Plain Bioregions, this CEEC was discounted from occurring within the Development footprint as patches of PCT 170 do not occur on duplex, clay loam or sandy clay loam topsoils above deep fine textured clay subsoils. Soils that support PCT 170 within the Development footprint are instead characterised by deep red sands. This CEEC is also diagnosed by a ground layer dominated by tussock grasses (DAWE 2021b) which were typically absent from this PCT within the Development footprint, with just 2 to 3.3% total grass cover recorded in VI plots.

4.5.3 *Acacia loderi* and *Acacia melvillei* shrublands

Acacia loderi shrublands and *Acacia melvillei* shrubland EEC can be discounted from occurring within the Development footprint and neither *Acacia loderi* nor *Acacia melvillei* were recorded within the Study area during surveys.

4.6 Priority weeds and exotic species

No priority weeds were recorded within the Study area. Several environmental weeds and HTEs were recorded within the Development footprint most of which were observed within PCT 58_ cleared. These included:

- Vervain (*Salvia verbenaca*)
- Stemless Thistle (*Onopordum acaulon*)
- Horehound (*Marrubium vulgare*) and
- Wards Weed (*Carrichtera annua*)

5. Habitat suitability for threatened and migratory species

5.1 Identification of threatened species for assessment

5.1.1 Ecosystem credit species

Based on the bioregional context for the assessment and the PCTs, patch size, vegetation cover and habitat resources present within the Development footprint, the BAM-C generates a list of threatened fauna species that are predicted to utilise the site (that is, potential 'predicted threatened species', or potential 'ecosystem credit entities'). The potential for these predicted threatened species to occur within the Development footprint was further refined based on the desktop assessment, habitat resources observed during field surveys, records during the surveys, and the knowledge and experience of the assessor. Targeted surveys are not required under the BAM for these species as they are assumed to be present in the PCTs within the Development footprint.

Table 5-1 lists all ecosystem credit species that are considered likely to occur on or use the Development footprint. The list of ecosystem credit species was compiled based on the following information as summarised in the 'Source' column of Table 5-1:

- 'BAM-C', meaning the list of potential ecosystem credit species generated by the BAM-C Version 1.5 based on location and vegetation data for the subject site and the TBDC
- 'Previous survey', meaning a direct observation of the species at the subject site as part of a previous assessments within the surrounding area for the Atlas-Campaspe Minesite
- 'Current survey' meaning directly observed within the Study area during field surveys conducted for the Proposal
- 'Desktop review' meaning evidence that the species would occur at the Development footprint based on BioNet Atlas records (NSW DCCEEW 2025a) or revealed by other information sources

Table 5.1 does not include species predicted by the PMST search, unless suitable habitat for these species was recorded within the subject site.

In accordance with BAM Subsections 5.2.1 and 5.2.2 (DPIE 2020a) geographic limitations, habitat constraints and vagrant species are the only reasons used for excluding ecosystem credit species.

In accordance with Step 2 of Section 5.2 of the BAM (DPIE 2020a), the following predicted species generated by the BAM-C are excluded from further assessment for ecosystem credits:

- White-bellied Sea Eagle (foraging) (*Haliaeetus leucogaster*)
- Regent Parrot (foraging) (*Polytelis anthopeplus monarchoides*)
- Painted Honeyeater (*Grantiella picta*)

Reasons for exclusion of these three species are provided in Table 5.1. Table 5-1 also identifies and provides justifications for the removal of species from the BAM-C auto-populated list in accordance with BAM Subsections 5.2.1 and 5.2.2 (DPIE 2020a). Geographic limitations, habitat constraints and vagrant species are the only reasons used for excluding ecosystem credit species.

Four ecosystem credit species were recorded during field surveys, the Jewelled Gecko (*Strophurus elderi*), Chestnut Quail-thrush, Hooded Robin (south-eastern) (*Melanodryas cucullata cucullata*), and Southern Whiteface (*Aphelocephala leucopsis*). The locations of threatened fauna observations are shown on Figure 5-1 (noting more than one individual was recorded at some locations) and described in Table 5.2.

Table 5.1 Predicted (ecosystem credit) species

Scientific name	Common name	BC Act status	EPBC Act status	Dual credit species	Sources	Species retained for further assessment	Reason for exclusion from further assessment	Associated vegetation zone	Sensitivity to gain class
<i>Antechinomys laniger</i>	Kultarr	E	-		☒ BAM-C ☐ Current survey ☐ Previous survey ☐ Desktop review	Yes	NA	171_Intact 170_Intact 143_Intact 58_Intact 58_Disturbed 58_Cleared	High
<i>Aphelocephala leucopsis</i>	Southern Whiteface	V	V		☒ BAM-C ☒ Current survey ☒ Previous survey ☐ Desktop review	Yes	NA	170_Intact 143_Intact 58_Intact 58_Disturbed 58_Cleared	Low
<i>Aprasia inaurita</i>	Mallee Worm-lizard	E	-		☒ BAM-C ☐ Current survey ☐ Previous survey ☒ Desktop review	Yes	NA	171_Intact 170_Intact	Moderate
<i>Artamus cyanopterus cyanopterus</i>	Dusky Woodswallow	V	-		☒ BAM-C ☐ Current survey ☒ Previous survey ☒ Desktop review	Yes	NA	171_Intact 170_Intact 143_Intact 58_Intact 58_Disturbed 58_Cleared	Moderate
<i>Cercartetus concinnus</i>	Western Pygmy Possum	V	-		☒ BAM-C ☐ Current survey ☐ Previous survey ☒ Desktop review	Yes	NA	171_Intact 170_Intact 58_Intact 58_Disturbed 58_Cleared	High

Scientific name	Common name	BC Act status	EPBC Act status	Dual credit species	Sources	Species retained for further assessment	Reason for exclusion from further assessment	Associated vegetation zone	Sensitivity to gain class
<i>Certhionyx variegatus</i>	Pied Honeyeater	V	-		☒ BAM-C ☐ Current survey ☐ Previous survey ☒ Desktop review	Yes	NA	171_Intact 170_Intact 143_Intact 58_Intact 58_Disturbed 58_Cleared	High
<i>Chalinolobus picatus</i>	Little Pied Bat	V	-		☒ BAM-C ☐ Current survey ☐ Previous survey ☒ Desktop review	Yes	NA	171_Intact 170_Intact 143_Intact 58_Intact 58_Disturbed 58_Cleared	High
<i>Cinclosoma castanotum</i>	Chestnut Quail-thrush	V	-		☒ BAM-C ☒ Current survey ☒ Previous survey ☐ Desktop review	Yes	NA	171_Intact 170_Intact	High
<i>Circus assimilis</i>	Spotted Harrier	V	-		☒ BAM-C ☐ Current survey ☐ Previous survey ☐ Desktop review	Yes	NA	171_Intact 170_Intact 143_Intact 58_Intact 58_Disturbed 58_Cleared	Moderate
<i>Ctenotus brooksi</i>	Wedgesnout Ctenotus	V	-		☒ BAM-C ☐ Current survey ☒ Previous survey ☐ Desktop review	Yes	NA	171_Intact 143_Intact	High

Scientific name	Common name	BC Act status	EPBC Act status	Dual credit species	Sources	Species retained for further assessment	Reason for exclusion from further assessment	Associated vegetation zone	Sensitivity to gain class
<i>Cyclodomorphus melanops elongatus</i>	Mallee Slender Blue-tongue Lizard	E	-		☒ BAM-C ☐ Current survey ☐ Previous survey ☐ Desktop review	Yes	NA	171_Intact	High
<i>Daphoenositta chrysoptera</i>	Varied Sittella	V	-		☒ BAM-C ☐ Current survey ☐ Previous survey ☒ Desktop review	Yes	NA	171_Intact 170_Intact 58_Intact 58_Disturbed 58_Cleared	High
<i>Delma australis</i>	Marble-faced Delma	E	-		☒ BAM-C ☐ Current survey ☐ Previous survey ☐ Desktop review	Yes	NA	171_Intact 170_Intact	Moderate
<i>Drymodes brunneopygia</i>	Southern Scrub-robin	V	-		☒ BAM-C ☐ Current survey ☐ Previous survey ☐ Desktop review	Yes	NA	171_Intact	Moderate
<i>Echiopsis curta</i>	Bardick	E	-	-	☒ BAM-C ☐ Current survey ☐ Previous survey ☐ Desktop review	Yes	NA	171_Intact	Moderate
<i>Falco hypoleucos</i>	Grey Falcon	E	-		☒ BAM-C ☐ Current survey ☐ Previous survey ☐ Desktop review	Yes	NA	171_Intact 170_Intact 143_Intact 58_Intact 58_Disturbed 58_Cleared	Moderate

Scientific name	Common name	BC Act status	EPBC Act status	Dual credit species	Sources	Species retained for further assessment	Reason for exclusion from further assessment	Associated vegetation zone	Sensitivity to gain class
<i>Falco subniger</i>	Black Falcon	V	-		☒ BAM-C ☐ Current survey ☐ Previous survey ☐ Desktop review	Yes	NA	171_Intact 170_Intact 143_Intact 58_Intact 58_Disturbed 58_Cleared	Moderate
<i>Glossopsitta porphyrocephala</i>	Purple-crowned Lorikeet	V	-		☒ BAM-C ☐ Current survey ☐ Previous survey ☐ Desktop review	Yes	NA	171_Intact 170_Intact	High
<i>Grantiella picta</i>	Painted Honeyeater	V	V		☒ BAM-C ☐ Current survey ☐ Previous survey ☐ Desktop review	No	Mistletoes are not present at a density of greater than five mistletoes per hectare	N/A	
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	V	M	Yes	☒ BAM-C ☐ Current survey ☐ Previous survey ☐ Desktop review	No	Habitat constraints (Development footprint is not within 1 km of a river, lakes, large dams or creek, wetlands and coastlines)	N/A	High
<i>Hamirostra melanosternon</i>	Black-breasted Buzzard (foraging)	V	-		☒ BAM-C ☐ Current survey ☐ Previous survey ☐ Desktop review	Yes	NA	171_Intact 170_Intact 143_Intact 58_Intact 58_Disturbed 58_Cleared	Moderate

Scientific name	Common name	BC Act status	EPBC Act status	Dual credit species	Sources	Species retained for further assessment	Reason for exclusion from further assessment	Associated vegetation zone	Sensitivity to gain class
<i>Hieraaetus morphnoides</i>	Little Eagle (foraging)	V	-	Yes	☒ BAM-C ☐ Current survey ☐ Previous survey ☒ Desktop review	Yes	NA	171_Intact 170_Intact 143_Intact 58_Intact 58_Disturbed 58_Cleared	Moderate
<i>Hylacola cautus</i>	Shy Heathwren	V	-		☒ BAM-C ☐ Current survey ☐ Previous survey ☐ Desktop review	Yes	NA	170_Intact	High
<i>Leipoa ocellata</i>	Malleefowl	E	V		☒ BAM-C ☐ Current survey ☒ Previous survey ☐ Desktop review	Yes	NA	171_Intact 170_Intact	High
<i>Lerista xanthura</i>	Yellow-tailed Plain Slider	V			☒ BAM-C ☐ Current survey ☐ Previous survey ☐ Desktop review	Yes	NA	171_Intact 170_Intact 143_Intact 58_Intact 58_Disturbed 58_Cleared	High
<i>Lichenostomus cratitius</i>	Purple-gaped Honeyeater	V			☒ BAM-C ☐ Current survey ☐ Previous survey ☐ Desktop review	Yes	NA	171_Intact 170_Intact	Moderate

Scientific name	Common name	BC Act status	EPBC Act status	Dual credit species	Sources	Species retained for further assessment	Reason for exclusion from further assessment	Associated vegetation zone	Sensitivity to gain class
<i>Lophochroa leadbeateri</i>	Pink Cockatoo (foraging)	V	E	Yes	☒ BAM-C ☒ Current survey ☒ Previous survey ☐ Desktop review	Yes	NA	171_Intact 170_Intact 143_Intact 58_Intact 58_Disturbed	Moderate
<i>Lophoicinia isura</i>	Squared-tailed Kite (foraging)	V	-	Yes	☒ BAM-C ☐ Current survey ☒ Previous survey ☐ Desktop review	Yes	NA	58_Intact 58_Disturbed 58_Cleared	Moderate
<i>Melanodryas cucullata cucullata</i>	Hooded Robin (south-eastern form)	E	E		☒ BAM-C ☒ Current survey ☒ Previous survey ☐ Desktop review	Yes	NA	171_Intact 170_Intact 143_Intact 58_Intact 58_Disturbed 58_Cleared	Moderate
<i>Neophema chrysostoma</i>	Blue-winged Parrot	V	V		☒ BAM-C ☐ Current survey ☐ Previous survey ☒ Desktop review	Yes	NA	171_Intact 170_Intact	Low
<i>Neophema splendida</i>	Scarlet-chested Parrot	V	-		☒ BAM-C ☐ Current survey ☐ Previous survey ☐ Desktop review	Yes	NA	171_Intact 170_Intact	High
<i>Ningau i yvonneae</i>	Southern Ningau i	V	-		☒ BAM-C ☐ Current survey ☒ Previous survey ☐ Desktop review	Yes	NA	170_Intact	High

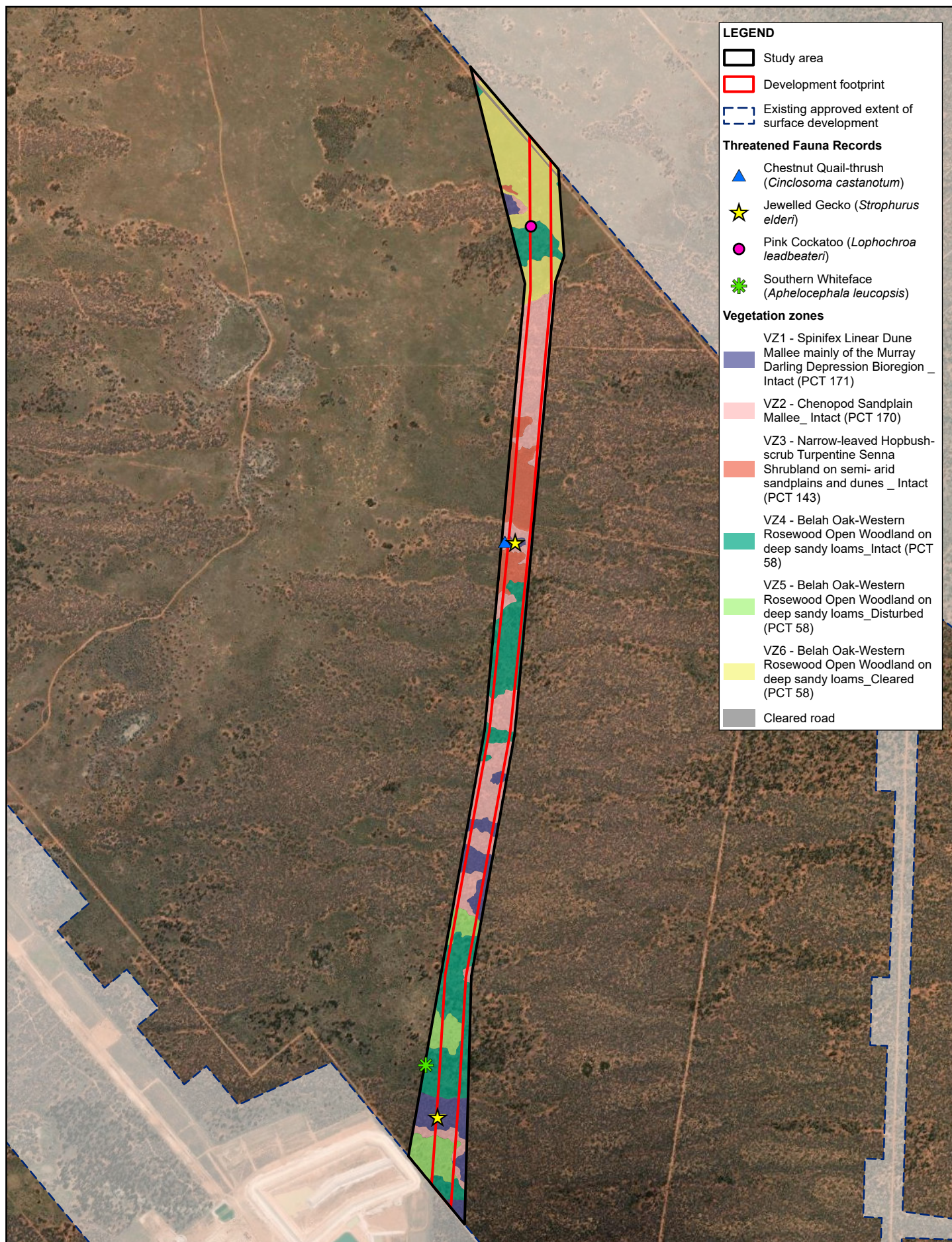
Scientific name	Common name	BC Act status	EPBC Act status	Dual credit species	Sources	Species retained for further assessment	Reason for exclusion from further assessment	Associated vegetation zone	Sensitivity to gain class
<i>Nyctophilus corbeni</i>	Corben's Long-eared Bat	V	V		☒ BAM-C ☐ Current survey ☒ Previous survey ☐ Desktop review	Yes	NA	170_Intact 58_Intact 58_Disturbed 58_Cleared	High
<i>Pachycephala inornata</i>	Gilbert's Whistler	V	-		☒ BAM-C ☐ Current survey ☐ Previous survey ☒ Desktop review	Yes	NA	170_Intact 58_Intact 58_Disturbed 58_Cleared	Moderate
<i>Polytelis anthopeplus monarchoides</i>	Regent Parrot (eastern subspecies) (foraging)	E	V	Yes	☒ BAM-C ☐ Current survey ☐ Previous survey ☐ Desktop review	No	Geographic limitation (Development footprint is not within 30 km of the Murray or Murrumbidgee rivers)	N/A	Moderate
<i>Pomotostomus temporalis temporalis</i>	Grey-crowned Babbler	V	-		☒ BAM-C ☐ Current survey ☐ Previous survey ☐ Desktop review	Yes	NA	143_Intact 58_Intact	Moderate
<i>Pseudomys bolami</i>	Bolam's Mouse	E	-		☒ BAM-C ☐ Current survey ☐ Previous survey ☐ Desktop review	Yes	NA	171_Intact 170_Intact 58_Intact 58_Disturbed	High

Scientific name	Common name	BC Act status	EPBC Act status	Dual credit species	Sources	Species retained for further assessment	Reason for exclusion from further assessment	Associated vegetation zone	Sensitivity to gain class
<i>Pseudomys hermannsburgensis</i>	Sandy Inland Mouse	V	-		☒ BAM-C ☐ Current survey ☐ Previous survey ☐ Desktop review	Yes	NA	171_Intact 143_Intact 58_Intact 58_Disturbed 58_Cleared	High
<i>Pseudonaja modesta</i>	Ringed Brown Snake	E	-		☒ BAM-C ☐ Current survey ☐ Previous survey ☐ Desktop review	Yes	NA	171_Intact 170_Intact 143_Intact 58_Intact 58_Disturbed 58_Cleared	Moderate
<i>Ramphotyphlops endoterus</i>	Interior Blind Snake	E	-		☒ BAM-C ☐ Current survey ☐ Previous survey ☐ Desktop review	Yes	NA	143_Intact	Moderate
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheathtail-bat	V	-		☒ BAM-C ☐ Current survey ☐ Previous survey ☐ Desktop review	Yes	NA	170_Intact 143_Intact 58_Intact 58_Disturbed 58_Cleared	High
<i>Sminthopsis macroura</i>	Stripe-faced Dunnart	V	-		☒ BAM-C ☐ Current survey ☐ Previous survey ☐ Desktop review	Yes	NA	171_Intact 143_Intact 58_Intact 58_Disturbed 58_Cleared	High

Scientific name	Common name	BC Act status	EPBC Act status	Dual credit species	Sources	Species retained for further assessment	Reason for exclusion from further assessment	Associated vegetation zone	Sensitivity to gain class
<i>Stagonopleura guttata</i>	Diamond Firetail	V	-		☒ BAM-C ☐ Current survey ☐ Previous survey ☐ Desktop review	Yes	NA	170_Intact 58_Intact 58_Disturbed 58_Cleared	Moderate
<i>Strophurus elderi</i>	Jewelled Gecko	V	-		☒ BAM-C ☒ Current survey ☒ Previous survey ☒ Desktop review	Yes	NA	171_Intact 170_Intact	High
<i>Tiliqua occipitalis</i>	Western Blue-tongued Lizard	V	-		☒ BAM-C ☐ Current survey ☐ Previous survey ☐ Desktop review	Yes	NA	171_Intact 170_Intact	High
<i>Vespadelus baverstocki</i>	Inland Forest Bat	V	-		☒ BAM-C ☐ Current survey ☐ Previous survey ☒ Desktop review	Yes	NA	171_Intact 170_Intact 143_Intact 58_Intact 58_Disturbed 58_Cleared	High

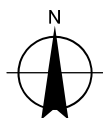
Table 5.2 Predicted (ecosystem credit) species recorded within the Development footprint

Common name	Scientific name	Status (BC Act)	Status (EPBC Act)	Occurrence within Development footprint
Jewelled Gecko	<i>Strophurus elderi</i>	Vulnerable	Not listed	One individual detected by spotlighting areas of spinifex clumps and one individual pit-fall trapped.
Chestnut Quail-thrush	<i>Cinclosoma castanotum</i>	Vulnerable	Not listed	The species was observed on one occasion within the Study area, with one individual seen foraging in open woodland.
Hooded Robin (south-eastern)	<i>Melanodryas cucullata cucullata</i>	Endangered	Endangered	The species was observed on one occasion within the Study area, with two individuals (a pair) seen foraging in open woodland.
Pink Cockatoo	<i>Lophochroa leadbeateri</i>	Vulnerable	Endangered	A group of four adult birds were recorded feeding on the ground in an open area within the north of the Study area.
Southern Whiteface	<i>Aphelocephala leucopsis</i>	Vulnerable	Vulnerable	The species was observed on one occasion within the Study area, with one individual seen foraging in chenopods in open shrubland.



Paper Size ISO A4
0 200 400 600 800
Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 54



Tronox Mining Australia Ltd
Atlas-Campaspe Mineral Sands Project Modification 6
Biodiversity Development Assessment Report

Project No. 12628564
Revision No. B
Date 05/11/2025

Threatened fauna and habitat resources

FIGURE 5.1

5.1.2 Species credit species

Threatened species that cannot reliably be predicted to occur on a development site based on PCT, distribution and habitat criteria are identified by the TBDC as 'species credit' entities. In some circumstances, the particular habitat components of species assessed for ecosystem credit species, such as the breeding habitat of a cave roosting bat or forest owls, are also assessed for species credits.

The credit calculator references geographic, vegetation and habitat data for the project site to generate a list of the species credit entities that are predicted to occur (i.e. the 'potential candidate threatened species'). Searches of threatened species databases were also completed to identify any additional potential candidate threatened species (to those generated by the credit calculator) that are known or predicted to occur in the locality. The likelihood of occurrence of potential candidate threatened species were reviewed, giving consideration to the habitats available in the Study area (refer to threatened species for assessment tables in Appendix B).

The list of potential candidate threatened species that could occur in the Development footprint are assessed based on the habitat resources observed during field surveys. 'Confirmed' candidate threatened species require further assessment of species presence and the extent of occupied habitat in accordance with the BAM. Several species could be reliably discounted as occurring within the Development footprint based on the type and quality of habitat resources present and the habitat requirements for the species identified in the TBDC. The list of confirmed candidate threatened species is presented in Table 5.3 along with justification for excluding species from further assessment in accordance with BAM Subsections 5.2.1, 5.2.1 and 5.2.3 (DPIE 2020a).

The following habitat types and resources are present at the Development footprint or adjoining areas and informed the assessment of candidate threatened species:

- Sandy soils including deep sands, shallow sandy and sandy loam soils, sometimes with deep litter beds, which provide substrates suitable for fossorial species, and Malleefowl nesting mounds
- Spinifex hummock provide protection for small reptile, mammal and bird species from predators
- Hollow bearing trees; living or dead tree with hollows greater than 10 cm diameter. There are no candidate nest trees in the Development footprint however there are several large hollow bearing mallee trees within the wider Study area. No evidence of occupancy by candidate threatened species was observed despite multiple rounds of dusk and spotlighting surveys and candidate tree inspections. Galahs (*Eolophus roseicapillus*) and Australian Owlet-nightjars (*Aegotheles cristatus*) were observed in hollows in mallee trees outside of the Development footprint

The TBDC as accessed via the BAM-C (NSW DCCEEW 2025f) lists several specific geographic constraints and habitat resources that are not present at the Development footprint. Species associated with these constraints have therefore been removed from the candidate species list.

Detailed habitat assessments for *Atriplex infrequens* were conducted in mid-October 2024 while completing threatened flora transverses for candidate species. *Atriplex infrequens* is a species that is confined to the NSW far western plains (NSW DCCEEW 2025a, Department of the Environment, Water, Heritage and the Arts [DEWHA] 2008). There are very few previous records of this species in NSW, with a small number of north western records recorded from east of Tibooburra, south east of Brewarrina and near Wilcannia with isolated collections from the Pooncarie area in the south. The closest record of this species is approximately 120 km north-west of the Study area where it was recorded near Moorara in 1975 (NSW DCCEEW 2025c, ALA 2025). The next closest record is from approximately 170km north west of the site where it was recorded in 2020 (NSW DCCEEW 2025c, Atlas of Living Australia [ALA] 2025). *Atriplex infrequens* is associated with broad drainage tracts, clay flats and possibly occasionally inundated habitats (NSW DCCEEW 2025a, DEWHA 2008). The TBDC states that critical habitat components for the species are speculated to be relatively undisturbed and ungrazed drainage lines and flats (NSW DCCEEW 2025a). Detailed habitat surveys for this species completed from the 9-15 October did not identify any drainage lines or clay flats within the Study area. This species has therefore been removed as a candidate species due to the absence of suitable microhabitat within the Development footprint pursuant to BAM s.5.2.3.2.a.i. *the assessor determines that microhabitats required by a species are absent from the subject land*. *Atriplex infrequens* has been excluded from occurring at the Development footprint or requiring calculation of species credits and so 'Degraded Habitat' was selected in the BAM-C habitat suitability tab.

Table 5.3 outlines the species that have been excluded from the candidate species and justification for their removal.

Heavy rainfall (typically greater than 50mm in 24 hours) is required for detection of Painted Burrowing Frog (*Neobatrachus pictus*) using aural-visual survey methods when the site is inundated (DPIE 2020d). There has not been a significant rainfall (>50mm) at the Atlas-Campaspe mine site since July 2023 (records reviewed from the Atlas automated weather station). A total of 17.4 mm of rainfall was recorded at the site on October 18, and 6.8mm recorded on November 13, five days before surveys. The remote and unpaved location of the Development makes access following even moderate rainfall extremely challenging. To determine whether this species should be included as a candidate species for the assessment detailed searches for potentially suitable breeding microhabitats were made across the Study area. The species requires temporary pools of water, such as claypans or floodplains, to breed and burrow into moist soil during dry periods (DPIE 2020d). The Development footprint is dominated by dry sandy soils and lacks extensive surface water features that could support the Painted Burrowing Frog. As not potentially suitable microhabitats were observed during the detailed site assessments and therefore this species has been excluded from occurring at the Development footprint or requiring calculation of species credits and so 'Degraded Habitat' was selected in the BAM-C habitat suitability tab.

Table 5.3 Candidate species credit species

Common name	Scientific name	Listing status		Sources	Species retained for further assessment	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act	EPBC Act				
Harrow Wattle	<i>Acacia acanthoclada</i>	E		☒ BAM-C ☐ Current survey ☐ Desktop review	Yes		PCT 171_Intact PCT 170_Intact
Purple-wood Wattle	<i>Acacia carneorum</i>	V	V	☒ BAM-C ☐ Current survey ☐ Desktop review	Yes		PCT 58_Intact PCT 58_Disturbed PCT 58_Cleared
Australian Bustard	<i>Ardeotis australis</i>	E		☒ BAM-C ☐ Current survey ☐ Desktop review	Yes		PCT 143_Intact PCT 58_Intact PCT 58_Disturbed PCT 58_Cleared
A saltbush	<i>Atriplex infrequens</i>	V	V	☒ BAM-C ☐ Current survey ☐ Desktop review	No	Microhabitat absent. No drainage lines or clay flats microhabitat features present within Development footprint	Nil
A spear-grass	<i>Austrostipa metatoris</i>	V	V	☒ BAM-C ☐ Current survey ☐ Desktop review	Yes		PCT 170_Intact
Bush Stone-curlew	<i>Burhinus gallarius</i>	E		☒ BAM-C ☐ Current survey ☐ Desktop review	Yes		PCT 58_Intact PCT 58_Disturbed PCT 58_Cleared
A burr-daisy	<i>Calotis moorei</i>	E	E	☒ BAM-C ☐ Current survey ☐ Desktop review	Yes		PCT 170_Intact PCT 143_Intact

Common name	Scientific name	Listing status		Sources	Species retained for further assessment	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act	EPBC Act				
Bluebush Daisy	<i>Cratystylis concocephala</i>	E		☒ BAM-C ☐ Current survey ☐ Desktop review	Yes		PCT 171_Intact PCT 170_Intact PCT 58_Intact PCT 58_Disturbed PCT 58_Cleared
Desert Hopbush	<i>Dodonaea stenozyga</i>	CE		☒ BAM-C ☐ Current survey ☐ Desktop review	Yes		PCT 171_Intact PCT 170_Intact
White-bellied Sea-Eagle	<i>Haliaeetus leucogaster</i>	V		☒ BAM-C ☐ Current survey ☐ Desktop review	No	Habitat constraints. Development footprint not within 1 km of rivers, lakes, large dams or creeks, wetlands or coastlines	Nil
Black-breasted Buzzard	<i>Hamirostra melonosternon</i>	V		☒ BAM-C ☐ Current survey ☐ Desktop review	No	Habitat constraints. Development footprint not within 40 m of riparian woodland on inland watercourses/waterholes containing dead or dying eucalyptus	Nil
Little Eagle	<i>Hieraaetus morphnoides</i>	V		☒ BAM-C ☐ Current survey ☐ Desktop review	Yes		PCT 171_Intact PCT 170_Intact PCT 58_Intact PCT 58_Disturbed
Fleshy Minuria	<i>Kippistia suaedifolia</i>	E		☐ BAM-C ☐ Current survey ☐ Desktop review	No	Habitat constraints. Development footprint does not contain and is not within 50 m of saline lakes, depressions or claypans with Gypsous or calcareous soils	Nil
Pink Velvet Bush	<i>Lasiopetalum behrii</i>	CE		☒ BAM-C ☐ Current survey ☐ Desktop review	Yes		PCT 171_Intact PCT 170_Intact

Common name	Scientific name	Listing status		Sources	Species retained for further assessment	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act	EPBC Act				
Southern Hairy-nosed Wombat	<i>Lasiorhinus latifrons</i>	E		☒ BAM-C ☐ Current survey ☐ Desktop review	Yes		PCT 171_Intact PCT 170_Intact PCT 58_Intact PCT 58_Disturbed PCT 58_Cleared
Winged Peppergrass	<i>Lepidium monoplacoides</i>	E		☒ BAM-C ☐ Current survey ☐ Desktop review	Yes		PCT 170_Intact
Button Immortelle	<i>Leptorhynchus waitzia</i>	E		☒ BAM-C ☐ Current survey ☐ Desktop review	Yes		PCT 170_Intact
Pink Cockatoo (breeding)	<i>Lophochroa leadbeateri</i>	V	E	☒ BAM-C ☒ Current survey ☐ Desktop review	No	Habitat constraints. Development footprint does not contain: hollow bearing trees; living or dead tree with hollows greater than 10cm diameter.	Nil
Square-tailed Kite (breeding)	<i>Lophoictinia isura</i>	V		☒ BAM-C ☐ Current survey ☐ Desktop review	Yes		PCT 58_Intact PCT 58_Disturbed PCT 58_Cleared
Crowned Gecko	<i>Lucasium stenodactylum</i>	CE		☒ BAM-C ☐ Current survey ☐ Desktop review	Yes		PCT 170_Intact PCT 143_Intact

Common name	Scientific name	Listing status		Sources	Species retained for further assessment	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act	EPBC Act				
Black-eared Miner	<i>Manorina melanotis</i>	E	V	☒ BAM-C ☐ Current survey ☐ Desktop review	Yes		PCT 171_Intact PCT 170_Intact
Painted Burrowing Frog	<i>Neobatrachus pictus</i>	E		☒ BAM-C ☐ Current survey ☐ Desktop review	Yes	Microhabitat absent. No surface water breeding microhabitat features present within Development footprint	Nil
Red-lored Whistler	<i>Pachycephala rufogularis</i>	CE		☒ BAM-C ☐ Current survey ☐ Desktop review	Yes		PCT 171_Intact
Thyme Rice-flower	<i>Pimelea serpyllifolia</i> subsp. <i>serpyllifolia</i>	E		☒ BAM-C ☐ Current survey ☐ Desktop review	No	Geographic limitations. Development footprint not within 50 km of the Murray River	Nil
Regent Parrot (Breeding)	<i>Polytelis anthopeplus monachoides</i>	E	V	☒ BAM-C ☐ Current survey ☐ Desktop review	No	Geographic limitations. Development footprint not within 1 km or watercourses or within 30 km of the Murray and Murrumbidgee Rivers	Nil
Desert Mouse	<i>Pseudomys desertor</i>	CE		☒ BAM-C ☐ Current survey ☐ Desktop review	Yes		PCT 171_Intact PCT 170_Intact
Cobar Greenhood	<i>Pterostylis cobarensis</i>	V		☒ BAM-C ☒ Current survey ☐ Desktop review	Yes		PCT 171_Intact PCT 170_Intact
Bitter Quandong	<i>Santalum murrayanum</i>	E		☒ BAM-C ☐ Current survey ☐ Desktop review	Yes		PCT 171_Intact PCT 170_Intact

Common name	Scientific name	Listing status		Sources	Species retained for further assessment	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act	EPBC Act				
Bladder Senna	<i>Swainsona colutoides</i>	E		☒ BAM-C ☐ Current survey ☐ Desktop review	Yes		PCT 171_Intact PCT 170_Intact
Yellow Swainson-pea	<i>Swainsona pyrophila</i>	V	V	☒ BAM-C ☐ Current survey ☐ Desktop review	Yes		PCT 171_Intact PCT 170_Intact

Notes – V= vulnerable, E = endangered, CE = critically endangered

5.2 Presence of candidate species credit species

Table 5.4 identifies the confirmed candidate species credit species requiring assessment in accordance with BAM Subsection 5.2.4, the method used to confirm their presence and the outcome of targeted surveys. The methods employed during field surveys in accordance with relevant guidelines are described in section 2.4. Figure 2-1 and Figure 2-2 show survey effort for candidate threatened species. Scanned field data sheets and GPS tracklogs demonstrating survey effort and coverage of the Study area have been submitted for approval along with this BDAR.

One species credit species, Cobar Greenhood (*Pterostylis cobarensis*) was recorded within the Study area during targeted surveys completed in October 2024 and October 2025. This species was recorded growing within PCT 171 and 170 within the Development footprint as shown on Figure 5-2. This species has been recorded growing elsewhere in the Atlas-Campaspe mining tenement within areas of similar habitat.

Four adult Pink Cockatoo (*Lophochroa leadbeateri*) were observed foraging briefly in the north of the Development footprint on one occasion, but displayed no breeding behaviour. The species is a dual credit entity (NSW DCCEEW 2025a) with species credits required for breeding habitat as indicated by occupied nest trees, dependent young or other specific evidence of breeding (NSW DCCEEW 2025b). No candidate nest trees for the species were recorded in the Development footprint and no occupied nest trees were recorded in the surrounding area despite targeted survey. The species is likely to use the Development footprint for foraging habitat only and no species credit calculations are required.

No other threatened flora or fauna species credit species were recorded during targeted searches conducted in accordance with the TBDC and the BAM survey guidelines.

A summary of the survey results as related to species credit calculations is presented in Table 5.4 below. Notably the core targeted reptile spotlight survey effort for Eastern Fat-tailed Gecko (*Diplodactylus platyurus*, syn. *D. ameyi*), Crowned Gecko (*Lucasium stenodactylum*) and Jewelled Gecko (*Strophurus eldери*) was conducted over four nights in November 2024 in accordance with the techniques specified for these species and within the prescribed survey period for the species of October, November and December only according to the TBDC (NSW DCCEEW 2025a) and reptile survey guidelines (DPE 2022). As noted in sections 2.4.3 and 2.5 above, conditions were suitable for the detection of the Eastern Fat-tailed Gecko and other target reptile species. These threatened reptiles have been excluded from occurring within the Development footprint or requiring calculation of species credits through 'Targeted threatened species survey'.

5.3 Mapping of species polygons

In accordance with section 5.2.5.3 of the BAM a species polygon was created for Cobar Greenhood based on records of the species and the area of suitable habitat for the species within the Development footprint. All individuals identified within the Study area were recorded within either PCT 170 or 171, where they typically occur at the vegetation transition between the two communities. None of the other PCTs that occur within the Development footprint are associated habitat for the Cobar Greenhood. As the Cobar Greenhood is assessed by the area of suitable habitat that occurs rather than the number of individuals, to create the species polygon all areas of PCT 170 and 171 within the Development footprint have been included within the species polygon (refer to Figure 5-2). Up to 20.68 ha of suitable habitat for the Cobar Greenhood (the total area of PCTs 170 and 171) occurs within the Development footprint and is included within the species polygon.

Table 5.4 Determining the presence of candidate species credit species in the Development footprint

Common name	Scientific name	Method used to determine presence	Present?	Survey method	Timing of survey – within recommended period? (BAM-C / TBDC)	Effort
Harrow Wattle	<i>Acacia acanthoclada</i>	Targeted threatened species survey	No	Parallel threatened flora traverses	☒ Yes ☐ No	Systematic coverage of potential habitat with traverses from 9-10 and 14-16 October 2024. Supplementary surveys were also completed on 10 October 2025
Purple-wood Wattle	<i>Acacia carneorum</i>	Targeted threatened species survey	No	Parallel threatened flora traverses	☒ Yes ☐ No	Systematic coverage of potential habitat with traverses from 9-10 and 14-16 October 2024. Supplementary surveys were also completed on 10 October 2025
Australian Bustard	<i>Ardeotis australis</i>	Targeted threatened species survey	No	Diurnal bird surveys	☒ Yes ☐ No	Systematic coverage of areas of potential habitat - eight person-hours of area searches on four separate days = total 32 hours survey.
A spear-grass	<i>Austrostipa metatoris</i>	Targeted threatened species survey	No	Parallel threatened flora traverses	☒ Yes ☐ No	Systematic coverage of potential habitat with traverses from 9-10 and 14-16 October 2024. Supplementary surveys were also completed on 10 October 2025
Bush Stone-curlew	<i>Burhinus gallarius</i>	Targeted threatened species survey	No	Nocturnal call playback	☒ Yes ☒ No	Nocturnal call playback and spotlighting surveys were conducted over 8 person hours on three nights between 19-21 November 2024.
A burr-daisy	<i>Calotis moorei</i>	Targeted threatened species survey	No	Parallel threatened flora traverses	☒ Yes ☐ No	Systematic coverage of potential habitat with traverses from 9-10 and 14-16 October 2024. Supplementary surveys were also completed on 10 October 2025

Common name	Scientific name	Method used to determine presence	Present?	Survey method	Timing of survey – within recommended period? (BAM-C / TBDC)	Effort
Bluebush Daisy	<i>Cratystylis Conocephala</i>	Targeted threatened species survey	No	Parallel threatened flora traverses	☒ Yes ☐ No	Systematic coverage of potential habitat with traverses from 9-10 and 14-16 October 2024. Supplementary surveys were also completed on 10 October 2025
Desert Hopbush	<i>Dodonaea stenozyga</i>	Targeted threatened species survey	No	Parallel threatened flora traverses	☒ Yes ☐ No	Systematic coverage of potential habitat with traverses from 9-10 and 14-16 October 2024. Supplementary surveys were also completed on 10 October 2025
Little Eagle	<i>Hieraaetus morphnoides</i>	Targeted threatened species survey	No	Diurnal bird surveys. Nest tree census	☒ Yes ☐ No	Diurnal bird surveys in the late breeding season using systematic coverage of areas of potential habitat – eight person-hours of area searches on two separate days = total 16 hours survey from 15-16 October 2024 Nest tree census including systematic coverage of the buffer area over two days in October 2024
Pink Velvet Bush	<i>Lasiopetalum behrii</i>	Targeted threatened species survey	No	Parallel threatened flora traverses	☒ Yes ☐ No	Systematic coverage of potential habitat with traverses from 9-10 and 14-16 October 2024. Supplementary surveys were also completed on 10 October 2025
Southern Hairy-nosed Wombat	<i>Lasiorhinus latifrons</i>	Targeted threatened species survey	No	Terrestrial fauna habitat assessment and diurnal active searches.	☒ Yes ☐ No	Systematic coverage of potential habitat using terrestrial fauna habitat and diurnal active searches, with eight person-hours of area searches on four separate days = total 32 hours Spotlighting surveys were conducted over 8 person hours on three nights between 19-21 November 2024.

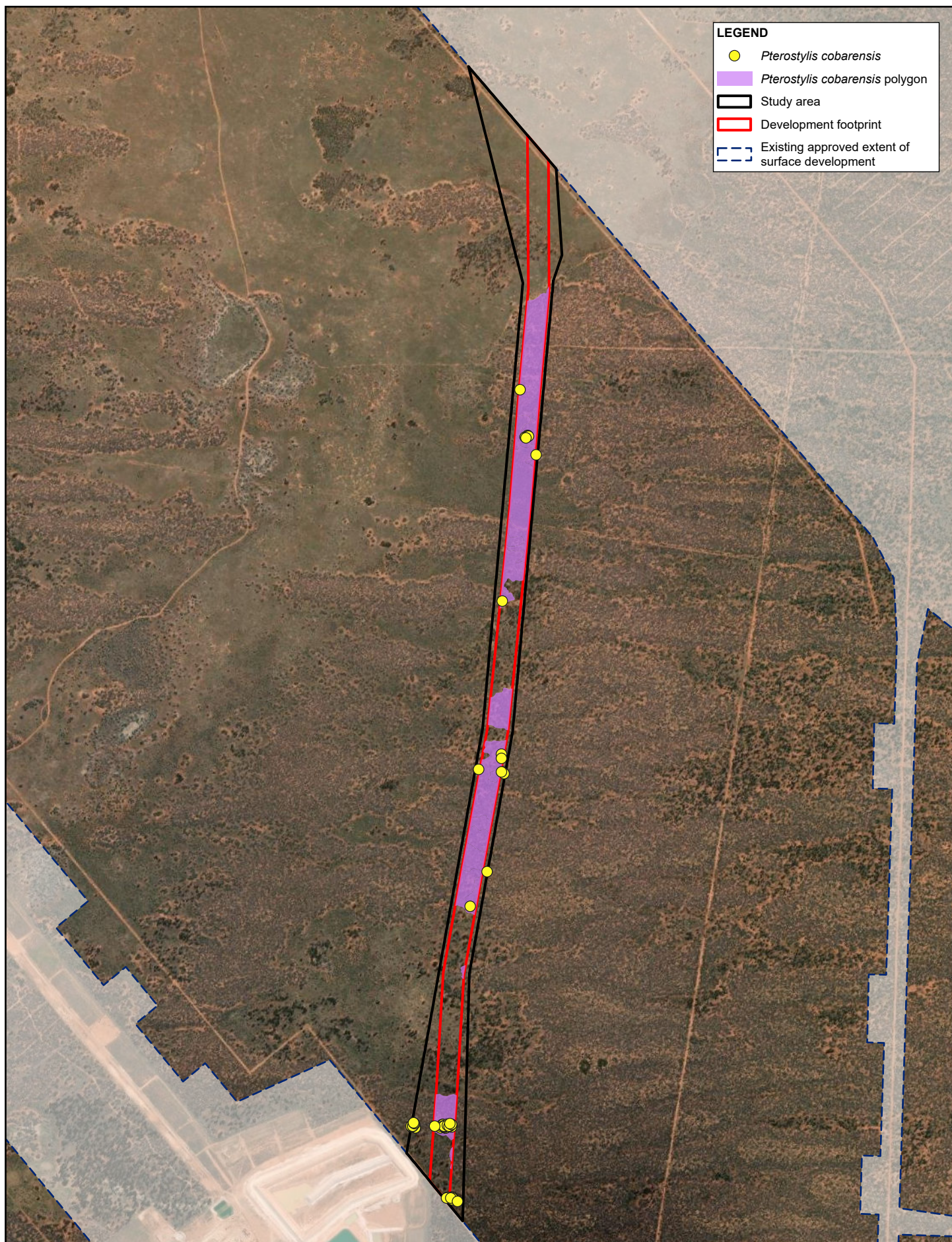
Common name	Scientific name	Method used to determine presence	Present?	Survey method	Timing of survey – within recommended period? (BAM-C / TBDC)	Effort
Winged Peppercreess	<i>Lepidium monoplocoides</i>	Targeted threatened species survey	No	Parallel threatened flora traverses	☒ Yes ☐ No	Systematic coverage of potential habitat with traverses from 9-10 and 14-16 October 2024. Supplementary surveys were also completed on 10 October 2025
Button Immortelle	<i>Leptorhynchus waitzia</i>	Targeted threatened species survey	No	Parallel threatened flora traverses	☒ Yes ☐ No	Systematic coverage of potential habitat with traverses from 9-10 and 14-16 October 2024
Pink Cockatoo (breeding)	<i>Lophochroa leadbeateri</i>	Targeted threatened species survey	No	Diurnal bird surveys Nest tree census	☒ Yes ☐ No	There are no hollow-bearing trees that would provide suitable breeding habitat within the Development footprint, and it is not a confirmed candidate species. Survey for breeding habitat was conducted in the broader Study area to help identify potential indirect impacts on breeding habitat and to inform the assessment of significance of impacts to the local population of the species. Diurnal bird surveys in the late breeding season using systematic coverage of areas of potential habitat – eight person-hours of area searches on two separate days = total 16 hours survey from 15-16 October 2024 Systematic coverage of areas of potential habitat - four person-hours of area searches on four separate days = total 16 hours survey.

Common name	Scientific name	Method used to determine presence	Present?	Survey method	Timing of survey – within recommended period? (BAM-C / TBDC)	Effort
Square-tailed Kite	<i>Lophoictinia isura</i>	Targeted threatened species survey	No	Diurnal bird surveys Nest tree census	☒ Yes ☐ No	Diurnal bird surveys in the late breeding season using systematic coverage of areas of potential habitat – eight person-hours of area searches on two separate days = total 16 hours survey from 15-16 October 2024 Nest tree census including systematic coverage of the buffer area over two days in October 2024
Crowned Gecko	<i>Lucasium stenodactylum</i>	Targeted threatened species survey	No	Spotlight surveys	☒ Yes ☐ No	>32 person hours of spotlight surveys over three nights from 18 -22 November 2024.
Black-eared Miner	<i>Manorina melanotis</i>	Targeted threatened species survey	No	Diurnal bird surveys	☒ Yes ☐ No	Systematic coverage of areas of potential habitat - eight person-hours of area searches on four separate days = total 32 hours survey.
Red-lored Whistler	<i>Pachycephala rufogularis</i>	Targeted threatened species survey	No	Diurnal bird surveys	☒ Yes ☐ No	Systematic coverage of areas of potential habitat - eight person-hours of area searches on four separate days = total 32 hours survey.
Desert Mouse	<i>Pseudomys desertor</i>	Targeted threatened species survey	No	Pitfall and Elliot trapping	☒ Yes ☐ No	Six survey sites, with five days and four nights of trapping. Each pitfall site with six buckets along a 30 m canvacon fence (144 pitfall trap nights). Ten Elliot traps at each site spaced 10m apart (240 Elliot trap nights). Total effort = 144 pitfall trap nights, 48 funnel trap nights, 240 Elliot trap nights.

Common name	Scientific name	Method used to determine presence	Present?	Survey method	Timing of survey – within recommended period? (BAM-C / TBDC)	Effort
Greenhood Orchid	<i>Pterostylis cobarensis</i>	Targeted threatened species survey	Yes- numerous individuals recorded within the Study area	Parallel threatened flora traverses	☒ Yes ☐ No	Systematic coverage of potential habitat with traverses from 9-10 and 14-16 October 2024. Supplementary surveys were also completed on 10 October 2025
Bitter Quandong	<i>Santalum murrayanum</i>	Targeted threatened species survey	No	Parallel threatened flora traverses	☒ Yes ☐ No	Systematic coverage of potential habitat with traverses from 9-10 and 14-16 October 2024. Supplementary surveys were also completed on 10 October 2025
Bladder Senna	<i>Swainsona colutoides</i>	Targeted threatened species survey	No	Parallel threatened flora traverses	☒ Yes ☐ No	Systematic coverage of potential habitat with traverses from 9-10 and 14-16 October 2024. Supplementary surveys were also completed on 10 October 2025
Yellow Swainson-pea	<i>Swainsona pyrophila</i>	Targeted threatened species survey	No	Parallel threatened flora traverses	☒ Yes ☐ No	Systematic coverage of potential habitat with traverses from 9-10 and 14-16 October 2024. Supplementary surveys were also completed on 10 October 2025

Notes: 'Parallel threatened flora traverses' comprise systematic traverses with 5 to 10 m wide spacing through all areas of suitable habitat in associated PCTs according to the TBDC (NSW DCCEEW 2025a). Includes general observations and additional broadly spaced traverses conducted through areas of potentially associated PCTs and unsuitable habitat such as bare earth or dense patches of non-target species within associated PCTs.

'Nest tree census' comprises systematic coverage of the Development footprint and identification of candidate nest trees based on presence of suitably sized trees with stick nests or appropriate hollows for the target species *and* at least one round of diurnal bird surveys and checking of candidate nest trees during the breeding-season survey period for the species as nominated in the TBDC (NSW DCCEEW 2025a).



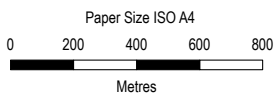
Pterostylis cobarensis

Pterostylis cobarensis polygon

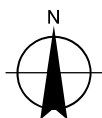
Study area

Development footprint

Existing approved extent of surface development



Map Projection: Transverse Mercator
 Horizontal Datum: GDA 1994
 Grid: GDA 1994 MGA Zone 54



Tronox Mining Australia Ltd
 Atlas-Campaspe Mineral Sands Project Modification 6
 Biodiversity Development Assessment Report

Pterostylis cobarensis
 species polygon

Project No. 12628564
 Revision No. B
 Date 05/11/2025

FIGURE 5.2

5.4 Matters of National Environmental Significance

5.4.1 Threatened ecological communities

The PMST identified three EPBC listed TECs with potential to occur within the Development footprint (Commonwealth DCCEEW 2025a):

- Buloke Woodlands of the Riverina and Murray Darling Depression Bioregions
- Weeping Myall Woodland
- Mallee Bird Ecological Community of the Murray Darling Depression Bioregion (Mallee Bird Community)

As described in section 4.5, one of these TECs (Mallee Bird Community) occurs within the Development footprint. This community is associated with PCTs 170 and 171, of which 20.68 ha would be impacted by the Proposal. This represents a very small proportion (around 0.0004%) of the current estimate of 5.601 million ha of mallee woodlands and shrublands in the Murray Darling Depression northern IBRA subregion that comprises potential habitat for this EEC (DCCEEW 2020). This potential habitat is located within a near-intact landscape of many hundreds of thousands of hectares of remnant native vegetation, in a near-contiguous patch including mallee and non-eucalypt semi-arid woodland.

The very small area of this TEC that would be impacted at a landscape scale is highly unlikely to cause a substantial change in the species composition of an occurrence of this EEC, or to cause a decline or loss of functionally important species.

No additional TECs listed under the EPBC Act were recorded in the Development footprint or surrounding Study area. There is no risk of direct or indirect impacts to any additional TECs listed under the EPBC Act.

An assessment of significance of impacts of the Proposal on the Mallee Bird Community is provided in Appendix F. This assessment determined that the project is not likely to result in a significant impact on this EPBC listed TEC.

5.4.2 Threatened species listed under the EPBC Act

Threatened fauna

Three threatened woodland bird species (Southern Whiteface listed as vulnerable and Hooded Robin (south-eastern) and Pink Cockatoo listed as endangered under the EPBC Act) were recorded in the Study area.

Two additional fauna species listed under the EPBC Act are also known to occur within the Atlas-Campaspe Mine tenement, Malleefowl (*Leipoa ocellata*) and Corben's Long-eared Bat (*Nyctophilus corbeni*). Although not recorded during targeted surveys completed for this BDAR, there is suitable habitat for both of these species within the Development footprint and therefore they are considered as species with potential to occur. There is also suitable habitat for the EPBC listed Blue-winged Parrot (*Neophema chrysostoma*) to occur within the Development footprint.

Threatened fauna listed under the EPBC Act that are known or that have potential to occur within the Development footprint are summarised in Table 5.5. There are no specific habitat features or resources at the Development footprint that suggest that it would be important for maintaining populations of any of these species. The fauna species listed below rely on at least some of the habitat resources at the Development footprint for their persistence in the local area. An extent of habitat within the Offset Area is provided based on the vegetation mapping across the original 18,400ha Atlas-Campaspe biodiversity Offset. Much additional habitat is available across the surrounding, contiguous landscape vegetation, though most is less accurately mapped, and this smaller area of offset is indicative of the scale and composition of the broader area. The existing biodiversity offset area contains 2,534 ha of PCT 58 Black Oak - Western Rosewood open woodland, 3,773 ha of PCT 170 Chenopod sandplain mallee woodland/shrubland, 10,519 ha of PCT 171 Spinifex linear dune mallee, 483 ha of PCT 143 Narrow-leaved Hopbush - Scrub Turpentine - Senna shrubland, and 538ha of PCT 172 Deep sand mallee of irregular dunefields, which also provides habitat for Mallee dependent species. Assessments of significance have been completed in accordance with the Significant Impact Guidelines (DEWHA 2013) (Appendix F). These assessments determined that the project is not likely to have a significant impact on any EPBC listed threatened

fauna species given the limited extent of native vegetation to be removed in comparison to the extensive areas of alternative habitat in the locality.

Threatened flora

Yellow Swainson-Pea (*Swainsona pyrophila*) is also known to occur in the bioregion surrounding the Development footprint and may occur in the PCTs and habitat types present. This species has been the subject of targeted, seasonal surveys according to the BAM and was not recorded within the Study area, nor has it been recorded within the Atlas-Campaspe Mine tenement during any of the numerous surveys that have been completed across the site over the past decade.

Two flora species listed as threatened under the EPBC Act, Winged Peppercress (*Lepidium monoplocoides*) and Mossgiel Daisy (*Brachyscome papillosa*) were recorded during surveys completed for the Environmental Impact Statement (EIS) that was prepared for the Project in 2024 (AMBS 2014). The EPBC approval for the Project determined that the Project has potential to have a significant impact on both these species.

The Mossgiel Daisy is endemic to NSW and chiefly occurs within the Riverina Bioregion, from Mossgiel in the north, Murrumbidgee Valley (Yanga) National Park in the south-west to Urana in the south-east. Sites are scattered across this Bioregion including the Jerilderie area, the Hay Plain (Maude and Oxley) and around Darlington Point. In addition, there are a number of records from the Willandra Lakes World Heritage Area (including Mungo National Park) with a north-western outlier at Byrnedale Station, north of Menindee. During surveys completed for the Project EIS this species was recorded along the mineral concentrate transport route approximately 20 km south-east of the Development footprint. Mossgiel Daisy primarily grows on red and grey cracking clay soils on Bladder Saltbush (*Atriplex vesicaria*) and Cotton Bush (*Maireana aphylla*) plains. It has also been recorded in grassland and in Grey Box (*Eucalyptus microcarpa*) – Cypress Pine (*Callitris* spp.) woodland (NSW DCCEEW 2025a). Habitat for this species does not occur within the optimised services corridor Development footprint and the species was not recorded during targeted surveys completed in October which is a suitable time for surveying the species (NSW DCCEEW 2025a).

Winged Peppercress is a small annual herb that is widespread through the semi-arid western plains regions of NSW. The species occurs on seasonally moist to waterlogged sites, on heavy fertile soils, with a mean annual rainfall of approximately 300-500mm and is associated with open woodland vegetation dominated by Bulloak (*Allocasuarina leuhammii*) and/or eucalyptus, particularly Blackbox (*Eucalyptus largiflorens*) or Poplar Box (*Eucalyptus populnea*). Winged Peppercress has also been recorded in wetland or grassland communities on waterlogged grey brown clays in association with Cane Grass (*Eragrostis australasicus*), *Lachnagrostis filiformis*, *Rytidosperma duttonianum*, *Walwhalleya proluta*, *Myriophyllum crispatum*, Fairy Aprons (*Utricularia dichotoma*) and Billy Buttons (*Pycnosorus globosus*). There is no suitable moist or waterlogged habitat or for Winged Peppercress within the Development footprint, nor were an associated species recorded during targeted surveys. It is therefore considered highly unlikely that this species occurs within the Development footprint or would be impacted by the Proposal.

Various other flora and fauna species listed under the EPBC Act have been assessed to have a low potential to occur given lack of suitable habitat and/or because the Development footprint is well outside of the known geographic range of the species (see Appendix B). MNES with an 'unlikely', 'highly unlikely' or 'nil' likelihood of occurrence are not considered further in this assessment.

Table 5.5 *Threatened species listed under the EPBC Act recorded or with potential to occur within the Development footprint*

Common name	Scientific name	EPBC Act status	Likelihood of occurrence	Extent of habitat within Development footprint	Extent of habitat within Offset
Southern Whiteface	<i>Aphelocephala leucopsis</i>	V	Present – recorded during assessment of Development footprint	PCTs 58, 143, 170 and 17150.41ha – 2.36% of available habitat withing existing biodiversity offset area.	Extensive – Approximately 17,311ha within Atlas-Campaspe biodiversity offset, over 200,000 ha across broader landscape.
Malleefowl	<i>Leipoa ocellata</i>	V	Possible - previously recorded within the Atlas mine tenement	PCTs 171 and 170 20.68 ha – 0.47% of available habitat withing existing biodiversity offset area.	Extensive – Approximately 14,293ha within Atlas-Campaspe biodiversity offset, over 100,000 ha across broader landscape.
Pink Cockatoo	<i>Lophochroa leadbeateri</i>	E	Present (foraging habitat) - recorded during assessment of Development footprint	PCTs 58, 143, 170 and 171 50.41ha – 2.36% of available habitat withing existing biodiversity offset area.	Extensive – Approximately 17,311ha within Atlas-Campaspe biodiversity offset, over 200,000 ha across broader landscape.
Hooded Robin (south-eastern)	<i>Melanodryas cucullata cucullata</i>	E	Likely- recorded adjacent to the site during assessment of Development footprint	PCTs 58, 143, 170 and 17150.41ha – 2.36% of available habitat withing existing biodiversity offset area.	Extensive – Approximately 17,311ha within Atlas-Campaspe biodiversity offset, over 200,000ha across broader landscape.
Blue-winged Parrot	<i>Neophema chrysostoma</i>	V	Possible – Suitable habitat recorded during assessment of Development footprint	PCTs 58 and 170 30.61 ha – 1.17% of available habitat withing existing biodiversity offset area.	Extensive – Approximately 6,308 ha within Atlas-Campaspe biodiversity offset, over 100,000 ha across broader landscape.
Corben's Long-eared Bat	<i>Nyctophilus corbeni</i>	V	Possible - previously recorded within the Atlas mine tenement	PCTs 58, 170 and 171 46.78 – 1.22% of available habitat withing existing biodiversity offset area.	Extensive – Approximately 16,827ha within Atlas-Campaspe biodiversity offset, over 100,000 ha across broader landscape.
Yellow Swainson-pea	<i>Swainsona pyrophila</i>	V	Possible - suitable habitat present however not recorded during targeted survey. The species is known to only be found after fire events but, although the Development footprint is unburned,	PCTs 171 and 170 20.68ha – 0.47% of available habitat withing existing biodiversity offset area.	Extensive – Approximately 14,293ha within Atlas-Campaspe biodiversity offset, over 100,000 ha across broader landscape.

Common name	Scientific name	EPBC Act status	Likelihood of occurrence	Extent of habitat within Development footprint	Extent of habitat within Offset
			we conclude this species is unlikely to occur based on the distance of the study site from nearest recorded important populations of the species (i.e. Hattah-Kulkyne NP and Murray-Sunset NP, which is approximately 125 km from the Development footprint).		

Notes: E – endangered species; V – vulnerable species.

5.4.3 Migratory shorebird species

A critical consideration in assessing the significance of potential impacts on listed migratory shorebird species is whether or not a proposed action is likely to affect 'important habitat' (DotE 2015). Important habitat mapping by NSW DCCEEW (2024f) maps areas that support bird numbers exceeding the international and national significance thresholds as defined above and in the Wildlife Conservation Plan for Migratory Shorebirds (DotE 2015). The Development footprint does not intersect any important habitat for any migratory shorebird species, and given the location of the Study area species of migratory shorebird are highly unlikely to use the Development footprint in any capacity.

5.4.4 Migratory terrestrial species

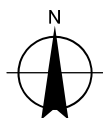
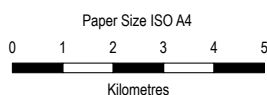
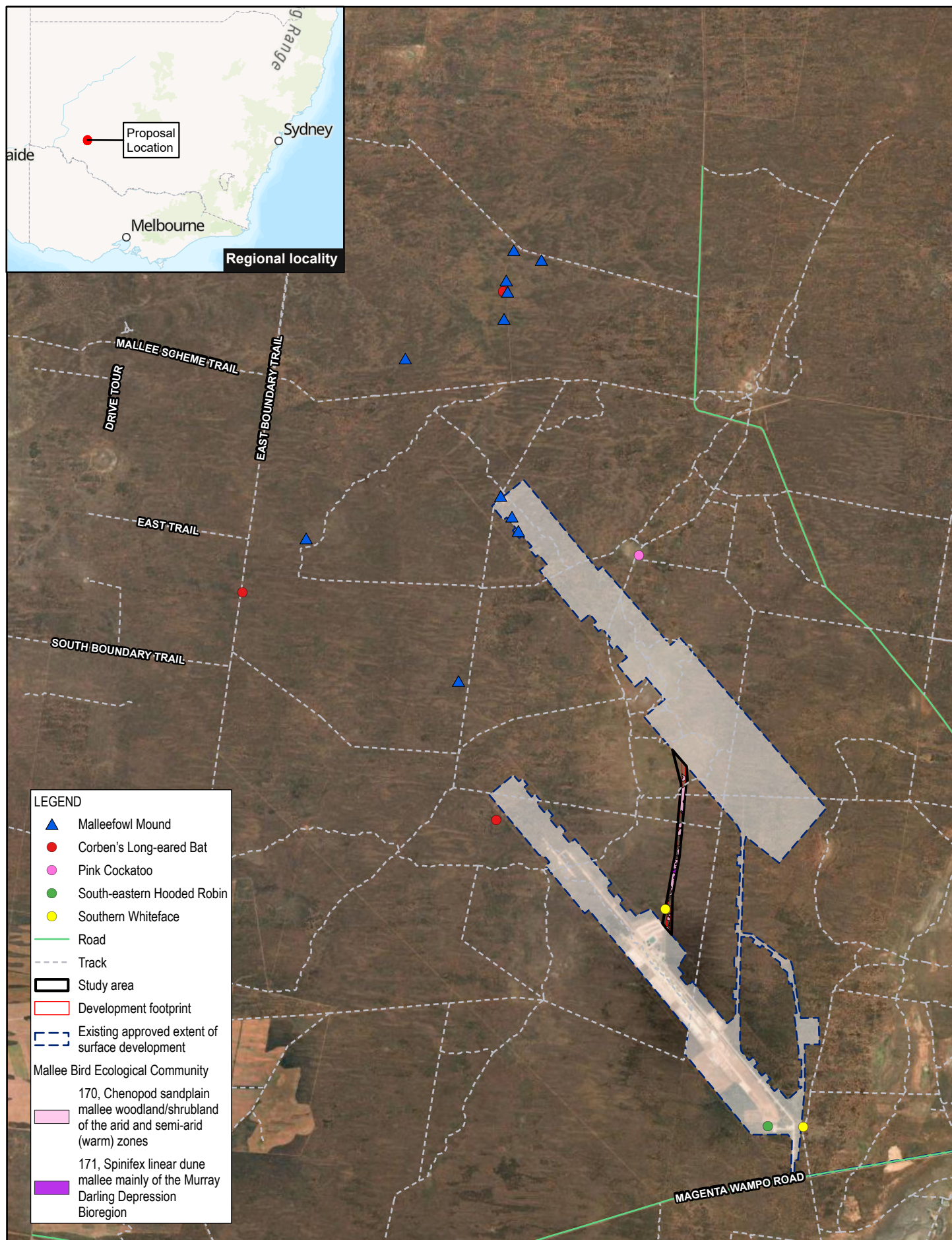
There is potential foraging or resting habitat at the Development footprint for the migratory bird species Fork-tailed Swift (*Apus pacificus*) in the semi-arid woodland, scrub and shrubland habitats at the Development footprint as summarised in Table 5.6 below. The species would not be reliant upon habitat within the Development footprint for any part of its life cycle.

Referral guidelines have been published for 14 migratory terrestrial species with consideration of impacts mainly based on the presence of important habitat (DotE 2015). Habitat in the Development footprint is not likely to support an ecologically significant proportion of the population of the Fork-tailed Swift, be of critical importance to the species at particular life-cycle stages, is not located at the limit of the species' range, and/or located within an area where the species is declining. As such, potential habitat in the Development footprint is not 'important habitat' for the species, as defined in the guidelines (DotE 2015).

The Proposal is not likely to result in any direct or indirect impacts to the Fork-tailed Swift any other migratory terrestrial species.

Table 5.6 *Migratory species listed under the EPBC Act that may occur at the Development footprint*

Common name	Scientific name	EPBC Act status	Likelihood of occurrence
Fork-tailed Swift	<i>Apus pacificus</i>	Migratory (terrestrial)	Possible. Species may fly over and forage over the subject site but does not breed within Australia. The species' ability to continue these behaviours during construction and operation of the Proposal would not be affected.



Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 54



Tronox Mining Australia Ltd
Atlas-Campaspe Mine Ecological Services
Atlas-Campaspe Mineral Sands Project Modification 6

Project No. 12628564
Revision No. A
Date 30/10/2025

**MNES recorded within or adjacent
to the development footprint**

FIGURE 5.3

6. Identifying prescribed impacts

6.1 Introduction

The Biodiversity Conservation Regulation 2017 (BC Regulation) (clause 6.1) identifies additional biodiversity impacts to which the BOS applies. These 'prescribed impacts' are the impacts on biodiversity values which are not related to, or are in addition to, native vegetation clearing and habitat loss. These types of impacts are used by the decision-maker to inform the determination and conditions of consent for developments. These include impacts:

- On the habitat of threatened entities including:
 - karst, caves, crevices, cliffs, rocks and other geological features of significance
 - human-made structures
 - non-native vegetation
- On areas connecting threatened species habitat, such as movement corridors
- That affect water quality, water bodies and hydrological processes that sustain threatened entities
- On threatened and protected animals from turbine strikes from a wind farm (not relevant to this project)
- On threatened species or fauna that are part of a TEC from vehicle strikes

A BDAR must identify the relevant prescribed impacts and the suite of threatened species that use or rely on the habitat values or would be affected by the impact, as specified in Section 6 of the BAM. The likelihood, extent and magnitude of prescribed impacts must then be assessed using the approach specified in the BAM Section 8.3.

Those of relevance to this project are described in the sections below.

6.2 Threatened biota that may be subject to prescribed impacts

Threatened species of relevance to this project that may be subject to prescribed impacts are described in Table 6.1. Potentially affected threatened species were identified based on the desktop assessment, site inspections and habitat assessments described above and have been grouped according to shared life histories and habitat associations. Candidate species that have been surveyed for and are not present are not considered to be subject to prescribed impacts.

Table 6.2 summarises the prescribed impact features listed in the NSW BC Regulation and BAM along with an assessment of their presence or otherwise at the Development footprint, their characteristics and location, and the threatened entities that are associated with the feature at the Development footprint. Justifications for features determined as not present are provided as appropriate.

Table 6.1 Threatened entities potentially subject to prescribed impacts

Group	Threatened entity
Threatened Plants	– Cobar Greenhood (<i>Pterostylis cobarensis</i>)
Threatened Microbats	– Corben's Long-eared Bat (<i>Nyctophilus corbeni</i>) – Little Pied Bat (<i>Chalinolobus picatus</i>) – Yellow-bellied Sheath-tail-bat (<i>Saccolaimus flaviventris</i>) – Inland Forest Bat (<i>Vespadelus baverstocki</i>)
Threatened Mammals	– Kultarr (<i>Antechinomys laniger</i>) – Western Pygmy Possum (<i>Cercartetus concinnus</i>) – Southern Ningauai (<i>Ningauai yvonnese</i>) – Bolam's Mouse (<i>Pseudomys bolmi</i>) – Sandy Inland Mouse (<i>Pseudomys hermannsburgensis</i>) – Stripe-faced Dunnart (<i>Sminthopsis macroura</i>)

Group	Threatened entity
Threatened Reptiles	– Mallee Worm-lizard (<i>Aprasia inaurita</i>) – Wedgesnout Ctenotus (<i>Ctenotus brooksi</i>) – Marble-faced Delma (<i>Delma australis</i>) – Bardick (<i>Echiopsis curta</i>) – Yellow-tailed Plain Slider (<i>Lerista xanthura</i>) – Ringed Brown Snake (<i>Pseudonaja modesta</i>) – Jewelled Gecko (<i>Strophurus elderi</i>) – Western Blue-tongued Lizard (<i>Tiliqua occipitalis</i>)
Threatened Woodland and Shrubland Birds	– Threatened Mallee Bird Community – Southern Whiteface (<i>Aphelocephala leucopsis</i>) – Fork-tailed Swift (<i>Apus pacificus</i>) – Pied Honeyeater (<i>Certhionyx variegatus</i>) – Spotted Harrier (<i>Circus assimilis</i>) – Chestnut Quail-thrush (<i>Cinolosoma castanotum</i>) – Purple-crowned Lorikeet (<i>Glossopsitta porphyrocephala</i>) – Shy Heathwren (<i>Hylacola cautus</i>) – Malleefowl (<i>Leipoa ocellata</i>) – Purple-gaped Honeyeater (<i>Lichenostomus cratitius</i>) – Pink Cockatoo (<i>Lophochroa leadbeateri</i>) – Hooded Robin (south-eastern) (<i>Melanodryas cucullata cucullata</i>) – Gilbert's Whistler (<i>Pachycephala inornata</i>) – Scarlet-chested Parrot (<i>Neophema splendida</i>) – Diamond Firetail (<i>Stagonopleura guttata</i>)
Threatened Raptors	– Grey Falcon (<i>Falco hypoleucos</i>) – Black Falcon (<i>Falco subniger</i>) – Little Eagle (foraging) (<i>Hieraaetus morphnoides</i>)

6.3 Assessment of prescribed impacts

No karst, caves, crevices, cliffs, geological features of significance, areas of non-native vegetation, human-made structures or waterbodies are present in the Proposal site. There are no human-made structures within the proposal site. Potential prescribed impacts associated with habitat connectivity and vehicle strikes are described in Table 6-2.

Table 6.2 Prescribed impacts

Feature	Present	Description of feature characteristics and location	Threatened entities that use, are likely to use, or are part of the habitat feature
Karst, caves, crevices, cliffs, rocks or other geological features of significance	☐ Yes / ☒ No	There are no areas of karst, caves, crevices or cliffs in the Development footprint or surrounding Study area.	N/A
Human-made structures	☐ Yes / ☒ No	There are no human-made structures within the Development footprint.	N/A
Non-native vegetation	☐ Yes / ☒ No	There are no areas of non-native vegetation with any potential habitat resources within the Development footprint. The area mapped as 'cleared road' comprises compacted bare earth and has no value as habitat for any threatened species.	N/A

Feature	Present	Description of feature characteristics and location	Threatened entities that use, are likely to use, or are part of the habitat feature
Habitat connectivity	☒ Yes / ☐ No	The Development footprint occurs in an extensive patch of well over 100,000ha of largely intact native vegetation that forms part of Mungo National Park, and incorporates the existing 16,000ha biodiversity offset site for the Atlas-Campaspe mine site (refer to Figure 3-1). After construction, the Development footprint would comprise a gap in native vegetation cover approximately 100m wide with fauna friendly (non-barbed) stock proof fence lining both sides. The 100 m wide MOD6 clearing will create a temporary barrier which may deter and reduce the movement of some smaller species of mammals and reptiles. The barrier will be rehabilitated back to native vegetation from 2034, creating a temporary barrier to any species unable to disperse across the alignment during its relatively short operation. Habitat connectivity to the west would be maintained however there would be an area of approximately 1,030 ha to the east, including 534 ha of the current biodiversity offset that is surrounded by the existing approved surface development boundary that would become temporarily isolated by the proposed 100m wide services corridor.	Mammals – Western Pygmy Possum (<i>Cercartetus concinnus</i>) – Southern Ningui (<i>Ningui yvonnese</i>) – Bolam's Mouse (<i>Pseudomys bolmi</i>) – Stripe-faced Dunnart (<i>Sminthopsis macroura</i>) – Corben's Long-eared Bat (<i>Nyctophilus corbeni</i>) – Little Pied Bat (<i>Chalinolobus picatus</i>) – Yellow-bellied Sheath-tail-bat (<i>Saccolaimus flaviventris</i>) – Inland Forest Bat (<i>Vespadelus baverstocki</i>) Reptiles – Wedgesnout Ctenotus (<i>Ctenotus brooksi</i>) – Bardick (<i>Echiopsis curta</i>) – Yellow-tailed Plain Slider (<i>Lerista xanthura</i>) – Jewelled Gecko (<i>Strophurus eldери</i>) – Western Blue-tongued Lizard (<i>Tiliqua occipitalis</i>) Woodland birds, parrots and raptors – Malleefowl (<i>Leipoa ocellata</i>) – Chestnut Quail-thrush (<i>Cinolosoma castanotum</i>) – Southern Whiteface (<i>Aphelocephala leucopsis</i>) – Spotted Harrier (<i>Circus assimilis</i>) Major Mitchell's Cockatoo (<i>Lophochroa leadbeateri</i>) – Hooded Robin (south-eastern) (<i>Melanodryas cucullata cucullata</i>) – Gilbert's Whistler (<i>Pachycephala inornata</i>) – Little Eagle (foraging) (<i>Hieraaetus morphnoides</i>)
Waterbodies, water quality and hydrological processes	☐ Yes / ☒ No	There are no waterbodies within or within close proximity to the Development footprint or Study area. The Proposal is not likely to impact water quality, water bodies and hydrological processes that sustain threatened species or threatened ecological communities There is no groundwater dependent vegetation known to occur within the Atlas–Campaspe Mine area. There are no permanent surface water features at the Atlas–Campaspe Mine site (i.e. no groundwater window lakes fed by the deep underlying saline groundwater aquifer) and therefore no groundwater dependent baseflows in streams and wetlands.	N/A

Feature	Present	Description of feature characteristics and location	Threatened entities that use, are likely to use, or are part of the habitat feature
Wind turbine strikes (wind farm development only)	☐ Yes / ☒ No	The Proposal does not involve construction of wind turbines.	N/A
Vehicle strikes	☒ Yes / ☐ No	The Proposal would result in increased traffic due to the construction of the services corridor which would include a haul road, through an area with no existing roads or traffic. It is anticipated that approximately four haul trucks per hour would use the services corridor and speed limited would be restricted to 50km/h. In accordance with the requirement of EPBC Approval 2012/644, the services corridor would be fenced on both sides which will significantly reduce the risk of vehicle strikes to native fauna. Tronox maintains a log of vehicle strikes to animals across the Atlas-Campaspe MLA, and haul roads. Over the nine year lifespan of the mine to date, no vehicle strikes to Malleefowl, or any other threatened species have been recorded, or are suspected to have occurred. Most recorded vehicle strikes are to livestock (sheep and cattle), with some to feral goats and kangaroo species (likely Western Grey and Red Kangaroos). The vast majority of these incidents have been recorded on the 135 kilometre haul road to the Ivanhoe processing facility, a public road with a speed limit of 100kmh, where heavy trucks carrying mineral concentrate travel at 80kmh. Threatened species of microbats, reptiles, woodland birds and raptors may be at low risk of vehicle strike while traveling within or through the Development footprint to other areas of habitat. Malleefowl are at particular risk of vehicle strike, and speed limits are in place in other areas of the mine to reduce vehicle strike risks to this species. Given the low volume of vehicles that would be present at the site during construction and operation of the Development footprint, potential impacts associated with vehicle strikes are anticipated to be minimal, particularly if speed limits are restricted to less than 50 km/h.	Mammals – Western Pygmy Possum (<i>Cercartetus concinnus</i>) – Southern Ningau (Ningau yvonnese) – Bolam's Mouse (<i>Pseudomys bolmi</i>) – Stripe-faced Dunnart (<i>Sminthopsis macroura</i>) Reptiles – Mallee Worm-lizard (<i>Aprasia inaurita</i>) – Wedgesnout Ctenotus (<i>Ctenotus brooksi</i>) – Bardick (<i>Echiopsis curta</i>) – Yellow-tailed Plain Slider (<i>Lerista xanthura</i>) – Jewelled Gecko (<i>Strophurus eldieri</i>) – Western Blue-tongued Lizard (<i>Tiliqua occipitalis</i>) Woodland birds, parrots and raptors – Malleefowl (<i>Leipoa ocellata</i>) – Chestnut Quail-thrush (<i>Cinolosoma castanotum</i>) – Black Falcon (<i>Falco subniger</i>) – Little Eagle (foraging) (<i>Hieraaetus morphnoides</i>) – Southern Whiteface (<i>Aphelocephala leucopsis</i>) – Pied Honeyeater (<i>Certhionyx variegatus</i>) – Spotted Harrier (<i>Circus assimilis</i>) – Purple-crowned Lorikeet (<i>Glossopsitta porphyrocephala</i>) – Purple-gaped Honeyeater (<i>Lichenostomus cratitius</i>) – Pink Cockatoo (<i>Lophochroa leadbeateri</i>) – Hooded Robin (south-eastern) (<i>Melanodryas cucullata cucullata</i>) – Gilbert's Whistler (<i>Pachycephala inornata</i>)

Stage 2: Impact Assessment (Biodiversity Values and Prescribed Impacts)

7. Avoid and minimise impacts

The BAM identifies two key areas of project planning to avoid and minimise direct, indirect and prescribed impacts:

- Project location – locating the development away from the highest biodiversity values
- Project design – retaining biodiversity values through design features that limit vegetation clearing or reduce the amount of development within the footprint

The Proposal would result in direct impacts on native vegetation and threatened species habitats as shown in Figure 4-1 and Figure 5-1. There is also the potential for indirect impacts on areas of native vegetation adjacent to the Development footprint, both during construction and operation of the road infrastructure.

Specific mitigation measures are recommended to minimise likely impacts on biodiversity values. These measures are presented according to the hierarchy of avoidance and minimise of impacts, mitigation of the effect of unavoidable impacts, and finally the provision of offsets to compensate for residual impacts of the Proposal.

7.1 Avoid and minimise direct and indirect impacts

7.1.1 Background

The approved Atlas-Campaspe Mine includes the development of a pre-concentrator plant (PCP) at the Campaspe deposit to initially process Campaspe deposit ore to produce a pre-mineral concentrate that is approved to be pumped and/or trucked via the transport route to the existing primary gravity concentration unit (PGCU) at the Atlas deposit for further processing. The transport route follows the approved services corridor between the Atlas and Campaspe deposits (Refer to Figure 1 of the revised BDAR).

The Modification would include the development of an optimised services corridor between the Atlas and Campaspe deposits to reduce the length of the transport route between the PCP and PGCU to improve operational efficiency and reduce greenhouse gas emissions at the Atlas-Campaspe Mine. The selection of the location of the optimised services corridor is therefore largely constrained by the location of the approved PCP and PGCU.

7.1.2 Proposal design

Planning measures

As part of initial planning for the siting of the optimised services corridor, Tronox considered a range of aspects, including design/operational considerations (e.g. most direct alignment, avoidance of low-lying areas subject to flooding) and environmental considerations (e.g. avoidance and minimisation of biodiversity and Aboriginal cultural heritage impacts).

For the biodiversity aspect of the initial planning, a desktop assessment of biodiversity constraints within the area between the PCP and PGCU where the optimised services corridor could be located was undertaken, including a review of the following databases and biodiversity resources:

- NSW State Vegetation Types Map (SVTM) (NSW DCCEEW 2025b) to identify candidate PCTs and to help map native vegetation extent
- NSW BioNet Vegetation Classification (NSW DCCEEW 2025c) to identify candidate TECs
- BioNet Atlas records of threatened biota (NSW DCCEEW 2025a)
- Aerial photography

The broad area between the PCP and PGCU consists of relatively intact native vegetation. This provided limited options to avoid/minimise impacts to biodiversity values when siting the optimised services corridor as there were no significant cleared areas or areas of lower value PCTs that could be targeted.

Given the above, the most direct route between the PCP and PCGU was selected for the optimised services corridor study area to minimise the proposed disturbance area required. Any alternative routes would result in increased disturbance of vegetation with similar biodiversity values and therefore result in increased biodiversity impacts.

Following this initial planning, targeted threatened flora surveys and BAM VI plot assessments were completed in October 2024 and targeted fauna surveys were completed in November and December 2024 in the study area (refer to the revised BDAR for survey details). Based on these survey outcomes, the optimised services corridor alignment was further refined to avoid and minimise biodiversity impacts.

A summary of the avoidance and minimisation measures implemented for the Modification is provided below.

Practical avoidance and minimisation measures

The location of the optimised services corridor was carefully refined to minimise impacts to biodiversity values as far as practicable. Initial considerations for the study area were based on aerial imagery and the best route to avoid low-lying drainage areas and clay-pans, minimise impacts to native vegetation and tree clearing, and minimising required earthworks. Specifically:

- **Optimised Services Corridor Width** – Following a review of preliminary environmental survey data (including the preliminary findings of the biodiversity and Aboriginal cultural heritage surveys) the initial corridor width was reduced from approximately 150 m wide to 100 m wide to avoid impacts on biodiversity values while allowing for the minimal width required to adequately accommodate the necessary infrastructure. This reduction in corridor width reduced the area of native vegetation disturbance from approximately 92 ha to 50.5 ha.
- **Targeting Poor Condition Vegetation** – The optimised services corridor has been designed to be located within areas where native vegetation is in the poorest condition with the lowest VI scores (including approximately 4.5 ha of previously cleared native vegetation). Vegetation that has been disturbed through past clearing represents approximately 11 percent of the development footprint.

Avoidance of Cobar Greenhood Orchid Individuals and habitat – The Modification has been designed to avoid and minimise disturbance to Cobar Greenhood Orchid individuals and habitat while balancing other environmental, heritage and operational constraints. Complete avoidance of Cobar Greenhood Orchid habitat was not however feasible as suitable habitat for this species is widespread around the optimised services corridor (refer to Figure 7.2). Within the optimised services corridor habitat for the Cobar Greenhood Orchid is present within PCTs 170 and 171. These PCTs are widely distributed and comprise two of the dominant PCTs across the Atlas-Campaspe Mine area (Figure 7.2). The widespread distribution of this habitat has been confirmed during, multiple rounds of surveys undertaken over the past decade at the Atlas-Campaspe Mine, that have recorded this species in relatively large numbers within these PCTs across the Atlas-Campaspe Mine. In the broader area, the extent of suitable habitat and the number of local records within vegetation adjoining the optimised services corridor indicate that the species is likely to be widely distributed through the area. The distribution of modelled habitat within a 5 km radius of the optimised services corridor is shown on Figure 7.2. As noted above, the selection of the optimised services corridor route is largely constrained by the location of the approved PCP and PCGU. This in combination with the extensive areas of modelled Cobar Greenhood Orchid habitat surrounding the optimised services corridor, the most direct route between the PCP and PCGU was selected for the optimised services corridor study area to minimise the proposed disturbance area required. As such, any realignment of the optimised services corridor would likely increase the disturbance of Cobar Greenhood habitat and therefore likely result in a comparable or increased level of impact to adjacent Cobar Greenhood Orchid.

- **Water Courses and Large Trees** – the optimised services corridor was realigned to avoid water courses, and minimal number of large or old trees to be impacted and avoiding indirect impacts to retained native vegetation where practicable.
- **Refinement during detailed design** - impacts would be confined to the Development footprint. Within this area, the final placement of infrastructure, access tracks, parking, and laydown areas would be refined during detailed design to minimise the extent of vegetation clearing.

7.1.3 Biodiversity Management Plan

In accordance with Condition 14(b), Schedule 3 of the Development Consent (SSD_5012), a Biodiversity Management Plan (BMP) has been prepared by a suitably qualified expert approved by the Secretary of the NSW Department of Planning, Housing and Infrastructure (DPHI) which outlines measures to mitigate impacts on biodiversity at the Atlas-Campaspe Mine. Measures have been defined according to 'specific, measurable, achievable, relevant, and time-bound' (SMART) principles and include auditable performance outcomes. The BMP includes the following:

- Vegetation Clearance Protocol to minimise the impact from vegetation clearance activities on native flora and fauna, including threatened species
- Threatened Species Management Protocol, including procedures for managing and monitoring the threatened species known to be present at the Atlas-Campaspe Mine, with particular focus on the primary species, namely, the Winged Peppercreep, Mossgiel Daisy, Cobar Greenhood Orchid, Malleefowl, Western Pygmy Possum (*Cercartetus concinnus*) and Corben's Long-eared Bat
- Nest box research program for the Corben's Long-Eared Bat and Western Pygmy Possum to evaluate the species' use of fabricated ply-wood nest boxes compared to nests constructed using tree hollows salvaged during vegetation clearance at the mine site
- Controlling access to authorised personnel and contractors
- Measures to reduce fauna vehicle strikes to generally minimise the occurrence of fauna-vehicle collisions on internal mine roads
- Weed control to reduce the abundance and distribution of weeds in the Atlas-Campaspe Mine site in order to minimise their impact on native flora and fauna
- Feral animal control to reduce the numbers of feral animals in the Atlas-Campaspe Mine and minimise their impact on native flora and fauna
- Erosion control measures
- Bushfire management

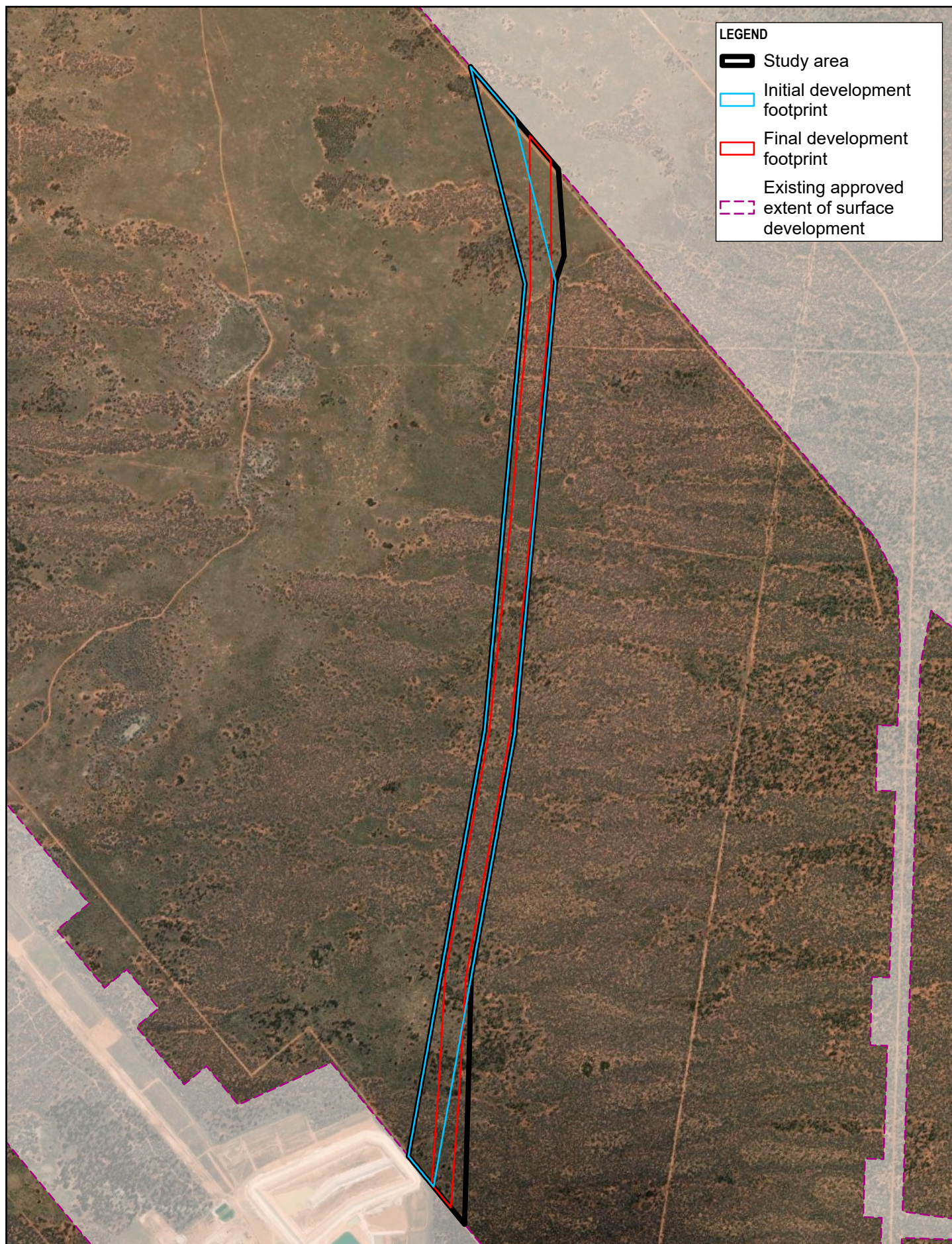
7.1.4 Summary of measures to avoid and minimise impacts

A summary of measures undertaken to avoid and minimise impacts is provided in Table 7.1

Table 7.1 Avoidance and minimisation measures for direct, indirect and prescribed impacts

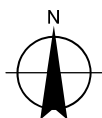
Action	Outcome	Timing	Responsibility
Identification of a site with minimal biodiversity value.	It has not been possible to fully avoid impacts to biodiversity values, noting the corridor between the Atlas and Campaspe deposits in an extensive area of native vegetation. The chosen location is immediately adjacent to areas already approved for development and has included non-native or previously disturbed vegetation as far as possible (located int the north of the proposed alignment).	Site selection	Proponent
Minimising impacts to vegetation through the use of existing access to the Development footprint.	Using existing access to the services corridor will result in avoidance of impacts and minimisation of the amount of native vegetation clearing required.	Site selection	Proponent
Minimisation of impacts to biodiversity values by avoiding higher value habitat features and resources.	Not possible to fully avoid impacts noting the location of the corridor between the Atlas and Campaspe deposits in an extensive area of native vegetation. The chosen location is immediately adjacent to areas already approved for development and has included non-native or previously disturbed vegetation as far as possible.	Preliminary design	Proponent

Action	Outcome	Timing	Responsibility
Reducing the Development footprint and concentrating development in non-native or poor condition vegetation.	Design has attempted to avoid and minimise the amount of native vegetation clearing required for the services corridor by locating the corridor along an alignment that includes previously disturbed vegetation at the northern end. The initial corridor width was reduced from approximately 150 m wide to 100 m wide to avoid impacts on biodiversity values while allowing for the absolute minimal width required to adequately accommodate the necessary infrastructure. This reduction in corridor width reduced the area of native vegetation disturbance from approximately 92 hectares (ha) to 50.5 ha.	Design	Proponent
Providing an adequate buffer between the Development footprint and mature trees, and water courses adjoining the Development footprint.	The proposal would not result in any direct or indirect impacts to water courses. There will be minimal impacts to large or old trees would be, and indirect impacts to retained native vegetation would be avoided where possible.	Design	Proponent



Paper Size ISO A4
0 200 400 600 800
Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 54

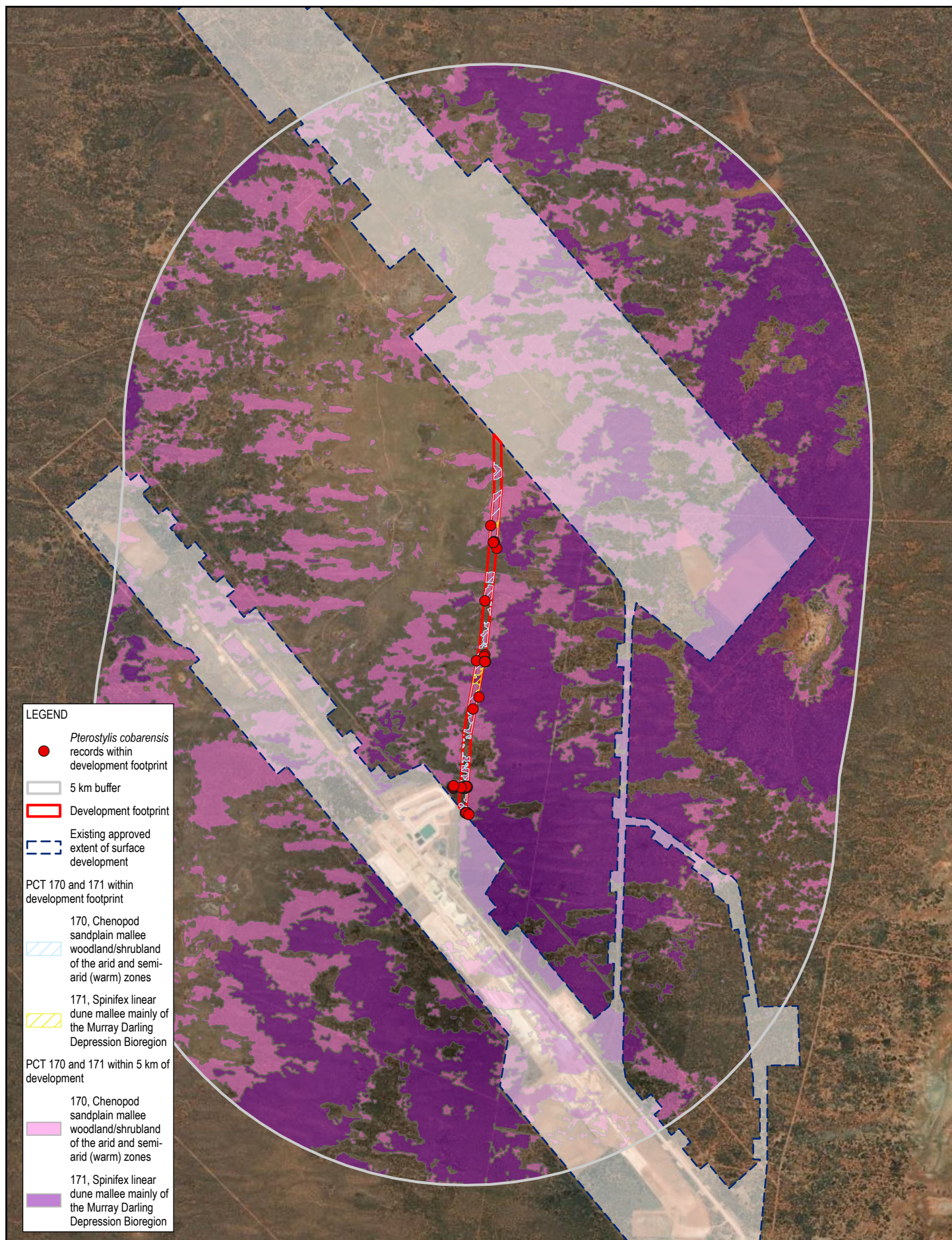


Tronox Mining Australia Ltd
Atlas-Campaspe Mineral Sands Project Modification 6
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Revision No. B
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Avoidance of impacts

FIGURE 7.1

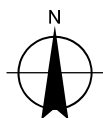


Paper Size ISO A4

0 570 1,140 1,710 2,280

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 54



Tronox Mining Australia Ltd
Atlas-Campaspe Mineral Sands Project Modification 6
Biodiversity Development Assessment Report

Project No. 12628564
Revision No. A
Date 05/11/2025

Pterostylis cobarensis habitat

FIGURE 7.2

8. Impact assessment

8.1 Direct impacts

8.1.1 Summary

The Development footprint would result in direct impacts to native vegetation and associated threatened species habitat through the clearing of up to 50.41 ha of native vegetation for construction of the optimised services corridor. There is also 0.12 ha of non-native vegetation associated with an existing cleared road in the Development footprint.

Residual direct impacts associated with the Proposal are summarised in Table 8.1 and Table 8.2.

For the purposes of this BDAR it has been assumed that the Proposal would result in the clearing and grading of the entire Development footprint. All future composition, structure and function scores have therefore, been entered as 0 for all vegetation zones as summarised in Table 8.2.

Table 8.1 Summary of residual direct impacts to vegetation

Direct impact	BC Act status	EPBC Act status	SAIL entity	Project phase/timing of impact (e.g. construction, operation, rehabilitation)	Extent (ha)
Clearing of PCT 171 – Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion_intact	Not listed	Not listed	No	Construction	4.42
Clearing of PCT 170 – Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones_intact	Not listed	Not listed	No	Construction	16.26
Clearing of PCT 143 - Narrow-leaved Hopbush – Scrub Turpentine- Senna shrubland on semi-arid and arid sandplains and dunes_intact	Not listed	Not listed	No	Construction	5.54
Clearing of PCT 58- Black-Oak -Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion_intact.	Not listed	Not listed	No	Construction	14.42
Clearing of PCT 58- Black-Oak -Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion_disturbed	Not listed	Not listed	No	Construction	4.42
Clearing of PCT 58- Black-Oak -Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion_cleared	Not listed	Not listed	No	Construction	5.35
Total clearing of native vegetation					50.41
Cleared road	Non-native	Non-native	No	n/a	0.12
Total Development footprint					50.53

Table 8.2 Impacts to vegetation integrity

Vegetation zone	Area (ha)	Before development				After development				
		Composition	Structure	Function ¹²	VI score	Composition	Structure	Function ¹	VI Score	Change in VI score
PCT 171 – Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion_intact	4.42	98.9	54.2	37.5	58.6	0	0	0	0	-58.6
PCT 170- Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones_intact	16.26	92.4	29.6	44.3	49.5	0	0	0	0	-49.5
PCT 143 - Narrow-leaved Hopbush – Scrub Turpentine-Senna shrubland on semi-arid and arid sandplains and dunes_intact	5.54	85.7	93.8	N/A	89.7	0	0	0	0	-89.7
PCT 58- Black-Oak -Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion_intact.	14.42	95.1	41.2	85.4	69.4	0	0	0	0	-69.4
PCT 58- Black-Oak -Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion_disturbed	4.42	78.6	29.1	7	25.2	0	0	0	0	-25.2
PCT 58- Black-Oak -Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion_cleared	5.35	76.3	9.9	17.4	23.6	0	0	0	0	-23.6

8.1.2 Removal of vegetation and habitat resources

The construction of the Proposal would result in the removal of up to 50.41 ha of native vegetation and associated threatened species habitat as detailed in section 8.1.1.

Surveys completed in October 2024 and October 2025 confirmed the presence of one flora species, Cobar Greenhood, listed as vulnerable under the BC Act. The Proposal would result in the removal of approximately 20.68 ha of habitat for the Cobar Greenhood within PCTs 170 and 171.

Surveys conducted in October and November 2024 within the Study area recorded a several fauna species listed as threatened under the NSW BC Act including the Jewelled Gecko, Chestnut Quail-thrush, Hooded Robin (south-eastern), Pink Cockatoo, and Southern Whiteface. In addition, the Hooded Robin (south-eastern), Pink Cockatoo and Southern Whiteface are also listed species under the EPBC Act. No direct evidence of breeding or any important habitat resources were observed to suggest that the Subject site is of particular importance to local populations of these species.

A nest tree census was conducted to identify hollow-bearing trees, stick nests or other signs of breeding activity of threatened fauna that could require calculation of species credits according to the BAM. The nest tree census revealed several low to moderate quality hollow-bearing trees and other candidate nest trees near the

² Composition, structure and function attribute scores are used to determine the VI score for each vegetation zone

Development footprint as shown on Figure 5-1. There are no candidate nest trees in the Development footprint nor are any likely to be affected by indirect impacts.

As described in section 4.5, the Mallee Bird Ecological Community occurs within the Development footprint. The Proposal would remove or modify 50.41 ha of native vegetation comprising habitat for this EEC. This represents a very small proportion (estimated at 0.0009%) of the current estimate of 5.601 million ha of mallee woodlands and shrublands in the Murray Darling Depression northern IBRA subregion that comprises potential available habitat for this EEC (DAWE 2021a). This potential habitat occurs within a highly intact landscape of many hundreds of thousands of hectares of remnant native vegetation, in a contiguous patch including mallee and non-eucalypt semi-arid woodland. The small area of habitat to be removed or modified at a landscape scale is highly unlikely to cause a substantial change in the species composition of an occurrence of this EEC, or to cause a decline or loss of functionally important species.

The Study area does not contain important habitat for any migratory species listed under the EPBC Act.

The Development footprint contains habitat for the threatened fauna species listed above and other fauna of semi-arid environments. The Development footprint includes tracts of mature mallee eucalypts and shrubs, such as *Acacia*, *Eremophila* and *Senna* species which would provide shelter and foraging resources for these threatened fauna species. Habitat associated with small trees, understorey vegetation and shelter substrate such as fallen timber, leaf litter and gibber would be removed or modified over up to 50.41 ha within the Development footprint. The Proposal would remove a very small proportion of the resources available in the local area.

The clearing of mallee, woodland and shrubland habitat would remove breeding, foraging and shelter habitat for a range of species, including small woodland birds. Eucalyptus and other native canopy species provide nectar resources as well as foraging substrate for a diverse range of arboreal species, such as birds and arboreal mammals, as well as microbats. The surrounding locality, in particular the Mungo National Park located to the west of the Development footprint, provides many thousands of hectares of similar vegetation and habitat resources which would continue to support these threatened species.

There is a risk of direct harm to any resident fauna occupying the Development footprint during clearing activities. As described above, the Development footprint provides a variety of habitat resources for native fauna species, including foraging, roosting and shelter resources for threatened species as well as common native fauna. Groundcover vegetation, leaf litter and woody debris would provide shelter and foraging substrate for reptiles, frogs and invertebrates. Trees and shrubs would provide additional shelter for these species as well as roosting and breeding habitat for birds. Construction is likely to result in the injury or mortality of some individuals of these fauna species with small terrestrial fauna or sub-mature birds that may be sheltering in vegetation within the Development footprint during clearing activities the most susceptible to potential impacts. There were no large or hollow-bearing trees detected in the Development footprint, and therefore there is a low potential risk of injury or mortality of arboreal mammals or hollow-nesting birds. The potential for impacts on fauna utilising hollows and other refuge sites in trees would be further reduced through pre-clearance surveys of any habitat trees. Alternative habitat resources and refuge from construction activities is available in retained native vegetation adjoining the impact area. More mobile native fauna such as adult birds, bats, terrestrial and arboreal mammals that may be sheltering in vegetation in the Development footprint are likely to evade injury during construction activities.

The implementation of the BMP (see 7.1.2) would help minimise the risk of vegetation clearing activities resulting in the injury or mortality of resident fauna.

Given the relatively small quantum of impact in a regional context and the presence of alternative habitat resources, the Proposal is unlikely to have an adverse effect on the life cycle of any threatened fauna species such that a viable local population of the species is likely to be placed at risk of extinction.

8.1.3 Impacts to an existing biodiversity offset area

The Development footprint occurs within the existing biodiversity offset area for the Atlas-Campaspe Mine, which was established in 2014 as a condition of Development Consent (SSD_5012) and the Projects EPBC Approval. Impacts to the existing biodiversity offset area would be compensated for through the establishment of a supplementary offset area that contains equivalent PCTs and threatened species habitat. A supplementary offset report that describes the alternative offset and demonstrates how it would be an equivalent or better offset than the area being impacted has been prepared and will be submitted with the Proposed modification application.

8.2 Indirect impacts

Table 8.3 documents the potential residual indirect impacts that could arise from the construction and operation of the Proposal, the mitigation measures that would be employed to help avoid tangible effects and the residual consequences and likelihood of these indirect impacts. Edge effects and other indirect impacts as a result of the Proposal have been assessed to have a low level of impact on PCTs and habitat for species credit species associated with these vegetation zones. The Study area contains near-intact vegetation with naturally open structure, low soil moisture, high resilience and very low weed cover which in general makes it much less susceptible to edge effects than other environments such as floodplains.

Avoidance and minimisation measures for indirect impacts are presented in Table 7.1 and management actions to further reduce residual indirect impacts are presented in Table 9.1. These mitigation measures are likely to effectively reduce the risk of residual indirect impacts as outlined in Table 8.3 below. Table 10.4 summarises proposed conservation measures for potential indirect and prescribed impacts. Given the likely effectiveness of avoidance, minimisation and mitigation measures, no offsets have been calculated for residual indirect or prescribed impacts.

Table 8.3 Summary of residual indirect impacts

Indirect impact	Likelihood and potential consequences
Edge effects	'Edge effects' can include increased noise and light or erosion and sedimentation at the interface of intact vegetation and cleared areas. Edge effects may result in impacts such as changes to vegetation type and structure, increased growth of exotic plants, increased predation of native fauna or avoidance of habitat by native fauna. Altered environmental conditions along new edges can allow invasion by pest animals specialising in edge habitats and/or change the behaviour of resident animals. Edge zones can be subject to higher levels of predation by introduced mammalian predators and native avian predators. The Proposal will result in the establishment of new edges along the optimized service corridor with potential edge effects continuing to affect vegetation and habitats retained outside the Development footprint. Woodland vegetation types in particular, can be more susceptible to edge effects compared to others. A study by Hansen et al. (2008) found that edge effects are most likely to negatively influence woodlands with a high biomass ecosystem and finer microclimates such as tropical and temperate rainforests but may have little influence on woodlands with low biomass ecosystems. PCTs within the Development footprint are typically associated with low biomass vegetation which have a lower susceptibility to edge effects. This is supported by observations of corridors that have been created elsewhere within the Atlas-Campaspe mine site that show minimal edge effect impacts as compared with the authors' experience of high biomass environments such as inland floodplains or near-coastal moist forests. Mitigation measures such as ongoing weed control will be implemented to reduce the potential impacts of edge effects and it is likely that the overall, the contribution to edge effects arising from clearing of vegetation and ongoing use of the services corridor would be relatively minor.

Indirect impact	Likelihood and potential consequences
Introduction and spread of weeds, pests and pathogens	Disturbance associated with vegetation clearing and vehicle traffic during construction may, in general, increase the potential for the spread, introduction and establishment of weed and pest species, and diseases and pathogens. Control measures that would be implemented to minimise the risk of introducing and spreading weeds through the site and into surrounding vegetation will include: – Machinery hygiene protocols for all machinery working in/around the Development footprint – Ensuring no weed affected soil or fill is introduced to the Development footprint – Use of erosion and sediment controls measures outlined in the Water Management Plan (WMP) to control nutrient/weed migration – Monitoring of high-risk areas in and around Atlas-Campaspe mine site such as access roads, stockpiles and bare ground – Control weed propagules by proactively trimming any developing flowers or seed heads and disposing of these appropriately A weed and pest control program is also provided in the BMP to reduce the abundance and distribution of weeds and pests in the Atlas-Campaspe Mine site in order to minimise their impact on native flora and fauna.
Noise and light impacts on fauna	Noise will be produced through the construction of the optimised services corridor and its infrastructure (i.e. pipelines, electricity transmission line, soil stockpiles and water management infrastructure). Noise levels during the construction period would result in an increase above existing background levels for the duration of construction. Noise levels would vary during the construction period, with some activities being louder and producing higher levels of vibration than others. Noise, vibration, and light have been shown to have a variety of impacts on fauna, including changing foraging behaviour, impacting breeding success and changing species occurrences. Construction activities at the Development footprint would increase noise levels in a sparsely populated landscape and would increase noise levels in the vicinity of some fauna roosting and nesting habitat. Fauna most at risk would be those residing near the works area, and in particular any species that may be nesting, roosting or denning in the area. Some fauna may vacate areas in proximity to the Development footprint during construction. There are extensive, connected areas of alternative habitat which any displaced animals could access with minimal risk or energy cost. During operations, there would be a small increase in noise associated with truck movements along the haul road as well as from trucking/pumping of mineral concentrates from the Campaspe deposit to the Atlas deposit. Given the very few trucks that would be using the road per day (approximately four), impacts associated with noise during operation of the Proposal are likely to be minimal. The noise generated from the pumping option involving pumping pre-mineral concentrates would be negligible in context of full-scale mining. Lights may be used during construction of the services corridor however the use of lighting would be limited to occasions that night-time works are required. When the lighting is required, the lighting has the potential to result in light spill into adjoining areas of native vegetation which may disturb resident fauna during the limited times it is required. Light will be managed in general accordance with the requirements in Australian Standard 4282:2023 Control of the obtrusive effects of outdoor lighting. Lighting proposed for the corridor are small scale that would be unlikely to disturb areas beyond the immediate vicinity. Lighting would be limited to intersections and around critical equipment (eg pump stations). Lighting will be designed to Australian Standard 4282:2023 and consider the principles of the <i>Dark Sky Planning Guideline</i>. Given the availability of alternate habitat in surrounding areas, it is unlikely the temporary increase in noise and light during construction and operation of the Proposal would significantly affect fauna populations that occur in adjoining vegetation.

Indirect impact	Likelihood and potential consequences
Erosion and sedimentation	Removal of vegetation, soil disturbance and excavation, and construction of the optimised service corridor would expose subsoil and generate spoil material and could, in general, result in erosion and sedimentation. The proposed works would be undertaken in accordance with the approved WMP for the Atlas-Campaspe mine site. Appropriate implementation of the WMP and associated mitigation measures would also reduce the likelihood of erosion and sedimentation during construction. Therefore, the project is not anticipated to result in unacceptable downstream erosion and sedimentation impacts. Given the scale of works, low rainfall, flat topography across the Study area, and the proposed environmental management measures the Proposal is highly unlikely to result in a tangible increase in the degree of erosion or sedimentation. No additional offsets are proposed for potential indirect impacts.

8.3 Prescribed impacts

Prescribed impacts are the impacts on biodiversity values which are not related to, or are in addition to, native vegetation clearing and habitat loss (Section 6.7 of the BAM). These types of impacts are used by the decision-maker to inform the determination and conditions of consent for developments. In general, these types of impacts affect habitat or features of the environment that are irreplaceable or otherwise important to the maintenance of biodiversity values.

The BC Regulation (clause 6.1) identifies actions that are prescribed as impacts to be assessed under the biodiversity offsets scheme. The likelihood, extent and magnitude of prescribed impacts must be assessed using the approach specified in the section 8.3 of the BAM. The likely effect of prescribed impacts that are relevant to the Development footprint and threatened species potentially impacted are described in Table 8.4.

The Proposal would include implementation of measures to mitigate residual impacts, specified in the relevant approved management plans, including the WMP and BMP (Section 7.1.2).

Given the scale and context of the proposal there are unlikely to be any substantial impacts on threatened species and their habitats beyond those associated with the removal of vegetation and habitat in the proposal site.

8.3.1 Karst, caves, crevices, cliffs, rocks and other geological features of significance

No areas of geological significance are present. No caves suitable for roosting or breeding of bats are present.

8.3.2 Human made structures and non-native vegetation

No buildings, culverts, bridges or similar human-made structures or areas of non-native vegetation would be impacted by the proposal.

8.3.3 Habitat connectivity

Habitat fragmentation resulting from vegetation clearing can increase the isolation of remnant vegetation and create barriers to movement for smaller, less mobile fauna, including ground-dwelling mammals, reptiles and amphibians. Fragmentation may also disrupt ecological processes by impeding the movement of pollinators (e.g. insects) and seed dispersal agents (e.g. birds), with potential consequences for the life cycles of both common and threatened flora species.

The Development footprint is located within an extensive tract of largely intact native vegetation exceeding 100,000 ha, which is connected to Mungo National Park and incorporates the existing 16,000 ha biodiversity offset area for the Atlas-Campaspe mine site (refer to Figure 3-1). Following construction, the Development would introduce a break in vegetation cover approximately 100 m in width, with a non-barbed stock-proof fence along both sides. While this clearing may temporarily deter or reduce movement for some smaller mammals and reptiles, it represents a narrow and short-term barrier within a highly connected landscape.

The temporary separation of 534 ha of vegetation and habitat that forms part of the existing biodiversity offset area is not expected to significantly restrict the movement of or substantially impact on threatened species or their habitats.

The 534 ha of existing biodiversity offset area is bounded to the north and south by the Atlas-Campaspe mine and is proposed to be temporarily bounded by the 100 m wide optimised service corridor to the west. To the east the offset area will remain connected to over 500 ha of remnant vegetation and persist as a patch of approximately 1,035 ha of similar condition remnant native vegetation and habitat. This area is large enough to provide sustained feeding and breeding habitat for all resident local threatened species.

Furthermore, the optimised services corridor would be rehabilitated with endemic native species so that it can be reincorporated into the approved biodiversity offset area at the end of the Project life (approximately 2034). The optimised services corridor would therefore represent only a temporary impact to any species unable to disperse across the alignment during its relatively short, eight years of operation.

In considering possible impacts to threatened species from fragmentation effects; microbat species, such as the South-eastern Long-eared Bat (*Nyctophilus corbeni*), which are highly mobile, are not likely to be impacted by the proposal, as they are capable of moving up to four kilometres a night from their roost sites to hunt and forage (Lumsden et al. 2008). The proposed 100 m gap in native vegetation along the optimised services corridor would therefore not prevent the movement of microbats within habitat within the offset landscape and beyond.

Threatened small mammal species within the 1,035 ha of remnant native vegetation are also unlikely to be impacted by fragmentation effects. Species such as Western Pygmy Possum, Bolam's Mouse and Stripe-faced Dunnart, whilst not detected during targeted surveys within the optimised services corridor, have the potential to be present. These species however have adequate mobility (Van Dyck & Strahan (2008) describe Stripe-faced Dunnart making overnight movements of 300 to 2,000 metres, Bolam's Mouse moving 300 metres in several hours, and Western Pygmy-possum as being extremely mobile), which are unlikely to be impacted by the construction and operation of the temporary optimised services corridor.

Threatened woodland birds, such as Pink Cockatoo and Southern Whiteface (both recorded within and around the optimised services corridor) are also highly mobile species unlikely to be impacted by the minor fragmentation effects. Other threatened woodland and shrubland birds (detailed in Table 6-1 of the revised BDAR) similarly would not have their movement limited by the optimised services corridor or temporary habitat loss, as all these species have wide home ranges and, are highly mobile and would easily move across the optimised services corridor and fences.

Despite being ground-based and rarely taking flight, Malleefowl are highly mobile and considered unlikely to be restricted in their movements by the proposal. Notwithstanding despite many years of intensive survey across the Atlas-Campaspe Mine (GHD 2018a, GHD 2019a, GHD 2019b, GHD 2019c, GHD 2019c, GHD 2020a, GHD 2020b, GHD 2022a, GHD 2022b, GHD 2023a, GHD 2023b, GHD 2024a, GHD 2024b, GHD 2024c, GHD 2025 and GHD 2026), that has included targeted surveys for Malleefowl and their nest mounds, none have been recorded within this part of the Atlas-Campaspe Mine. The closest recorded Malleefowl record is located seven kilometres west of the optimised services corridor. The next closest record is located nine kilometres north-west of the optimised services corridor (refer to Figure 5.1 of the revised BDAR). Breeding Malleefowl tend to be sedentary, nesting in the same general area year after year (Benshemesh 1992, DCCEEW 2024), suggesting that the temporary separation of approximately 1,035 ha of remnant native vegetation is very unlikely to have any immediate impact on the Malleefowl population in the vicinity of the Atlas-Campaspe Mine, and despite birds sometimes moving several kilometres between nesting seasons this movement would be unhindered by the proposed development following its completion and rehabilitation from 2034.

A study of Malleefowl dispersal has demonstrated that chicks are capable of rapid and wide-ranging movement soon after emerging from nests. Benshemesh (1992) recorded mean dispersal rates exceeding 600 m per day, with some individuals averaging more than two kilometres per day. Dispersing chicks were observed moving from unburnt habitats into recently burnt mallee and open woodland areas with limited cover, indicating a low sensitivity to habitat boundaries. These findings suggest that the species has a strong capacity to disperse and recolonise habitat patches, even where fragmentation is present.

In the unlikely event that Malleefowl colonise and begin utilising the approximately 1,035 ha of separated remnant native vegetation, the relatively narrow cleared area (with a maximum width of approximately 100 m) is unlikely to

impede movement. The proposed offset fence, which will not incorporate a barbed top, is not expected to restrict movement and would be readily traversable by the species.

Furthermore, Malleefowl typically occupy home ranges of between 50 and 500 ha. As such, sufficient habitat would be available within the approximately 1,035 ha of separated remnant native vegetation to support the species should it utilise this area in the future.

The Chestnut Quail-thrush, another threatened ground-dwelling bird species recorded within the optimised services corridor, is capable of short-distance flight. The optimised services corridor is therefore unlikely to represent a barrier to movement of this species across the broader landscape.

The Jewelled Gecko was detected during spotlighting surveys within the optimised services corridor, though numerous other threatened reptile species are likely to be present within and adjacent to the footprint, including within the approximately 1,035 ha of separated remnant native vegetation, including the Mallee Worm-lizard and Marble-faced Delma. Jewelled Geckos are Triodia-obligate species and would be limited to areas of mallee with a Triodia understorey within the offset area, being unlikely to travel far from the safety of their Triodia habitat. The Mallee Worm-lizard is another mallee specific species, mostly living within ant colonies underground within sandy habitat with scattered surface debris, such as mallee tree roots. Like the Mallee Worm-lizard, the Marble-faced Delma is restricted to mallee habitats but has a greater ability to utilize both Triodia and leaf litter microhabitats within the mallee zone. These species are unlikely to be negatively impacted by the fragmentation effects as they require comparatively small areas to forage, breed and shelter within, and as with many reptile species, are small-bodied animals that are quite sedentary, being unlikely to move far from their shelter sites. In the rare case that reptiles do move over the haul road and/or out of the offset, the fenceline will not create a barrier, due to the small size of these animals.

The optimised services corridor would be relatively narrow in extent and temporary in duration and is not expected to impede species movement or substantially affect the suitability of the area for threatened species. The resulting isolated area would exceed 1,000 ha, which is considered sufficient to support populations of the threatened species relevant to the site.

Any potential impacts associated with habitat fragmentation are expected to be temporary and would be resolved following rehabilitation after cessation of mining operations in 2034. On this basis, the inclusion of an additional 534 ha within the existing offset area is not considered necessary or appropriate.

Table 8.4 *Impacts on connectivity*

Criteria	Assessment
describe the nature, extent and duration of short and long-term impacts (during operation, during construction, that are uncertain)	Nature The assessment of landscape context according to the BAM is provided in section 4.1. Figure 3-1 shows the extent of the patch of vegetation that the Development footprint falls within, with extensive areas of connected vegetation surrounding the Study area. There are hundreds of thousands of hectares of semi-arid shrubland and woodland similar to that in the development footprint, which form part of the same contiguous block of remnant vegetation. In this context the development footprint is unlikely to comprise a key link in a resource corridor, or to be critical to the ongoing connectivity of habitat in the local area. The development footprint however is located within an existing biodiversity offset site and would result in the fragmentation of the site, into two smaller patches. After construction the Development footprint would create a temporary gap in native vegetation cover and potential barrier to east-west movement of some species through the landscape approximately 100 meters wide. The development footprint would contain structures, roads and fences as well as noise, light and human activity which may limit the ability of some fauna to move through the landscape. This infrastructure is not however expected to significantly restrict the movement of threatened species across the site. Extent The proposal would include clearing of native vegetation and construction of infrastructure and access tracks in around 50.41 ha of land. 20.68 ha of this area is considered Malleefowl habitat. Removal of native vegetation cover and operation of the Development footprint would create a temporary gap in east-west connectivity about 100 m wide and 5.2 km long. When considered alongside the existing approved extent of surface development for the Atlas and Campaspe deposits the Proposal would contribute to temporary barriers

Criteria	Assessment
	in east-west connectivity about 10 km long. This barrier is not however expected to significantly restrict the movement of threatened species across the site Duration The impact is expected to occur over a period of up to 8 years during the operation of the corridor. Following decommissioning in 2034, the area would be rehabilitated to native vegetation and subsequently incorporated back into the mine's offset area.
predict the consequences of the impacts for the persistence of the threatened entities identified in Sub-Section 6.1.3, taking into consideration mobility, abundance, range and other relevant life history factors. justify predictions of impacts with relevant literature and other published sources of information and describe any limitations to data, assumptions and predictions about impacts on biodiversity).	The Development footprint may be traversed by fauna and provides some groundcover that may be used as shelter by smaller species, including those listed in Table 6-2. The site does not contain water bodies or other key habitat features that function as critical connectivity links between habitat areas. However, the optimised services corridor occurs within a broader vegetated corridor between existing and proposed developments within the tenement and would bisect the existing biodiversity offset site, resulting in a fragmented and temporarily isolated patch of offset to the east of the development footprint. When considered in combination with the approved extent of surface development for the Atlas and Campaspe deposits, the Proposal would contribute to a cumulative temporary reduction in east-west connectivity across a corridor of approximately 10 kilometres. The threatened species identified for the site may traverse the development footprint opportunistically as part of their broader use of surrounding habitat but are unlikely to be reliant on this area to maintain connectivity within the local landscape. Regional habitat connectivity would continue to be supported by extensive tracts of comparable semi-arid woodland and shrubland surrounding the Project footprint. Notwithstanding, when considered cumulatively with existing approved disturbances, the Proposal would not contribute to fragmentation at a regional scale within the broader biodiversity offset area. At a finer scale, an area of vegetation approximately two by five kilometres would remain between the main areas of surface disturbance. This extent of habitat is considered sufficient to support populations of less mobile species with smaller home ranges. More mobile species, including microbats, woodland birds, Malleefowl and raptors, are capable of moving across, around or over the Development footprint, although such movements may incur minor energetic costs or a minor increased risk of harm, such as from interaction with fencing. The development footprint does not involve the installation of large or hazardous structures that would substantially increase the risk or energetic cost of fauna movement. However, vegetation clearing associated with the services corridor and associated infrastructure would result in a moderate increase in habitat fragmentation between retained habitat areas to the east and west of the alignment. The resulting gap in vegetation, approximately 100 metres in width, is not expected to disrupt key ecological processes such as migration or pollination. Despite being primarily ground-dwelling and infrequently taking flight, Malleefowl are highly mobile and are unlikely to have their movements constrained by the development footprint. Extensive survey effort across the Atlas-Campaspe Mineral Lease Area (GHD 2018a–2026), including targeted surveys for Malleefowl and their mound sites, has not recorded the species within this portion of the site. The nearest recorded mound is approximately seven kilometres west of the corridor, with another located approximately nine kilometres to the north-west (refer to Figure 5.1). No active mounds are currently known within or immediately adjacent to the Development footprint or the offset area to be isolated. Malleefowl are generally sedentary during breeding, returning to the same nesting areas annually (Frith 1959; Benshemesh 1992; DCCEEW 2024), indicating that the temporary isolation of the offset area is unlikely to have any immediate impact on the local population. While individuals may move several kilometres between breeding seasons, such movements would not be expected to be impeded by the Proposal, particularly following rehabilitation of the corridor after 2034. Research by Benshemesh (1992) also demonstrates that Malleefowl chicks are capable of rapid dispersal, with mean movement rates exceeding 600 metres per day and some individuals travelling more than two kilometres per day shortly after hatching. Observations of chicks moving into recently burnt and sparsely vegetated habitats indicate a capacity to traverse open areas and a limited sensitivity to habitat boundaries. This suggests that the species retains the ability to recolonise habitat patches even where fragmentation occurs. Overall, the proposed development footprint is relatively narrow and temporary in nature and is not expected to significantly impede fauna movement or reduce habitat suitability for threatened species. Any fragmentation effects would be temporary and would be resolved following rehabilitation of the corridor after cessation of mining operations in

Criteria	Assessment
	2034. While the development footprint would contribute a minor, cumulative reduction in landscape connectivity and may temporarily impede movement of some less mobile ground-dwelling fauna, these impacts are expected to be moderate in scale and duration and not significant at the population level.

8.3.4 Vehicle strike

The Proposal would result in increased traffic due to the construction of the services corridor which would include a haul road, through an area with no roads or traffic at present. It is anticipated that approximately four haul trucks per hour would use the services corridor, with a maximum speed of 50km/h in accordance with the requirement of existing EPBC Approval 2012/644, the services corridor would be fenced on both sides with a barb-less stock-proof fence, which will significantly reduce the risk of vehicle strikes to native fauna. The Modification would increase the volume of vehicle traffic to and through the Development footprint – with four vehicle movements per hour anticipated.

An assessment of the risk of vehicle strike is provided in Table 8.5.

Table 8.5: *Impacts of vehicle strike*

Criteria	Assessment
(a) predict the likelihood of vehicle strike to each relevant species, taking into consideration mobility, abundance, range and other relevant life cycle factors	The Development footprint will introduce additional traffic associated with the construction and operation of the Proposal. It is anticipated that approximately four haul trucks per hour will utilise the services corridor during operations, travelling at a maximum speed of 50 km/h. Construction traffic will be minimal and largely limited to existing plant and equipment already present at the Atlas-Campaspe mine site. Overall, the low volume of traffic and restricted vehicle speeds are expected to minimise the risk of vehicle strike to fauna within the Development footprint. The haul road will be operational for approximately eight years, from October 2027 to June 2034, after which the corridor will be rehabilitated in accordance with the existing SSD consent conditions. Most threatened species occurring in the locality are either highly mobile (e.g. birds, microbats) or are small mammals and reptiles with relatively small home ranges and a low likelihood of attempting to cross the cleared corridor. Accordingly, the risk of vehicle strike for these species is considered low. Microbat species, with advanced echolocation capabilities, and mobile woodland birds and ground-dwelling birds such as the Chestnut Quail-thrush (<i>Cinclosoma castanotum</i>), are expected to readily avoid vehicles travelling at low speeds and in low numbers. Less mobile species, including small mammals such as the Western Pygmy Possum (<i>Cercartetus concinnus</i>) and reptiles such as the Jewelled Gecko (<i>Strophurus elderi</i>), are unlikely to frequently traverse the corridor while it is present, further reducing exposure to vehicle strike risk. Malleefowl have been identified as the species most potentially at risk of vehicle strike due to their ground-dwelling behaviour. However, extensive survey effort across the Atlas-Campaspe Mineral Lease Area (GHD 2018a–2026), including targeted surveys for Malleefowl and their mound sites, has not recorded the species within this portion of the site. The nearest recorded mound is approximately seven kilometres west of the corridor, with another located approximately nine kilometres to the north-west (refer to Figure 5.1), and no active mounds are known within or adjacent to the Development footprint or the offset area to be isolated. Given the sedentary nature of breeding Malleefowl (Frith 1959; Benshemesh 1992; DCCEE 2024), individuals are considered unlikely to occur within the Development footprint, and the risk of vehicle strike for this species is therefore very low. In the unlikely event that Malleefowl do utilise the south-eastern portion of the offset, the combination of low traffic volumes and reduced speed limits (50 km/h) would maintain collision risk at a low level. Any potential impacts associated with vehicle strike are expected to be minor, temporary, and limited to the operational life of the corridor. Upon cessation of mining operations in June 2034, the corridor will be rehabilitated to native vegetation, and any residual risk to fauna associated with vehicle movements will cease.

Criteria	Assessment
(b) estimate vehicle strike rates with supporting data or literature, where available	Tronox maintains a register of fauna vehicle strike incidents across the Atlas-Campaspe Mineral Lease Area and associated haul roads. Over the nine-year operational period of the mine to date, no vehicle strikes involving Malleefowl or any other threatened species have been recorded or are suspected to have occurred. Recorded incidents have predominantly involved livestock (sheep and cattle), with some occurrences involving feral goats and kangaroo species (likely Western Grey Kangaroo and Red Kangaroo). The majority of these incidents have occurred along the 135 kilometre haul route to the Ivanhoe processing facility, which is a largely unfenced public road with a speed limit of 100 km/h, where haulage vehicles typically travel at approximately 80 km/h. On the basis of this historical record, and taking into account the substantially lower traffic volumes and reduced speed limits proposed for the MOD6 services corridor (50 km/h, averaging four vehicles per hour), the likelihood of vehicle strike during the proposed eight-year operational period is expected to be very low, and likely negligible.
(c) predict the consequences of the impacts for the persistence of the relevant species	Given the low number of vehicle movements and the reduced speed limits that will be enforced, the risk of vehicle strike during both construction and operation is expected to be minimal. As such, impacts to threatened species at both the local and regional scale are unlikely to be significant. Most threatened species known to occur in the locality are either highly mobile (e.g. birds and microbats) or comprise small mammals and reptiles with relatively small home ranges. These ecological characteristics further reduce the likelihood of interaction with vehicles, and consequently the overall risk of vehicle strike is considered low.

8.4 Serious and irreversible impacts on biodiversity values

Under the BC Act, Section 6.7 of the BC regulation sets out principles for determining whether an impact on a specific threatened species or ecological community is serious and irreversible. If an impact is likely to contribute significantly to the risk of a threatened species or ecological community becoming extinct, this is deemed a serious and irreversible impact (SAIL). The likelihood of SAIL is assessed based on the following four principles:

1. The impact will cause a further decline of a species or ecological community that is currently observed, estimated, inferred or reasonably suspected to be in a rapid rate of decline
2. The impact will further reduce the population size of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very small population size
3. The impact is made on the habitat of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very limited geographic distribution
4. The impacted species or ecological community is unlikely to respond to measures to improve its habitat and VI, and therefore its members are not replaceable

A set of criteria have been developed and are included in the *DPIE Guidelines to assist a decision-maker to determine a SAIL* (DPIE, 2019). Threatened biota that meet the criteria under one or more of the above principles have been identified as SAIL entities. Each potential SAIL entity has an impact threshold identified which can be used to help determine if a development will result in SAIL. The decision-maker must determine whether or not an impact on biodiversity values is likely to be SAIL. The framework allows for decision-makers to take into account the scale of an impact and the potential for avoidance and mitigation. These factors are weighed against the status and vulnerabilities of the potential SAIL entity to ultimately determine if a project would result in a SAIL.

Of the threatened biota of relevance to this assessment, no threatened species or ecological communities considered known or likely to occur are candidate SAIL entities. The Proposal would not result in any impacts to known or potential SAIL entities or their habitat. Therefore, no further consideration of potential SAILs is required.

8.5 Impacts to Threatened Species and Communities listed under the EPBC Act

8.5.1 Threatened Ecological Communities

One EPBC listed TEC, Mallee Bird Community of the Murray Darling Depression Bioregion, occurs within the Development footprint. Based on consideration of the assessment criteria (Appendix F), the Development footprint is considered unlikely to have a significant impact on the Mallee Birds Community, as:

- A small area of suitable habitat for this EEC (20.68 ha) would be removed or modified, which represents a very small proportion of the available habitat for these mobile species within the locality
- The small size and narrow width of the Development footprint will only result in a minor increase in the degree of fragmentation between retained areas of habitat for these mobile species and will not result in any isolation of habitat
- No important populations are identified for the community
- The Development footprint is unlikely to adversely affect habitat critical to the survival of this TEC
- The Proposal is unlikely to modify or destroy abiotic factors necessary for this EEC's survival, including reduction of groundwater levels, or alteration of surface water drainage patterns
- The Proposal is unlikely to cause a substantial change in the species composition of an occurrence of this EEC, including causing a decline or loss of functionally important species from the community
- The Development footprint is not likely to cause a substantial reduction in the quality or integrity of an occurrence of this TEC, by assisting invasive species that are harmful to the community to become established, or mobilising chemicals or pollutants which may kill or inhibit the growth of species in the TEC
- The relatively small size of the Development footprint within a largely intact landscape is unlikely to interfere substantially with the recovery of the Mallee Bird Community TEC.

8.5.2 Threatened fauna species

The Development footprint provides known and potential habitat for several fauna species listed as threatened under the EPBC Act, including:

- Pink Cockatoo (eastern) (*Lophochroa leadbeateri*) (listed as vulnerable under EPBC Act)
- Malleefowl (*Leipoa ocellata*) (listed as vulnerable under EPBC Act)
- South-eastern Hooded Robin (*Melanodryas cucullata cucullata*) (listed as endangered under EPBC Act)
- Corben's Long-eared Bat (*Nyctophilus corbeni*) (listed as endangered under EPBC Act)
- Southern Whiteface (*Aphelocephala leucopsis*) (listed as vulnerable under EPBC Act)
- Blue-winged Parrot (*Neophema chrysostoma*) (listed as endangered under EPBC Act)

Impacts to EPBC listed threatened fauna would include the removal of up to 50.41 ha of known or potential habitat and removal of potential breeding habitat for some of these species. Potential indirect impacts may also include disturbance associated with noise, dust and vibration during construction and operation of the Proposal, edge effects including fragmentation of habitat and potential degradation of habitat through the introduction of weeds, pests and pathogens.

Potential impacts on fauna species listed as threatened under the EPBC Act are assessed in sections 8.1 and 8.2, and in detail in Appendix F as per the *Guidance for accredited assessors on the assessment of MNES* (DPHI, undated).

The project is not considered likely to have a significant impact on any EPBC Act listed species given:

- The limited extent of native vegetation to be removed in comparison to the extensive areas of alternative habitat in the locality, and noting that the vegetation would be cleared outside of the accepted breeding season for these species.
- The limited quality of habitat to be removed, noting that the Development footprint does not contain any limiting habitat features such as nest trees for these species.

- The Tronox vegetation preclearance protocol will be implemented, which avoids all vegetation clearing during Malleefowl and microbat breeding season, preclears habitat trees with potential for microbats to reside within, and relocates microbats to areas of remnant vegetation.
- The Development footprint is unlikely to have an adverse effect on the size or breeding cycle of a population of any of these species.
- The Development footprint will not impact on habitat identified as critical to any of the threatened species.
- The Development footprint will only result in a minor increase in the degree of fragmentation between retained areas of habitat for these species and will not result in any significant isolation of habitat
- The Development footprint site is unlikely to be important to the recovery of any of the species.

8.5.3 Threatened flora species

No flora species listed under the EPBC Act were recorded during surveys completed for this BDAR. An assessment of habitat suitability determined that there is suitable habitat for one EPBC listed flora species (Yellow Swainson Pea). Targeted surveys completed for this BDAR did not record this species within the Development footprint. Two EPBC listed threatened flora species (Winged Peppergrass (*Lepidium monoplacoides*) and Mossy Daisy (*Brachyscome papillosa*) are known to occur within or near to the Atlas-Campaspe Mine tenement. There is not habitat for either of these species within the Development footprint, they have therefore not been considered further in this assessment (refer to Section 5.4.2).

8.5.4 Summary of impacts to EPBC Act listed species and communities

Table 8.5 provides a summary of residual impacts and conclusions of assessments of significance, completed for species and communities listed under the EPBC Act that have either been recorded or have potential to occur within the Development footprint.

Table 8.6 provides a summary of potential impacts to EPBC entities including the nature and consequence of impacts, duration of impact, extent and consequence of impacts and whether the impact is likely to require offsetting.

Table 8.6 Summary of residual impacts on EPBC Act listed species and communities

Species/ Community	Associated PCTs	Residual impact	Part of an important population	Conclusion of Assessment of Significance	Offset required
Pink Cockatoo (eastern) (<i>Lophochroa leadbeateri</i>)	58, 143, 170, 171	Removal of 50.41 ha of foraging habitat	Yes	Unlikely to be a significant impact	No
Malleefowl (<i>Leipoa ocellata</i>)	170, 171	Removal of 20.68 ha of potential foraging and breeding habitat	Yes	Unlikely to be a significant impact	No
South-eastern Hooded Robin (<i>Melanodryas cucullata cucullata</i>)	58, 143, 170, 171	Removal of 50.41 ha of foraging habitat and potential breeding resources	Yes	Unlikely to be a significant impact	No
Corben's Long-eared Bat (<i>Nyctophilus corbeni</i>)	58, 170, 171	Removal of 44.87 ha of foraging, breeding and roosting habitat	Yes	Unlikely to be a significant impact	No
Southern Whiteface (<i>Aphelocephala leucopsis</i>)	58, 143, 170, 171	Removal of 50.41 of foraging habitat	Yes	Unlikely to be a significant impact	No

Species/ Community	Associated PCTs	Residual impact	Part of an important population	Conclusion of Assessment of Significance	Offset required
Blue-winged Parrot (<i>Neophema chrysostoma</i>)	170, 58	Removal of 40.45 ha of foraging habitat	Yes	Unlikely to be a significant impact	No
Mallee Bird Community	170, 171	Removal of 20.68 ha of habitat for this TEC	N/A	Unlikely to be a significant impact	No

Table 8.7 Summary of nature and consequence of impacts, duration of impact, extent and consequence of impacts and whether the impact is likely to require offsetting

Species/ Community	Nature and consequence of impact (direct and indirect)	Duration of impact (e.g. construction, operation, life of project)	Quantum of impact	Consequence of impact (local, state and national scales)
Pink Cockatoo (eastern) (<i>Lophochroa leadbeateri</i>)	<u>Direct impact</u> Removal foraging habitat	Construction	Removal of 50.41 ha of foraging habitat	Given the large extent of alternative foraging habitat within the local area impacts are likely to be of low consequence. The Proposal will not impact breeding habitat. At a state and national scale, the impacts are not likely to impact on the size of extent of the population and therefore are considered to be low.
Malleefowl (<i>Leipoa ocellata</i>)	<u>Direct impact</u> Removal of potential foraging and breeding habitat <u>Indirect impact</u> Potential fatalities associated with vehicle strike Potential reduction in foraging and breeding habitat available due to fragmentation of habitat	Life of project	Removal of 20.68 ha of potential foraging and breeding habitat	Given the large extent of alternative foraging habitat within the local area impacts are likely to be of low consequence. At a state and national scale, the impacts are not likely to impact on the size of extent of the population and therefore are considered to be low

Species/ Community	Nature and consequence of impact (direct and indirect)	Duration of impact (e.g. construction, operation, life of project)	Quantum of impact	Consequence of impact (local, state and national scales)
South-eastern Hooded Robin (<i>Melanodryas cucullata cucullata</i>)	<u>Direct impact</u> Removal of foraging habitat and potential breeding resources <u>Indirect impact</u> Potential disruption to breeding habitat adjacent to Development footprint due to construction and operational noise, light and vibration.	Construction and operation	Removal of 50.41 ha of foraging habitat and potential breeding resources	Given the large extent of alternative foraging habitat within the local area impacts are likely to be of low consequence. At a state and national scale, the impacts are not likely to impact on the size of extent of the population and therefore are considered to be low
Corben's Long-eared Bat (<i>Nyctophilus corbeni</i>)	<u>Direct impact</u> Removal of foraging, breeding and roosting habitat	Construction	Removal of 44.78 ha of foraging habitat	Given the large extent of alternative foraging breeding and roosting habitat within the local area impacts are likely to be of low consequence. At a state and national scale, the impacts are not likely to impact on the size of extent of the population and therefore are considered to be low
Southern Whiteface (<i>Aphelocephala leucopsis</i>)	<u>Direct impact</u> Removal of foraging habitat	Construction	Removal of 50.41 of foraging habitat	Given the large extent of alternative habitat within the local area impacts are likely to be of low consequence. At a state and national scale, the impacts are not likely to impact on the size of extent of the population and therefore are considered to be low
Blue-winged Parrot (<i>Neophema chrysostoma</i>)	<u>Direct impact</u> Removal of foraging habitat	Construction	Removal of 40.45 ha of foraging habitat	Given the large extent of alternative foraging habitat within the local area impacts are likely to be of low consequence. The Proposal will not impact breeding habitat and at a state and national scale the impacts are not likely to impact on the size of extent of the population and therefore are considered to be low

Species/ Community	Nature and consequence of impact (direct and indirect)	Duration of impact (e.g. construction, operation, life of project)	Quantum of impact	Consequence of impact (local, state and national scales)
Mallee Bird Community	<u>Direct impact</u> Removal of habitat for this TEC	Construction	Removal of 20.68 ha of habitat for this TEC	Given the large extent of alternative habitat within the local area impacts are likely to be of low consequence. At a state and national scale, the impacts are not likely to impact on the size of extent of the population and therefore are considered to be low

9. Mitigation and management of impacts

The Development footprint has been designed to avoid and minimise impacts on biodiversity values as described in Section 7.1.

Further to the above, measures to mitigate impacts on biodiversity at the Atlas-Campaspe Mine are described in the approved BMP prepared in accordance with Condition 14, Schedule 3 of the Development Consent (SSD_5012) (Tronox 2018).

The BMP also includes performance indicators, triggers and contingency measures (e.g. weed and feral animal control).

Tronox proposes to apply the existing management measures outlined in the BMP to the Development footprint. Note that if the Modification is approved the BMP will be updated with any additional mitigation measures outlined in Table 9-1.

All measures to mitigate and manage impacts in the BMP (and Table 9-1) have a low risk of failure (i.e. risk the measure fails to have the intended outcome), because there are no constraints to implementing the measures at the Atlas-Campaspe Mine (as modified) and all of the measures have been implemented successfully at the existing Atlas-Campaspe Mine. As such, adaptive management strategies as described in the BAM (DPIE 2020a) are not proposed.

Unavoidable residual direct impacts on biodiversity values from clearing and habitat loss would be offset in accordance with the BOS. After the measures to mitigate and manage impacts outlined in the BMP are implemented, there would be a low risk of additional indirect or prescribed impacts to biodiversity and/or low consequences of such impacts. Potential impacts of the Proposal have been reduced as far as possible within the constraints of the objectives of the Modification and the practical constraints of the Study area layout.

A summary of proposed mitigation and management measures for residual impacts is shown in Table 9.1 below.

Table 9.1 Summary of proposed mitigation and management measures for residual impacts (direct, indirect and prescribed)

ID	Impact	Mitigation measures (refer to approved Project BMP for details)	Timing/ responsibility	Likely effectiveness	Risk of failure	Risk and consequence of residual impacts*
B01	General	All workers will be provided with an environmental induction prior to starting work on site. This would include information on the biodiversity values of the site, protection measures to be implemented to protect native biota.	Construction / Construction contractor and Project ecologist	High	Low	Negligible risk, low consequence.
B02	Harm to resident fauna	The existing Vegetation Clearance Protocol in the Project BMP will continue to be used for the management of flora and fauna and their habitats when clearing remnant vegetation and applied by appropriately qualified ecologists. This protocol has been used successfully since 2018 to manage potential impacts to native vegetation, resident fauna, particularly microbats, Malleefowl, nesting raptors and cockatoos, and spinifex-dependent reptiles and small mammals. Vegetation clearance is only permitted between February and May to avoid the main period of breeding activity of microbats, Malleefowl and other bird species, while avoiding low activity periods of microbats and reptiles. The key components of the protocol are: – Clear delineation of areas to be cleared of native remnant vegetation – Pre-clearance targeted surveys for threatened flora and fauna, to map their location and habitats, particularly habitat trees – During habitat tree surveys, Malleefowl mounds are identified, and if active, no clearance is permitted within 200 m of the mound site until after the mound has been found to be inactive for a minimum of five consecutive days – Pre-clearance targeted surveys for hollow bearing and large old trees and their dependent fauna – including microbats, raptors and cockatoos – Pre-clearance targeted surveys for Spinifex dependent fauna, and capture and translocation of individuals, using spinifex raking – A staged vegetation clearing method which minimises risk of injury or death to resident fauna and provides opportunity for their natural escape (such as microbats) or are captured and translocated to remnant areas outside of the clearing zones – Fauna management strategies – Reporting of outcomes of vegetation clearing protocol – Salvage of woody debris and other habitat resources where practicable, for use in rehabilitation phase	Construction / Construction contractor and Project ecologist	High	Low	Low risk, moderate consequence.

ID	Impact	Mitigation measures (refer to approved Project BMP for details)	Timing/ responsibility	Likely effectiveness	Risk of failure	Risk and consequence of residual impacts*
		Management of any trenches or drill sites to prevent fauna from becoming trapped or injured				
B03		A Vegetation Clearance Protocol report will be prepared and include: - A summary of the management of vegetation and fauna at each stage of the Vegetation Clearance Protocol in the reporting period - A list of threatened species recorded during the implementation of the Vegetation Clearance Protocol in the reporting period - An overview of the results of the Vegetation Clearance Protocol, including vertebrate animals harmed and the quantity of material salvaged for habitat enhancement	Construction / Construction contractor and Project ecologist	High	Low	Low risk, moderate consequence.
Indirect impacts						
B04	Spread of weeds	No priority weeds were recorded during surveys completed for this BDAR. If detected within the site declared priority weeds will be managed according to requirements of the <i>Biosecurity Act 2015</i>. Weed control measures outlined in the Project BMP would be implemented at the Development footprint.	Construction / Contractor	High	Low	Low risk, low consequence.
B05	Establishment or increase in number of exotic predators – feral cats and red fox	Altered environmental conditions along new edges and clearings can allow invasion by pest animals specialising in edge habitats and/or change the behaviour of resident animals. Edge zones can be subject to higher levels of predation by introduced mammalian predators, such as foxes and feral cats. Feral animal control measures outlined in the Project BMP would be implemented at the Development footprint.	Tronox	High	Low	Negligible risk, low consequence.
B06	Soil loss hazard – erosion of soils and sediment due to clearing during construction	Erosion and sediment control measures will be established prior to construction in accordance with the guidelines in Managing Urban Stormwater: Soils and Construction – Volume 2C: Unsealed Roads (DECC, 2008). Other erosion and sediment control measures outlined in the approved Surface WMP for the Project would also be implemented where appropriate.	Pre-construction, construction / Contractor	High	Low	Negligible risk, low consequence.
B07	Reduction in surface water quality due to sedimentation	Erosion and sediment controls throughout the site will be inspected and maintained to ensure they are operating effectively.	Construction / Contractor	High	Low	Negligible risk, low consequence.

ID	Impact	Mitigation measures (refer to approved Project BMP for details)	Timing/ responsibility	Likely effectiveness	Risk of failure	Risk and consequence of residual impacts*
B08	Vehicle strike	Tronox maintains a log of vehicle strikes to animals across the Atlas-Campaspe MLA, and haul roads. Over the nine year lifespan of the mine to date, no vehicle strikes to Malleefowl, or any other threatened species have been recorded, or are suspected to have occurred. Most recorded vehicle strikes are to livestock (sheep and cattle), with some to feral goats and kangaroo species (likely Western Grey and Red Kangaroos). The vast majority of these incidents have been recorded on the 135 kilometre haul road to the Ivanhoe processing facility, a largely unfenced public road with a speed limit of 100kmh, where heavy trucks carrying mineral concentrate travel at 80kmh. Whilst vehicle strikes to smaller animals are easily missed and some incidents almost certainly go unnoticed or unreported, the risk of vehicle strikes to Malleefowl associated with the MOD6 corridor are considered very unlikely due to two key factors – the 50kmh vehicle speed, and the scarcity of Malleefowl in this area. The haul road would be operational for around 8 years, from construction in 2027 to completion in 2034, when the alignment would begin rehabilitation back to native vegetation, with no further vehicle movements. Appropriate speeds for all construction and contractor vehicles will be enforced to limit dust generation and minimise chances of fauna mortality through vehicle strike throughout the construction and during operational of the project. A speed limit of 50 km/h would be established and enforced across the Development footprint.	Construction, operation / Contractor, Tronox	Moderate	Low	Low risk, moderate consequence.

ID	Impact	Mitigation measures (refer to approved Project BMP for details)	Timing/ responsibility	Likely effectiveness	Risk of failure	Risk and consequence of residual impacts*
B09	Vehicle strike	Services corridor would be fully fenced to minimise risk of vehicle strike. Fencing would be designed to be fauna friendly and would be constructed using of non-barbed plain top wire. Fencing is not expected to limit Malleefowl movement or trap this species within the alignment as this species is highly mobile and capable of flight, though only when disturbed or to roost in the canopy (DCCEEW 2024).	Prior to commissioning of services corridor	Moderate	Low	Low risk, moderate consequence.
Decommissioning						
B10	Longer term potential for soil, water and biodiversity impacts listed above	A Rehabilitation Management Plan will be prepared to guide rehabilitation planning, implementation, monitoring and maintenance of disturbed areas at the Development footprint. Rehabilitation will make use of coarse woody debris from trees and logs stockpiled from the clearing phase of the work in the Vegetation Clearance Protocol. The optimised services corridor will be reincorporated into the existing biodiversity offsets area post- mining.	Decommissioning / Construction contractor/ Tronox	High	Low	Negligible risk, low consequence.

* Consequence of residual impacts likely to remain *after mitigation measures are applied* as per 8.4 (2) c of BAM (DPIE, 2020a)

10. Impact and offset summary

10.1 Offset requirement for impacts under the BC Act

10.1.1 Impacts on native vegetation (ecosystem credits)

Impacts associated with the Proposal that require offsetting comprise the removal or modification of up to 50.41 ha of native vegetation and associated threatened species habitat as shown in Table 10.1. The determination of these impacts and their offset requirements have been informed by the thresholds for assessing and offsetting impacts shown in Figure 10-1.

The data from the fieldwork and mapping was entered into Version 1.5 of the BAM-C (BAM data last update 05/08/2025 - Version 82) as a 'Development' assessment to determine the number and type of biodiversity credits that would be required to offset impacts of the Proposal. Version 1.2 'average year' benchmark data was used as stated in section 2.6, reflecting the average rainfall in the 12 months preceding field surveys as described in section 2.5.

The credit calculations Parent case ID for the Development footprint is 00051304. The assessment is 00051304/BAAS17098/24/00051305 Revision 2.

The biodiversity credit report is included in Appendix E and identifies the numbers and classes of biodiversity credits required to be retired in accordance with the like-for-like requirements of the offset rules and those that could be retired in accordance with the variation rules. This BDAR has been certified and submitted to the decision-maker within 14 days of the date the BAM-C credit report was finalised.

Ecosystem credit requirements are summarised in Table 10.1 and offset trading groups (OTGs) to ensure 'like for like' provision of biodiversity offsets are summarised in Table 10.2. Each of the ecosystem credit types can be traded with credits in the same OTG and located in the South Olary Plain IBRA subregion containing the Development footprint; the Barrier Range, Outwash, Darling Depression, Great Darling Anabranch, Lachlan, Menindee, Murray Fans, Murray Scroll Belt, Murrumbidgee, Pooncarie-Darling, and Robinvale Plains subregions adjoining the Development footprint; as well as any additional subregions that fall within 100 km of the Development footprint.

Table 10.1 *Impacts that require an offset – ecosystem credits*

Vegetation zone	PCT ID	PCT name	TEC	Impact area (ha)	Current VI score	Future VI score	Change in VI score	Biodiversity risk weighting	Number of ecosystem credits required
171_Intact	171	Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion	Yes	4.42	58.6	0	-58.6	1.5	97
170_Intact	170	Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones	Yes	16.26	49.5	0	-49.5	1.5	402
143_Intact	143	Narrow-leaved Hopbush – Scrub Turpentine- Senna shrubland on semi-arid and arid sandplains and dunes	Yes	5.54	89.7	0	-89.7	1.5	186
58_Intact	58	Black-Oak -Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion.	No	14.42	69.4	0	-69.4	1.75	438
58_Disturbed	58	Black-Oak -Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion.	No	4.42	25.2	0	-25.2	1.75	49
58_Cleared	58	Black-Oak -Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion.	No	5.35	23.6	0	-23.6	1.75	55

Table 10.2 'Like-for-like' ecosystem credits required to offset impacts of the Development footprint

Vegetation zone	Credit class	OTG	Containing hollow-bearing trees
171_Intact	Dune Mallee Woodlands This includes PCT's: 171, 172, 191	Dune Mallee Woodlands - < 50% cleared group (including Tier 4 or higher threat status)	Yes
170_Intact	Sand Plain Mallee Woodlands This includes PCT's: 142, 170, 173, 174, 190, 193, 355, 474	Sand Plain Mallee Woodlands - < 50% cleared group (including Tier 4 or higher threat status)	Yes
143_Intact	Sand Plain Mulga Shrublands This includes PCTs 69, 119, 124, 128, 129, 140, 143, 199, 215, 220, 232	Sand Plain Mulga Shrublands - < 50% cleared group (including Tier 4 or higher threat status).	No
58_Intact	Semi-arid Sand Plain Woodlands This includes PCT's: 58, 252	Semi-arid Sand Plain Woodlands - ≥ 50% - < 70% cleared group (including Tier 3 or higher threat status).	Yes
58_Disturbed	Semi-arid Sand Plain Woodlands This includes PCT's: 58, 252	Semi-arid Sand Plain Woodlands - ≥ 50% - < 70% cleared group (including Tier 3 or higher threat status).	Yes
58_Cleared	Semi-arid Sand Plain Woodlands This includes PCT's: 58 ,252	Semi-arid Sand Plain Woodlands - ≥ 50% - < 70% cleared group (including Tier 3 or higher threat status).	No

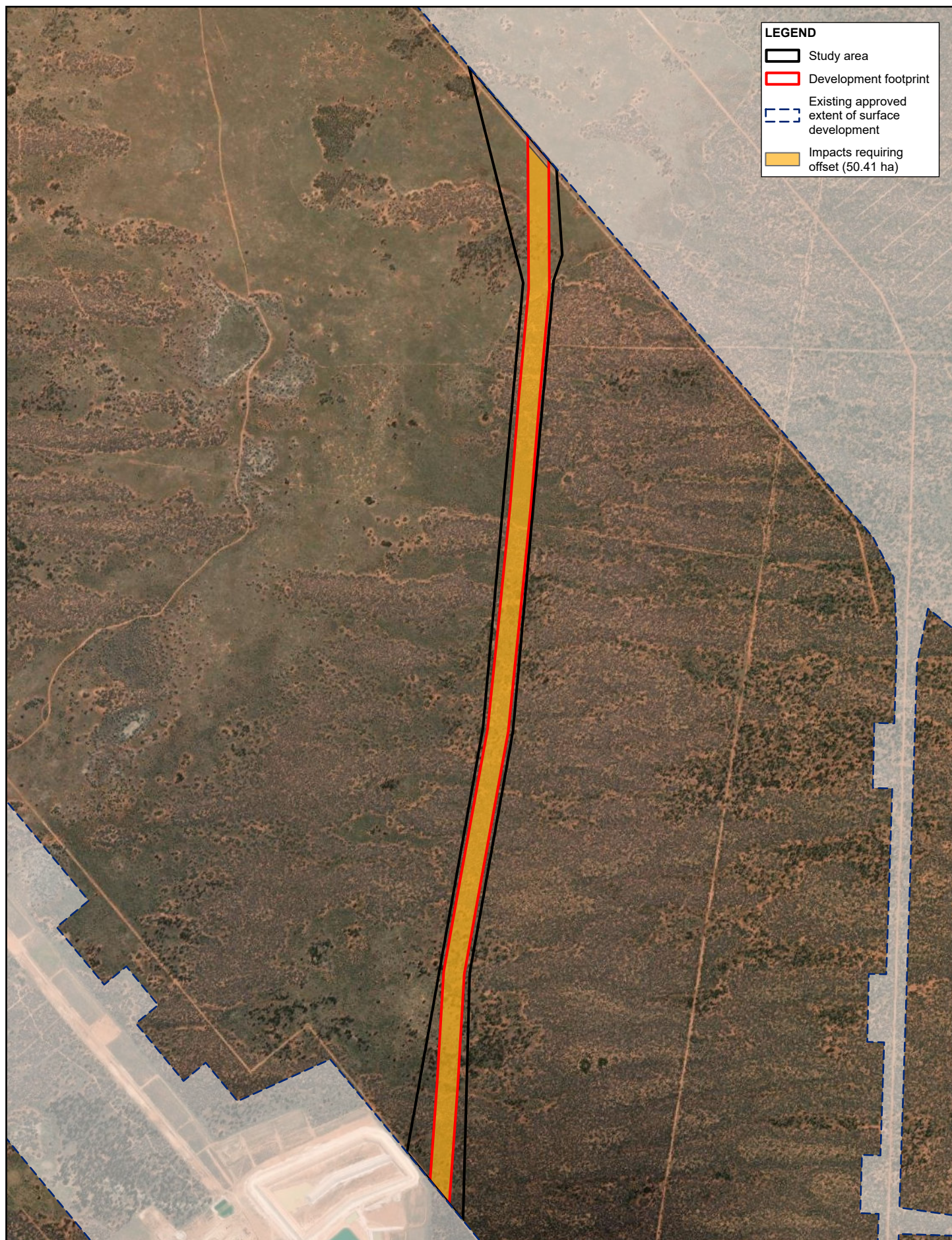
10.1.2 Impacts on threatened species and their habitat (species credits)

Confirmed candidate species credit species requiring assessment in accordance with BAM are detailed in Table 5.2. The method used to confirm their presence, the outcome of targeted surveys and the mapping of species polygons is detailed in section 5.2. One species credit species, Cobar Greenhood was identified within the Development footprint. Habitat for this species is associated with PCTs 171 and 170. There is a total of 20.68 ha of habitat for this species within the Development footprint. Species credits required to offset impacts to the Cobar Greenhood are identified in Table 10.3. Cobar Greenhood species credits can be traded anywhere in NSW.

Each of the other candidate species and species credit matters such as nest trees have been excluded through targeted seasonal survey with reference to the TBDC (NSW DCCEEW, 2025b) and relevant guidelines as described in sections 2 and 5.2. No other species credit matters were recorded or are assumed present within the Development footprint.

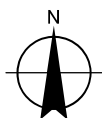
Table 10.3 *Impacts that require an offset – species credits*

Common name	Scientific name	BC Act status	EPBC Act status	Loss of habitat (ha)	Biodiversity risk weighting	Number of species credits required
Cobar Greenhood	<i>Pterostylis cobarensis</i>	V	Not listed	20.68	2	531



Paper Size ISO A4
0 200 400 600 800
Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 54



Tronox Mining Australia Ltd
Atlas-Campaspe Mineral Sands Project Modification 6
Biodiversity Development Assessment Report

Thresholds for assessing
and offsetting impacts

Project No. 12628564
Revision No. B
Date 05/11/2025

FIGURE 10.3

10.1.3 Indirect and prescribed impacts

Significant residual indirect and prescribed impacts that remain after measures to avoid, minimise and mitigate have been applied, may require calculation of biodiversity offsets using additional biodiversity credits (above the credit requirement generated by the BAM-C for direct impacts) and/or other conservation measures. Table 10.4 summarises proposed conservation measures for potential indirect and prescribed impacts. Given the likely effectiveness of avoidance, minimisation and mitigation measures presented in this BDAR, and implemented in accordance with the approved BMP, no offsets have been calculated for residual indirect or prescribed impacts.

Table 10.4 Summary of proposed conservation measures for residual indirect and prescribed impacts

Residual indirect or prescribed impact	Conservation measure description
Edge effects	'Edge effects' will be managed through appropriate construction and operation management regimes stipulated in approved environmental management plans as a subplan can include increased noise and light or erosion and sedimentation at the interface of intact vegetation and cleared areas. Edge effects may result in impacts such as changes to vegetation type and structure, increased growth of exotic plants, increased predation of native fauna or avoidance of habitat by native fauna. Edge effects would result from construction activities and then continue to affect vegetation and habitats adjoining the Development footprint. Altered environmental conditions along new edges can allow invasion by pest animals specialising in edge habitats and/or change the behaviour of resident animals. Edge zones can be subject to higher levels of predation by introduced mammalian predators and native avian predators. Vegetation within and adjoining the Development footprint is in good condition with very low abundance and diversity of weed species present. There is a moderate to high risk of construction activities spreading new weeds into adjoining vegetation. Management measures to mitigate this risk will included: – Soil disturbance would be avoided as much as possible to minimise the potential for spreading weeds – Machinery hygiene protocols will be implemented for all machinery working in/around the construction site – Measures will be put in place to ensure weed affected soil or fill is introduced to the construction site – Erosion and sediment controls measures would be followed as outlined in the WMP to control nutrient/weed migration – High-risk areas will be monitored in and around Atlas-Campaspe such as access roads, stockpiles and bare ground Weed propagules will be controlled by proactively trimming any developing flowers or seed heads and disposing of these appropriately. Other relevant mitigation measures to reduce the impacts of edge effects include dust suppression, and erosion and sediment measures during construction.
Introduction and spread of weeds, pests and pathogens	The potential for significant or new impacts as a result of the spread of weeds, pests and pathogens is relatively low, given the existing development presence and very low extent of human visitation across the Development footprint and surrounding Study area. Construction personnel and vehicles would be excluded from native vegetation outside the Development footprint. To further mitigate the risk of weeds and pathogens being brought onto and/or spread through the site the following measures will be implemented. – Soil disturbance would be avoided as much as possible to minimise the potential for spreading weeds – Machinery hygiene protocols will be implemented for all machinery working in/around the construction site – Measures will be put in place to ensure weed affected soil or fill is introduced to the construction site – Erosion and sediment controls measures would be followed as outlined in the Water Management Plan to control nutrient/weed migration – High-risk areas will be monitored in and around Atlas-Campaspe such as access roads, stockpiles and bare ground

Residual indirect or prescribed impact	Conservation measure description
Noise impacts on fauna	Noise levels during the construction period would result in an increase above existing background levels for the duration of construction. Fauna most at risk would be those residing near the works area, and in particular any species that may be nesting, roosting, or denning in the area. Some fauna may vacate areas in proximity to the Development footprint during construction. Hollow-bearing trees in adjacent areas may provide nesting habitat for species, including a variety of threatened microbat species. Disturbance has the potential to interrupt breeding activities for some individuals. Other more resilient fauna species are likely to become accustomed to the noise, and this increased or novel impact is unlikely to result in a decrease in population numbers or diversity of these species. Given the availability of alternate habitat in surrounding areas, it is unlikely the temporary increase in noise during construction of the Proposal would significantly impact on fauna that occur adjacent to the Development footprint. During operation, noise levels are expected to be low in volume and localised.
Erosion and sedimentation	The Proposal has the potential to result in erosion within the Development footprint through construction activities and exposure of soils and may, in general, result in sedimentation impacts on adjoining native vegetation. Sediments may smother terrestrial vegetation, introduce weed propagules or nutrients that promote weeds, or introduce disease. Construction of the Proposal has the potential to result in the mobilisation of sediments into adjoining vegetation. Potential impacts from sedimentation would be managed through the implementation of mitigation measures, including the provision of silt fences and other structures to intercept runoff. The residual risk of the impact is likely to be low.
Dust	Construction of the Proposal may result in generation of dust. High dust levels could reduce habitat quality for flora and fauna species by reducing plant and animal health in adjacent areas of vegetation. Dust may affect photosynthesis, respiration and transpiration in plants and allow the penetration of gaseous pollutants. This then leads to decreased productivity, and in the long-term can alter community structure. Dust could also impact health of fauna, such as through respiratory disease, and the reduction in health of animals would be exacerbated by changes to plant health and community structure. Suppression of dust would be undertaken during construction, and in alignment with existing dust suppression measures across the existing mine site.
Fire	Construction of the Proposal presents a potential risk of fire, for example from storage of combustible fuels or ignition from works areas. Small fires can spread very quickly in unfavourable conditions to become large wildfires. In drought conditions, this risk would be increased due to the dry nature of the vegetation. Much of Australia's biodiversity is adapted to and relies upon bushfire as a natural ecosystem process. However, fires can lead to mortality of fauna, degradation of fire-sensitive communities or plants, and destruction of habitat resources, especially if too regular or intense. Bushfires of high to extreme intensity can result in significant modification of vegetation structure and composition such that the original vegetation type and condition is no longer identifiable. The risk of fires spreading to adjacent areas would be minimised through a fire hazard management plan and other measures to contain and control the outbreak of fire, following the existing Atlas-Campaspe mine site bushfire management plan.

10.2 Impacts that do not need further assessment under the BC Act

The Development footprint includes 0.12 ha of cleared land, along a road located in the northern extend of the corridor (see Figure 10-1). This cleared area does not contain native vegetation or any habitat features or resources for threatened biota or any other biodiversity values and does not need further assessment under the BAM.

10.3 Offsets for MNES

Under the *Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy* (DSEWPaC, 2012) (the EPBC Act Environmental Offsets Policy) biodiversity offsets are required to compensate for significant residual impacts on MNES. This BDAR includes the identification and assessment of potentially affected MNES, consideration of the potential significance of impacts on MNES pursuant to the EPBC Act significant impact guidelines 1.1 (DotE 2013). The outcome of these assessments is that the Proposal is unlikely to result in a significant impact on any MNES. No biodiversity offsets for impacts on MNES are therefore likely to be required in accordance with the EPBC Act Environmental Offsets Policy.

Regardless of the requirement to offset impacts to MNES under the EPBC Act Environmental Offsets Policy, the project would include offsets for all EPBC threatened species recorded or with potential to occur within the Development footprint as part of the offset requirements under the NSW BAM. These offsets would include ecosystem credits for threatened fauna predicted by the BAM-C to occur including:

- Pink Cockatoo (eastern) (*Lophochroa leadbeateri*) (foraging habitat)
- Malleefowl (*Leipoa ocellata*)
- South-eastern Hooded Robin (*Melanodryas cucullata cucullata*)
- Corben's Long-eared Bat (*Nyctophilus corbeni*) (foraging habitat)
- Southern Whiteface (*Aphelocephala leucopsis*)
- Blue-winged Parrot (*Neophema chrysostoma*) (foraging habitat)

Table 10.5 provides a summary of ecosystem credits that would be retired to offset impact to these ecosystem credit species.

Table 10.5 Summary of ecosystem credits to be retired that offset impacts EPBC listed species

PCT ID	PCT Name	Area impacted (ha)	Associated EPBC species	Associated ecosystem credits to be retired	Offset required
170	Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones	4.42	Pink Cockatoo (eastern) Malleefowl South-eastern Hooded Robin Corben's Long-eared Bat Southern Whiteface Blue-winged Parrot	294	No
171	Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion	16.26	Pink Cockatoo (eastern) Malleefowl South-eastern Hooded Robin Corben's Long-eared Bat Southern Whiteface	116	No
143	Narrow-leaved Hopbush – Scrub Turpentine- Senna shrubland on semi-arid and arid sandplains and dunes	5.54	Pink Cockatoo (eastern) South-eastern Hooded Robin Southern Whiteface	184	No

PCT ID	PCT Name	Area impacted (ha)	Associated EPBC species	Associated ecosystem credits to be retired	Offset required
58	Black-Oak -Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion.	26.19	Pink Cockatoo (eastern) South-eastern Hooded Robin Corben's Long-eared Bat Southern Whiteface Blue-winged Parrot	606	No

10.4 Conservation measures proposed to offset impacts of development

Tronox proposed to offset the residual impacts of the development through the retirement of biodiversity credits generated from a 316 ha Biodiversity Stewardship Site (BSS) that will be established adjacent to existing project offset area in the south-west of the Atlas-Campaspe mining lease (refer to Figure 1-2).

The proposed BSS has been assessed by an accredited assessor and contains vegetation types (PCTs) and habitat for threatened species commensurate with those impacted by the development. The BSS is expected to generate sufficient ecosystem credits to meet the total credit obligations for PCT 58, 170 and 171 as well as approximately 50 percent of the ecosystem credit required for PCT 143. All required species credits for the Cobar Greenhood (*Pterostylis cobarensis*) would also be generated and retired from the BSS.

The stewardship site has been assessed in accordance with the BAM and a Biodiversity Stewardship Site Assessment Report (BSSAR) is currently being prepared to document the ecosystem and species credits that would be generated. A Site Management Plan (SMP) has also been drafted and a Total Funds Deposit (TFD) calculated, detailing and costing the management and restoration actions required to be improve and maintain biodiversity values in perpetuity.

Any residual credit shortfall for PCT 143 would be met through the purchase of suitable biodiversity credits from another stewardship site in accordance with the BOS or via payment into the Biodiversity Conservation Fund (BCF). Table 10.6 provides a summary of the proposed offsetting approach for PCTs and associated EPBC species that would be impacted by the development.

Table 10.6 Summary of proposed offsetting approach

PCT ID	PCT Name	Associated EPBC listed species recorded or with potential to occur	Area impacted (ha)	Associated ecosystem credits to be retired	Offsetting approach
170	Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones	Pink Cockatoo (eastern) Malleefowl South-eastern Hooded Robin Corben's Long-eared Bat Southern Whiteface Blue-winged Parrot	4.42	294	All credits would be retired from a BSS proposed to be established adjacent to existing project offset area.
171	Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion	Pink Cockatoo (eastern) Malleefowl South-eastern Hooded Robin Corben's Long-eared Bat Southern Whiteface	16.26	116	All credits would be retired from a BSS proposed to be established adjacent to existing project offset area.

PCT ID	PCT Name	Associated EPBC listed species recorded or with potential to occur	Area impacted (ha)	Associated ecosystem credits to be retired	Offsetting approach
143	Narrow-leaved Hopbush – Scrub Turpentine- Senna shrubland on semi-arid and arid sandplains and dunes	Pink Cockatoo (eastern) South-eastern Hooded Robin Southern Whiteface	5.54	184	Approximately 50 % of required credits would be retired from a BSS proposed to be established adjacent to existing project offset area. The remaining credits would be purchased through the credit market or through payment into the BCF.
58	Black-Oak -Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion.	Pink Cockatoo (eastern) South-eastern Hooded Robin Corben's Long-eared Bat Southern Whiteface Blue-winged Parrot	26.19	606	All credits would be retired from a BSS proposed to be established adjacent to existing project offset area.

11. Summary and conclusions

The Study area comprises native vegetation and is located adjacent to the existing Atlas-Campaspe Mine and associated infrastructure maintained by Tronox. It contains moderate to good condition native spinifex linear dune mallee, chenopod sandplain mallee woodland, semi-arid shrubland and Black-Oak-Western Rosewood open woodland, typical of the semi-arid climatic zone of south-western NSW.

One threatened flora species, Cobar Greenhood was recorded within the Development footprint. Approximately 20.68 ha of habitat for this species would be impacted by the Proposal through the removal of habitat associated with PCTs 170 and 171 within the Development footprint.

Fauna surveys completed for this BDAR recorded several threatened fauna species listed as vulnerable or endangered under the NSW BC Act, including the Jewelled Gecko, Chestnut Quail-thrush, Hooded Robin (south-eastern) Pink Cockatoo, and Southern Whiteface. Additionally, the Hooded Robin (south-eastern), Pink Cockatoo and Southern Whiteface are listed as vulnerable or endangered species under the EPBC Act. These species are all defined as ecosystem credit species by the TBDC. Species credits may be required for Pink Cockatoo nesting habitat; however, this species credit matter was excluded through targeted survey.

No direct evidence of breeding or any important habitat resources were observed to suggest that the Development footprint is of particular importance to local populations of threatened fauna recorded within the site. The Study area contains suitable habitat for the Mallee Bird Community, which is listed as a TEC under the EPBC Act. However, no direct evidence of breeding or any important habitat resources were observed to suggest that the Development footprint is of particular importance to local populations of the component bird species within the EEC. The Study area does not contain important habitat for any migratory species listed under the EPBC Act. The Development footprint contains habitat for the species listed above and other fauna of semi-arid environments.

A nest tree census was conducted to identify hollow-bearing trees, stick nests or other signs of breeding activity of threatened fauna that could require calculation of species credits according to the BAM. There are no candidate nest trees in the Development footprint or likely to be affected by indirect impacts.

The Proposal has been developed to avoid impacts to biodiversity values where possible, however the location of the Development footprint is fundamentally constrained to the corridor between the Atlas and Campaspe deposits. This corridor is located within a very large patch of land containing similar vegetation types and conditions and so completely avoiding higher value native vegetation and habitat resources in the Study area has not been possible. The proponent aims to minimise ecological impacts through the implementation of the existing BMP (including a Vegetation Clearance Protocol) employed by Tronox in all vegetation clearing at the Atlas-Campaspe Mine. This BMP has been used successfully since 2018 to manage potential impacts to resident fauna, particularly microbats, Malleefowl, nesting raptors and cockatoos, and spinifex dependent reptiles and small mammals. Clearing is only permitted between February and May to avoid the main period of breeding activity of microbats, Malleefowl and other bird species, while also avoiding low activity periods of microbats and reptiles in winter.

The Development footprint would result in direct impacts to native vegetation and associated threatened species habitat through clearing of up to 50.41 ha of native vegetation for construction of the optimised service corridor and associated infrastructure.

The Development footprint does not contain any known or potential nest or roost sites or any other habitat resources that would be critical to the ecology of any threatened species. The Development footprint would comprise a gap in native vegetation cover of approximately 100 m within the existing Atlas-Campaspe Mine biodiversity offset area. The Development footprint would contain structures, roads and fences as well as noise, light and human activity which may limit the ability of fauna to move through the landscape.

The species identified throughout the report may travel through the site on occasion as an extension of their use of habitat in adjoining areas of native vegetation but would not be limited to, or reliant on, the connectivity provided by the site to support their continued use of the local area. Habitat connectivity would be maintained around the Development footprint through extensive areas of similar semi-arid woodland and shrubland. The Development footprint does not include the erection of any large or hazardous structures that would increase the risk or energy cost of movement of any threatened or migratory fauna. Removal of vegetation and construction of the corridor, access tracks and associated infrastructure would increase the degree of fragmentation between retained areas of

habitat for these species and would result in the isolation of a biodiversity offset area to the east of the alignment. The reduction in extent of habitat would be minor. The Development footprint would create a gap in habitat connectivity about 100 m across and is likely to result in a barrier for less movement species.

Mitigation measures are currently in place in accordance with the approved BMP (which follows the SMART principles) to minimise likely impacts on biodiversity values. These measures are clarified according to the hierarchy of avoidance and mitigation of impacts, and the identification of residual impacts of the Development footprint that cannot be avoided or mitigated. The Development footprint will include, as a minimum, industry-standard measures for the management of soil, surface water, weeds and pollutants, as well as site-specific measures for the management of flora and fauna under the approved BMP.

The Development footprint may result in residual indirect impacts through noise and vibration generation causing displacement of threatened species and other native fauna from habitat adjoining the Development footprint. The Development footprint would result in residual prescribed impacts through the removal or modification of vegetation within habitat corridors, minor changes to surface water flows and a moderate risk of vehicle strike causing harm to threatened fauna species and other native fauna using habitats in the vicinity of the Development footprint. These residual impacts are likely to be minor in intensity and consequence and therefore no additional offsets are proposed.

A BAM assessment and credit calculations have been performed in accordance with the methodology (DPIE 2020a) and using credit calculator version 1.5, and version 1.2 'average year benchmarks. The following ecosystem credits would need to be retired to offset residual impacts of the Proposal on vegetation and predicted threatened species habitat:

- 97 ecosystem credits to offset the removal of 4.42 ha of PCT 171 Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion_intact
- 402 ecosystem credits to offset the removal of 16.26 ha of PCT 170 Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones_intact
- 186 ecosystem credits to offset the removal of 5.54 ha of PCT 143 Narrow-leaved Hopbush- Scrub Turpentine -Senna shrubland on semi-arid and arid sandplains and dunes_intact
- 438 ecosystem credits to offset the removal of 14.42 ha of PCT 58 Black Oak- western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion_intact
- 49 ecosystem credits to offset the removal of 4.42 ha of PCT 58 Black Oak- western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion_disturbed
- 55 ecosystem credits to offset the removal of 5.35 ha of PCT 58 Black Oak- western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion_cleared

In addition, 531 Cobar Greenhood (*Pterostylis cobarimensis*) species credits will need to be retired to offset the removal of 20.68 ha of habitat for this species.

Impacts on the Mallee Bird Community EEC, Hooded Robin (south-eastern), Pink Cockatoo, Southern Whiteface, Malleefowl, Blue-winged Parrot and Corben's Long-eared bat resulting from the Proposal have been assessed in accordance with the *Matters of National Environmental Significance: Significant impact guidelines 1.1* (DotE 2013). These assessments determined that the Proposal is unlikely to have a significant impact on any threatened biota, migratory species or EECs listed under the EPBC Act.

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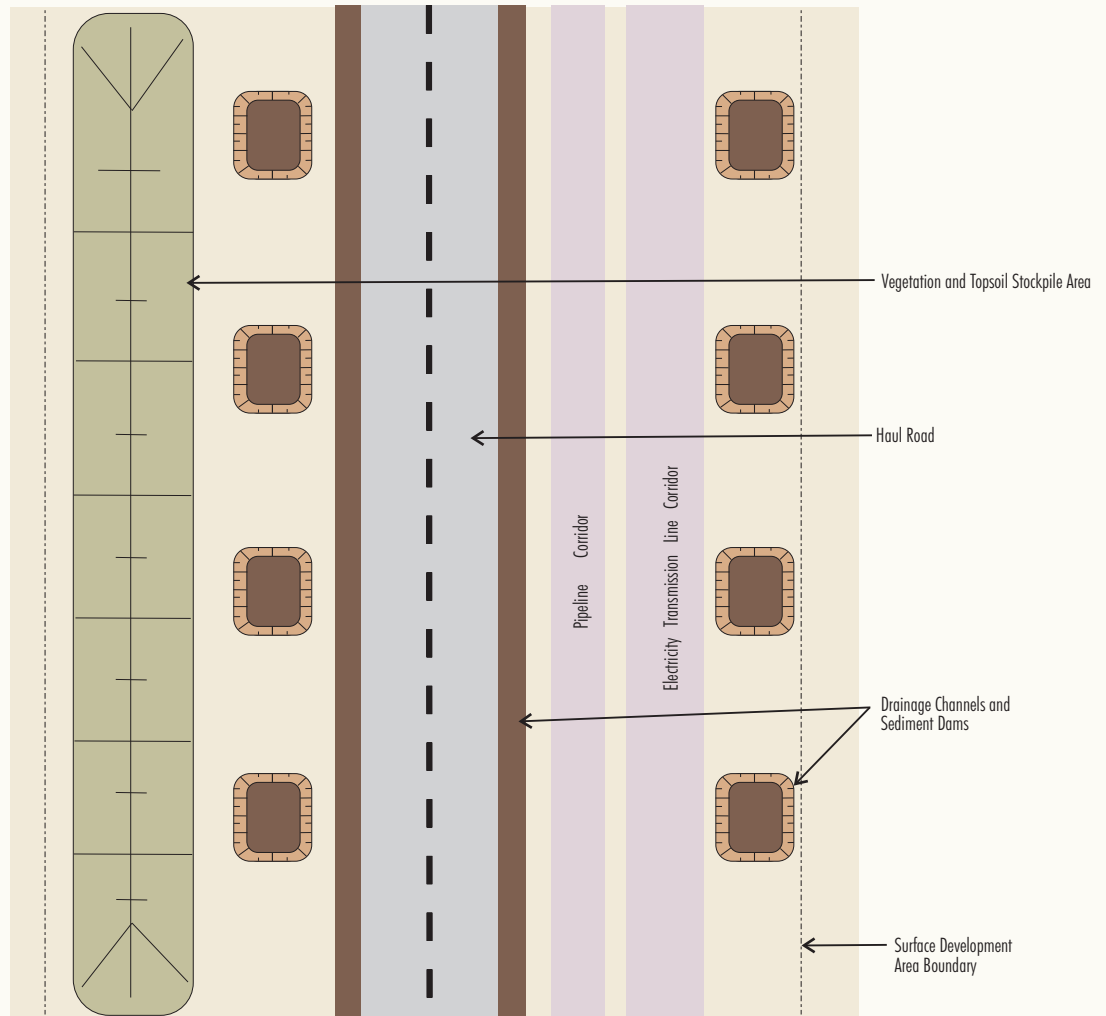
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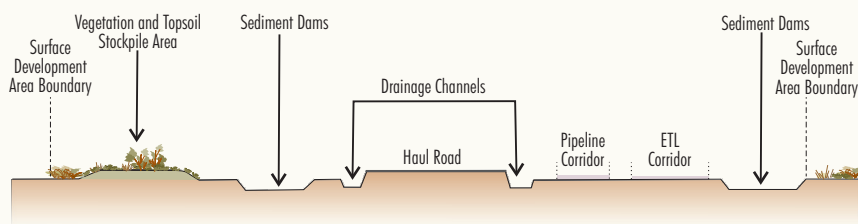
Appendices

Appendix A

Indicative Project Layout



Plan View



Cross Section

Note: The final layout, including the arrangement and size of individual components, within the modified surface development area would be subject to the outcomes of additional engineering studies and detailed design.

Not to Scale

TRV-24-11 AC MOD 6 R 0028

Figure 4

Appendix B

Threatened Species for Assessment

Key to Table:

EPBC Act Codes: VU (Vulnerable), EN (Endangered), CR (Critically Endangered)

BC Act Codes: vu (Vulnerable in Victoria), en (Endangered in NSW), cr (Critically Endangered in NSW)

BioNet– NSW Species Sightings Search

PMST – Protected Matters Search Tool

Likelihood of occurrence

Present	Species known to occur within or in close proximity to the study site based on findings from the literature review, database search and site assessment.
Possible	Potentially suitable habitat occurs within the study site and species' known range encompasses the Study area. Species recorded historically within 10 km of the study site, and generally within the last 10 years.
Unlikely	Species' known range encompasses the Study area, but suitable habitat does not occur within Development footprint, or occurs within Development footprint but may be marginal (e.g. very small extent) and of low quality. Species recorded historically within 10 km of the study site, but generally not within the last 10 years.
Highly Unlikely	No historical records of the species within 10 km of the Development footprint and/or no suitable habitat within Development footprint.

Likelihood of impact

Possible	Species known or predicted to occur within the locality and low quality potentially suitable fauna habitat occurs within the Development footprint OR potential flora habitat occurs but the species has been excluded through targeted survey. Fauna species may occur in the Development footprint on a transitory, seasonal or opportunistic basis. Flora species may be present in the soil seed bank or otherwise have become established in habitat in the future. The Proposal may result in minor direct or indirect impacts on these species, but would not remove any habitat resources that are relied upon by local populations of these species for their ongoing survival in the locality.
Low	The Development footprint is outside of the biota's known local distribution and/or; suitable habitat is not present within the Development footprint. The Proposal would remove low quality and/or very infrequently occupied potential habitat for species with broader habitat requirements.
Very low	The Development footprint is outside of the biota's known regional distribution and/or; potential habitat is clearly not present within the Development footprint for species with specific habitat requirements. The Proposal would not result in any direct or indirect impacts on these species or their habitats. Threatened ecological communities not identified in the Development footprint.

Table B.1 Threatened species assessment

Class	Scientific name	Common name	BC Status	EPBC Status	Source	No. Records	Habitat requirements (OEH 2020b)	Likelihood of occurrence	Likelihood of impacts	Justification
Amphibian	<i>Litoria raniformis</i>	Southern Bell Frog	E	V	PMST (DCCEEW 2025a)	0	In NSW the species was once distributed along the Murray and Murrumbidgee Rivers and their tributaries, the southern slopes of the Monaro district and the central southern tablelands as far north as Tarana, near Bathurst. Currently, the species is known to exist only in isolated populations in the Coleambally Irrigation Area, the Lowbidgee floodplain and around Lake Victoria. A few yet unconfirmed records have also been made in the Murray Irrigation Area in recent years. The species is also found in Victoria, Tasmania and South Australia, where it has also become endangered. Usually found in or around permanent or ephemeral Black Box/Lignum/Nitre Goosefoot swamps, Lignum/Typha swamps and River Red Gum swamps or billabongs along floodplains and river valleys. They are also found in irrigated rice crops, particularly where there is no available natural habitat.	Highly unlikely	Very low	No suitable habitat present and not previously recorded in locality.
Bird	<i>Actitis hypoleucos</i>	Common Sandpiper		C,J,K	PMST (DCCEEW 2024a)	0	Does not breed in Australia. When in Australia it is found on all coastlines and in inland areas, but is concentrated in the north and west with important areas in WA, the NT and Qld. Utilises a wide range of coastal and inland wetlands with varying salinity levels.	Highly unlikely	Very low	No suitable habitat present and not previously recorded in locality.
Bird	<i>Aphelocephala leucopsis</i>	Southern Whiteface	V	V	PMST (DCCEEW 2025a), Bionet (NSW DCCEEW 2025b), GHD November 2024 targeted fauna surveys	8	Southern Whiteface live in a wide range of open woodlands and shrublands where there is an understorey of grasses or shrubs, or both. These areas are usually in habitats dominated by acacias or eucalypts on ranges, foothills and lowlands, and plains. Southern Whiteface forage almost exclusively on the ground, favouring habitat with low tree densities and an herbaceous understorey litter cover.	Present	Likely	Recorded within the Study area. Species frequently observed throughout the broader Locality, and the Development footprint represents a small area of foraging habitat for this species, within a much larger area of suitable habitat. Likely impacts very small.
Bird	<i>Apus pacificus</i>	Fork-tailed Swift	-	Mi	PMST (DCCEEW 2025a)	0	Recorded in all regions of NSW. Non- breeding, and almost exclusively aerial while in Australia. Occurs over urban and rural areas as well as areas of native vegetation.	Possible	Low	Aerial species that may fly over site but highly unlikely to be impacted by the project.
Bird	<i>Calidris acuminata</i>	Sharp-tailed Sandpiper		C,J,K	PMST (DCCEEW 2025a)	0	Spends the non-breeding season in Australia with small numbers occurring regularly in New Zealand. Most of the population migrates to Australia, mostly to the south-east and are widespread in both inland and coastal locations and in both freshwater and saline habitats. Many inland records are of birds on passage. In Australasia, prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. Breeds in northern Siberia.	Highly unlikely	Very low	No suitable habitat present and not previously recorded in locality.
Bird	<i>Calidris ferruginea</i>	Curlew Sandpiper	E	CE, M	PMST (DCCEEW 2025a)	0	The Curlew Sandpiper is distributed around most of the Australian coastline (including Tasmania). It occurs along the entire coast of NSW, particularly in the Hunter Estuary, and sometimes in freshwater wetlands in the Murray-Darling Basin. Inland records are probably mainly of birds pausing for a few days during migration. The Curlew Sandpiper breeds in Siberia and migrates to Australia (as well as Africa and Asia) for the non-breeding period, arriving in Australia between August and November, and departing between March and mid-April. It generally occupies littoral and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats of sheltered coasts. It also occurs in non-tidal swamps, lakes and lagoons on the coast and sometimes inland.	Highly unlikely	Low	No suitable habitat present and not previously recorded in locality.

Class	Scientific name	Common name	BC Status	EPBC Status	Source	No. Records	Habitat requirements (OEH 2020b)	Likelihood of occurrence	Likelihood of impacts	Justification
Bird	<i>Calidris melanotos</i>	Pectoral Sandpiper		Mi	PMST (DCCEEW 20245)	0	In NSW, the Pectoral Sandpiper is widespread, but scattered. Records exist east of the Great Divide, from Casino and Ballina, south to Ulladulla. West of the Great Divide, the species is widespread in the Riverina and Lower Western regions. The species prefers shallow fresh to saline wetlands. The species is usually found in coastal or near coastal habitat but occasionally found further inland. It prefers wetlands that have open fringing mudflats and low, emergent or fringing vegetation, such as grass or samphire. The species has also been recorded in swamp overgrown with lignum. They forage in shallow water or soft mud at the edge of wetlands.	Highly unlikely	Very low	No suitable habitat present and not previously recorded in locality.
Bird	<i>Certhionyx variegatus</i>	Pied Honeyeater	V	-	Bionet (NSW DCCEEW 20245)	4	Widespread throughout acacia, mallee and spinifex scrubs of arid and semi-arid Australia. Occasionally occurs further east, on the slopes and plains and the Hunter Valley, typically during periods of drought. Inhabits wattle shrub, primarily Mulga (<i>Acacia aneura</i>), mallee, spinifex and eucalypt woodlands, usually when shrubs are flowering; feeds on nectar, predominantly from various species of emu-bushes (<i>Eremophila</i> spp.); also from mistletoes and various other shrubs (e.g. <i>Grevillea</i> spp.); also eats saltbush fruit, berries, seed, flowers and insects.	Possible	Possible	This highly mobile species may occasionally pass through the Development footprint, which could provide limited foraging habitat within a much larger area of more suitable habitat across the landscape. Any likely impacts very small.
Bird	<i>Cinclosoma castanotum</i>	Chestnut Quail-thrush	V	-	Bionet (NSW DCCEEW 2025b), GHD November 2024 targeted fauna surveys	18	This species is endemic to arid and semi-arid southern Australia, reaching its northern extent in the south of the Northern Territory. Known from central mallee centred on Round Hill and Nombinnie Nature Reserves, with a number of sightings also made on leasehold land to the north and west of these reserves. This population probably occurred in mallee as far south as Griffith and Temora, though extensive clearing has meant that recent records have only been made in Loughnan Nature Reserve and in mallee near Taleeban, and more rarely in Cocoparra National Park. Also known from the south west corner of the state where it is widespread in both the Scotia mallee and in areas east of the Darling River as far east as Balranald and north to near Menindee. Throughout its distribution it occurs in a wide range of arid and semi-arid habitats; mainly in the low shrubs and undergrowth of mallee scrub, but also in Acacia scrubs, dry sclerophyll woodland, heath, and native pine. However, in NSW it seems to occur almost exclusively in mallee habitats, with understorey dominated by spinifex, chenopods or other shrubs including Acacia species.	Present	Likely	This mobile species was observed within the Development footprint and broader Assessment Area. The species is likely to occasionally forage with the Development footprint, which represents a very small area of suitable habitat within a much larger landscape of highly suitable habitat. Likely impacts very small.
Bird	<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)	V	-	Bionet (NSW DCCEEW 2025b)	8	Endemic to eastern Australia and occurs in eucalypt forests and woodlands of inland plains and slopes of the Great Dividing Range. It is less commonly found on coastal plains and ranges. Mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, sometimes with one or more shrub species; also found in mallee and River Red Gum (<i>Eucalyptus camaldulensis</i>) Forest bordering wetlands with an open understorey of acacias, saltbush, lignum, cumbungi and grasses. Sedentary, considered to be resident in many locations throughout its range; present in all seasons or year-round at many sites; territorial year-round. Up to 80% of the diet is comprised of ants; other invertebrates (including spiders, insects larvae, moths, beetles, flies, hemipteran bugs, cockroaches, termites and lacewings) make up the remaining percentage; nectar from Mugga Ironbark (<i>Eucalyptus sideroxylon</i>) and paperbarks, and sap from an unidentified eucalypt are also eaten. Hollows in standing dead or live trees and tree stumps are essential for nesting. Breeds in pairs or co-operatively in territories which range in size from 1.1 to 10.7 ha (mean = 4.4 ha).	Highly unlikely	Very low	Development footprint is more than 400 km west of the range of the eastern subspecies. The western subspecies <i>C.p.picumnus</i> is relatively common across Assessment Area.

Class	Scientific name	Common name	BC Status	EPBC Status	Source	No. Records	Habitat requirements (OEI 2020b)	Likelihood of occurrence	Likelihood of impacts	Justification
Bird	<i>Daphoenositta chrysoptera</i>	Varied Sittella	V	-	Bionet (NSW DCCEEW 2025b)	23	The Varied Sittella is sedentary and inhabits most of mainland Australia except the treeless deserts and open grasslands. Distribution in NSW is nearly continuous from the coast to the far west. The Varied Sittella's population size in NSW is uncertain but is believed to have undergone a moderate reduction over the past several decades. Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland. Feeds on arthropods gleaned from crevices in rough or decorticated bark, dead branches, standing dead trees and small branches and twigs in the tree canopy.	Possible	Possible	This highly mobile species may occasionally pass through the Development footprint, which could provide limited foraging habitat within a much larger area of more suitable habitat across the landscape. Any potential impacts very small.
Bird	<i>Epthianura albifrons</i>	White-fronted Chat	V		Bionet (NSW DCCEEW 2025b)	1	The White-fronted Chat is found across the southern half of Australia, from southernmost Queensland to southern Tasmania, and across to Western Australia as far north as Carnarvon. Found mostly in temperate to arid climates and very rarely sub-tropical areas, it occupies foothills and lowlands up to 1000 m above sea level. In NSW, it occurs mostly in the southern half of the state, in damp open habitats along the coast, and near waterways in the western part of the state. Along the coastline, it is found predominantly in saltmarsh vegetation but also in open grasslands and sometimes in low shrubs bordering wetland areas. Gregarious species, usually found foraging on bare or grassy ground in wetland areas, singly or in pairs. They are insectivorous, feeding mainly on flies and beetles caught from or close to the ground.	Possible	Possible	Limited suitable habitat within the Development footprint. A highly mobile species which may occasionally pass through the Development footprint, which could provide very limited foraging habitat within a much larger area of more suitable habitat across the landscape. Any potential impacts very small.
Bird	<i>Falco hypoleucos</i>	Grey Falcon	E	-	PMST (DCCEEW 2025a)	0	The Grey Falcon is sparsely distributed in NSW, chiefly throughout the Murray-Darling Basin, with the occasional vagrant east of the Great Dividing Range. The breeding range has contracted since the 1950s with most breeding now confined to arid parts of the range. There are possibly less than 5000 individuals left. Population trends are unclear, though it is believed to be extinct in areas with more than 500mm rainfall in NSW. Usually restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions, although it is occasionally found in open woodlands near the coast. Also occurs near wetlands where surface water attracts prey.	Unlikely	Low	No suitable habitat present and not previously recorded in locality.
Bird	<i>Gallinago hardwickii</i>	Latham's Snipe		J,K, Migratory Wetland	PMST (DCCEEW 2025a)	0	Latham's Snipe is a non-breeding migrant to the south east of Australia including Tasmania, passing through the north and New Guinea on passage. Latham's Snipe breed in Japan and on the east Asian mainland. Latham's Snipe are seen in small groups or singly in freshwater wetlands on or near the coast, generally among dense cover. They are found in any vegetation around wetlands, in sedges, grasses, lignum, reeds and rushes and also in saltmarsh and creek edges on migration. They also use crops and pasture.	Highly unlikely	Very low	No suitable habitat present and not previously recorded in locality.

Class	Scientific name	Common name	BC Status	EPBC Status	Source	No. Records	Habitat requirements (OEH 2020b)	Likelihood of occurrence	Likelihood of impacts	Justification
Bird	<i>Grantiella picta</i>	Painted Honeyeater	V	V	PMST (DCCEEW 2025a)	0	Nomadic, occurring in low densities across most of NSW. Highest concentrations and almost all breeding occur on inland slopes of the Great Dividing Range. Inhabits Boree, Brigalow and Box Gum woodlands and Box-Ironbark forests. Specialist forager on the fruits of mistletoes, preferably of the <i>Amyema</i> genus. Nests in outer tree canopy. A specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias. Prefers mistletoes of the genus <i>Amyema</i> .	Unlikely	Low	No suitable habitat present and not previously recorded in locality.
Bird	<i>Hieraaetus morphnoides</i>	Little Eagle	V	-	Bionet (NSW DCCEEW 2025b)	2	The Little Eagle is found throughout the Australian mainland excepting the most densely forested parts of the Dividing Range escarpment. It occurs as a single population throughout NSW. Occupies open eucalypt forest, woodland or open woodland. Sheoak or Acacia woodlands and riparian woodlands of interior NSW are also used.	Possible	Possible	This highly mobile species may very occasionally pass over the Development footprint, while foraging within a much larger area of suitable habitat across the landscape. Any potential impacts very small.
Bird	<i>Leipoa ocellata</i>	Malleefowl	E	V	PMST (DCCEEW 2025a), Bionet (NSW DCCEEW 2025b)	11	Occurs in semi-arid to arid mallee country in the south-west of NSW. Its NSW stronghold is centred on Mallee Cliffs NP, extending east to Balranald and with scattered records north to Mungo NP. There are also populations near Dubbo (Goonoo forest). Occasional records exist from the Pilliga, around Cobar and Goulburn River NP. Predominantly inhabit mallee communities, preferring the tall, dense and floristically-rich mallee found in higher rainfall (300 - 450 mm mean annual rainfall) areas. Utilises mallee with a spinifex understorey, but usually at lower densities than in areas with a shrub understorey. Less frequently found in other eucalypt woodlands, such as Inland Grey Box, Ironbark or Bimble Box Woodlands with thick understorey, or in other woodlands such dominated by Mulga or native Cypress Pine species. Prefers areas of light sandy to sandy loam soils and habitats with a dense but discontinuous canopy and dense and diverse shrub and herb layers.	Possible	Likely	Several active mounds recorded in past surveys of broader surrounding area. If no precautions are taken, clearing activities have the potential to harm active nest mounds, and provide increased access to exotic predators such as Red Fox, to an area of otherwise largely intact vegetation. If existing preclearance procedures are followed (not clearing vegetation outside of Feb-May, completing mound searches before clearing and if active mounds identified, not clearing within 200m of them), and appropriate predator baiting programs are completed, likelihood of impacts can be reduced to Possible. Likely impacts very small.
Bird	<i>Lophochroa leadbeateri</i>	Pink Cockatoo	V	E	PMST (DCCEEW 2025a), Bionet (NSW DCCEEW 2025b), GHD November 2024 targeted fauna surveys	49	Inhabits a wide range of treed and treeless inland habitats, always within easy reach of water. Feeds mostly on the ground, especially on the seeds of native and exotic melons and on the seeds of species of saltbush, wattles and cypress pines. Nest in tree hollows throughout the second half of the year.	Present	Low	Recorded within the Study area, but no suitable nesting habitat within the Development footprint, and species only likely to occasionally forage within the Development footprint.
Bird	<i>Melanodryas cucullata cucullata</i>	Hooded Robin	E	E	PMST (DCCEEW 20245), Bionet (NSW DCCEEW 2025b), GHD November 2024 targeted fauna surveys	10	The Hooded Robin is widespread, found across Australia, except for the driest deserts and the wetter coastal areas - northern and eastern coastal Queensland and Tasmania. However, it is common in few places, and rarely found on the coast. It is considered a sedentary species, but local seasonal movements are possible. The south-eastern form (subspecies <i>cucullata</i>) is found from Brisbane to Adelaide and throughout much of inland NSW, with the exception of the extreme north-west, where it is replaced by subspecies <i>picata</i> . Two other subspecies occur outside NSW. Prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas. Requires structurally diverse habitats featuring mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses.	Present	Likely	This mobile species may occasionally pass through the Development footprint, which could provide habitat within a much larger area of suitable habitat across the landscape.
Bird	<i>Motacilla flava</i>	Yellow Wagtail		C,J,K	PMST (DCCEEW 2025a)	0	The Yellow Wagtail breeds in temperate Europe and Asia. They occur within Australia in open country habitat with disturbed ground and some water. Recorded in short grass and bare ground, swamp margins, sewage ponds, saltmarshes, playing fields, airfields, ploughed land and town lawns.	Highly unlikely	Very low	No suitable habitat present and not previously recorded in locality.

Class	Scientific name	Common name	BC Status	EPBC Status	Source	No. Records	Habitat requirements (OEH 2020b)	Likelihood of occurrence	Likelihood of impacts	Justification
Bird	<i>Neophema chrysostoma</i>	Blue-winged Parrot	V	V	PMST (DCCEEW 2005a)	0	Neophema chrysostoma breeds on mainland Australia south of the Great Dividing Range in southern Victoria from Port Albert in Gippsland west to Nelson, and sometimes in the far south-east of South Australia, and the north-western, central and eastern parts of Tasmania (Emison et al. 1987; Higgins 1999). A partial migrant, variable numbers of birds migrate across Bass Strait in winter. During the non-breeding period, from autumn to early spring, birds are recorded from northern Victoria, eastern South Australia, south-western Queensland and western NSW with some birds reaching south-eastern New South Wales and eastern Victoria, particularly on the southern migration. During the breeding season (spring and summer), birds occupy eucalypt forests and woodlands. Before migrating from Tasmania in autumn, Neophema chrysostoma congregate on saltmarshes and agricultural land before departing north (Higgins 1999). While on the mainland, mobile flocks feed in saltmarsh and rough pasture in coastal Victoria. Neophema chrysostoma are known to move more than 100 km inland during winter to feed in semi-arid chenopod shrubland and sparse grassland.	Possible	Low	This highly mobile species may occasionally pass through the Development footprint, which could provide very limited foraging habitat within a much larger area of more suitable habitat across the landscape.
Bird	<i>Pachycephala inornata</i>	Gilbert's Whistler	V	-	Bionet (NSW DCCEEW 2025b)	2	The Gilbert's Whistler is sparsely distributed over much of the arid and semi-arid zone of inland southern Australia, from the western slopes of NSW to the Western Australian wheatbelt. The eastern population extends from the central NSW mallee (Yathong, Nombinnie and Round Hill NRs), south and east through the Cocoparra Range to Pomingalama Reserve (near Wagga Wagga) then north through the South West Slopes east as far as Cowra and Burrendong Dam, to the Goonoo reserves (with scattered records as far north as Pilliga). Occasional records are also made of this species in the Capertee Valley. The species is also recorded in River Red Gum forests along the Murray River valley between Mathoura and Wentworth, with the eastern populations (between Mathoura and Barham) apparently isolated from other NSW populations. West of Swan Hill, this population may interact with populations found to the north of the Murray River west of Balranald and as far north as the Scotia country (Tarawi NR and Scotia Sanctuary). The Gilbert's Whistler occurs in a range of habitats within NSW, though the shared feature appears to be a dense shrub layer. It is widely recorded in mallee shrublands, but also occurs in box-ironbark woodlands, Cypress Pine and Belah woodlands and River Red Gum forests, though at this stage it is only known to use this habitat along the Murray, Edwards and Wakool Rivers. Within the mallee the species is often found in association with an understorey of spinifex and low shrubs including wattles, hakeas, sennas and hop-bushes. In woodland habitats, the understorey comprises dense patches of shrubs, particularly thickets of regrowth Callitris pine. Parasitic 'cherries' (Exocarpos species) appear to be an important habitat component in Belah and Red Gum communities, though in the latter case other dense shrubs, such as Lignum and wattles, are also utilised.	Possible	Likely	This mobile species may occasionally pass through the Development footprint, which could provide habitat within a much larger area of suitable habitat across the landscape.

Class	Scientific name	Common name	BC Status	EPBC Status	Source	No. Records	Habitat requirements (OEH 2020b)	Likelihood of occurrence	Likelihood of impacts	Justification
Bird	<i>Pedionomus torquatus</i>	Plains-wanderer	E	CE	PMST (DCCEEW 2025a)	0	The vast majority (>99%) of records of Plains-wanderers in NSW over the past 30 years come from an area of the western Riverina bounded by Hay and Narrandera on the Murrumbidgee River in the north, the Cobb Highway in the west, the Billabong Creek in the south, and Urana in the east. Even within its western Riverina stronghold, the Plains-wanderer has a very patchy distribution. Surveys in the 1990s across 5,000 km ² of the western Riverina covering 37 properties found only 5% of the total area comprised suitable habitat. The amount of high quality habitat in the Riverina drops to 1-2% during very wet or dry years when grasslands become too dense or are grazed too bare for Plains-wanderers. Plains-wanderers live in semi-arid, lowland native grasslands that typically occur on hard red-brown soils. These grasslands support a high diversity of plant species, including a number of state and nationally threatened species. Habitat structure appears to play a more important role than plant species composition. Preferred habitat of the Plains-wanderer typically comprises 50% bare ground, 10% fallen litter, and 40% herbs, forbs and grasses.	Unlikely	Low	No suitable habitat present and not previously recorded in locality.
Bird	<i>Polytelis anthopeplus monarchoides</i>	Regent Parrot (eastern subspecies)	E	V	PMST (DCCEEW 2025a)	0	The eastern subspecies is restricted to areas around the Murray River in South Australia, Victoria and NSW. In NSW it occurs along the Murray River downstream of Tooleybuc (though there are few records between Mildura and the South Australian border), the Wakool River downstream of Kyalite, and the Murrumbidgee River immediately upstream from the junction with the Murray River and adjoining areas of mallee. There are scattered records along the Darling River as far north as Menindee, but at this stage the species has not been confirmed to breed along this river. The nominate subspecies occurs in south western Western Australia. The species nests within River Red Gum forests along the Murray, Wakool and lower Murrumbidgee Rivers, and possibly the Darling River downstream of Pooncarie. Typical nest trees are large, mature healthy trees with many spouts (though dead trees are used) and are usually located close to a watercourse. Principal foraging habitat is mallee woodlands, though foraging also occurs in riverine forests and woodlands. Mallee woodland within 20 kilometres of nesting sites is critical foraging habitat for breeding birds.	Unlikely	Low	No suitable habitat present and not previously recorded in locality.
Bird	<i>Rostratula australis</i>	Australian Painted Snipe	E	E	PMST (DCCEEW 2025a) Australian Museum Business Services (2012)	1	In NSW many records of the Australian Painted Snipe are from the Murray-Darling Basin including the Paroo wetlands, Lake Cowal, Macquarie Marshes, Fivebough Swamp and more recently, swamps near Balldale and Wanganella. Other important locations with recent records include wetlands on the Hawkesbury River and the Clarence and lower Hunter Valleys. The species prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber.	Unlikely	Low	Recorded in locally flooded Box Swamp 5km north of Study Site in 2012 during EIS, however no suitable habitat is present within the and Study Site.
Bird	<i>Stagonopleura guttata</i>	Diamond Firetail	V	-	PMST (DCCEEW 2025a)	0	The Diamond Firetail is endemic to south-eastern Australia, extending from central Queensland to the Eyre Peninsula in South Australia. It is widely distributed in NSW, with a concentration of records from the Northern, Central and Southern Tablelands, the Northern, Central and South Western Slopes and the North West Plains and Riverina. Not commonly found in coastal districts, though there are records from near Sydney, the Hunter Valley and the Bega Valley. This species has a scattered distribution over the rest of NSW, though is very rare west of the Darling River. Found in grassy eucalypt woodlands, including Box-Gum Woodlands and Snow Gum Eucalyptus pauciflora Woodlands. Also occurs in open forest, mallee, Natural Temperate Grassland, and in secondary grassland derived from other communities. Often found in riparian areas (rivers and creeks), and sometimes in lightly wooded farmland.	Unlikely	Low	No suitable habitat present and not previously recorded in locality.

Class	Scientific name	Common name	BC Status	EPBC Status	Source	No. Records	Habitat requirements (OEH 2020b)	Likelihood of occurrence	Likelihood of impacts	Justification
Mammal	<i>Cercartetus concinnus</i>	Western Pygmy Possum	V		Bionet (NSW DCCEEW 2025b)	3	The Western Pygmy-possum is generally found in heathlands, shrublands and dry forests with a heathy understorey. The understorey characteristically includes a range of myrtaceous and proteaceous shrubs (such as banksias, grevilleas, callistemons, hakeas and melaleucas). These vegetation types are usually associated with the deep sands of dunes or sand plains and include mallee scrub and Brown Stringybark scrub, Jarrah, tall Broombush shrubland and dry heath.	Possible	Possible	Development footprint contains potential habitat within a much larger area of suitable habitat across the landscape.
Mammal	<i>Chalinolobus picatus</i>	Little Pied Bat	V	-	Bionet (NSW DCCEEW 2025b)	9	The Little-Pied Bat is found in inland Queensland and NSW (including Western Plains and slopes) extending slightly into South Australia and Victoria. Occurs in dry open forest, open woodland, mulga woodlands, chenopod shrublands, cypress pine forest and mallee and Bimbil box woodlands. Roosts in caves, rock outcrops, mine shafts, tunnels, tree hollows and buildings.	Possible	Possible	Development footprint contains potential habitat within a much larger area of suitable habitat across the landscape.
Mammal	<i>Ningui yvonneae</i>	Southern Ningui	V	-	Bionet (NSW DCCEEW 2025b)	58	In NSW most records are from the far south west, including the Scotia mallee (Tarawi Nature Reserve, Scotia Sanctuary and surrounding properties) and east of the Darling River (Mungo and Mallee Cliffs National Parks and many surrounding properties). An apparently isolated population occurs in central NSW mallee with most records from Nombinnie, Round Hill and western Yathong Nature Reserves and one single record from remnant mallee near Taleeban (south west of West Wyalong). Shelters in spinifex clumps, beneath logs, and in dense vegetation, but may also dig its own burrows. Closely tied to vegetation with spinifex clumps (in NSW mainly associated with mallee woodlands), though occasionally recorded in other habitats.	Possible	Possible	Development footprint contains potential habitat within a much larger area of suitable habitat across the landscape.
Mammal	<i>Nyctophilus corbeni</i>	South-eastern Long-eared Bat	V	V	PMST (DCCEEW 2025a), Bionet (NSW DCCEEW 2025b)	23	Overall, the distribution of the south eastern form coincides approximately with the Murray Darling Basin with the Pilliga Scrub region being the distinct stronghold for this species. Inhabits a variety of vegetation types, including mallee, buloke <i>Allocasuarina leuhmanni</i> and box eucalypt dominated communities, but it is distinctly more common in box/ironbark/cypress-pine vegetation that occurs in a north-south belt along the western slopes and plains of NSW and southern Queensland.	Possible	Possible	Development footprint contains potential habitat within a much larger area of suitable habitat across the landscape.
Mammal	<i>Vespadelus baverstocki</i>	Inland Forest bat	V	-	Bionet (NSW DCCEEW 2025b)	30	Believed to occur widely in all the mainland states, generally in areas with annual rainfall less than 400 millimetres. In Victoria it is confined to the extreme north west. In NSW it has been most regularly captured in the far south west, north from the Murray River to Menindee, and at least as far east as the Balranald-Ivanhoe Road. There is some evidence to suggest that this species also occurs in the central NSW mallee, centred on Nombinnie Nature Reserve, although there has been very little recent survey in this part of the state. The habitat requirements of this species are poorly known but it has been recorded from a variety of woodland formations, including Mallee, Mulga and River Red Gum. Most records are from drier woodland habitats with riparian areas inhabited by the Little Forest Bat. However, other habitats may be used for foraging and/or drinking.	Possible	Possible	Development footprint contains potential habitat within a much larger area of suitable habitat across the landscape.
Reptile	<i>Aprasia inaurita</i>	Mallee Worm-lizard	E	-	Bionet (NSW DCCEEW 2025b)	1	This species inhabits semi-arid mallee woodlands on red sands. It is a burrowing species that is active during the day. This species has been recorded across the four southern mainland states, though its distribution in both Western Australian and New South Wales is restricted. Most records in NSW are from the south west corner of the state, though there are two records from the central mallee (Pulletop and Gubbata NRs) from 1999. Most records are from the mallee between Balranald and Gol Gol centred on Mallee Cliffs NP, though recent surveys in the Scotia mallee have also recorded this species.	Possible	Possible	Development footprint contains potential habitat for this species within a much larger area of suitable habitat. If existing preclearance ecological surveys are completed during vegetation clearing, likely impacts to this species would be reduced, within a broader Locality perspective.

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Reptile	<i>Echiopsis curta</i>	Bardick	E	-	Bionet (NSW DCCEEW 2025b)	1	This species occurs in three regions, all in the semi-arid regions of southern Australia. These are in south western Western Australia, the Eyre Peninsula in South Australia and in the mallee regions of eastern South Australia, north western Victoria and south western NSW. Inhabits hummock grasslands and mallee areas on sandy or loamy soils and is usually associated with run-off slopes and drainage from local rises. The species is particularly common in areas of spinifex.	Possible	Possible	Development footprint contains potential habitat for this species within a much larger area of suitable habitat. If existing preclearance ecological surveys are completed during vegetation clearing, likely impacts to this species would be reduced, within a broader Locality perspective.
Reptile	<i>Hemiaspis damelii</i>	Grey Snake	E	E	PMST (DCCEEW 2025a)	0	Key habitat features of the Grey Snake are floodplains and ephemeral wetlands, which provide breeding habitat for the frog species that are its main prey, the presence of the frog species themselves, and heavy clay soils, which provide cracks and crevices that the species uses in its hunting strategy and for shelter (DCCEEW 2022). In NSW, the Grey Snake's habitat includes the margins of ephemeral wetlands within River Red Gum (<i>Eucalyptus camaldulensis</i>) and Black Box (<i>E. largiflorens</i>) vegetation communities and Tangled Lignum (<i>Duma florulenta</i>) swamps. The species has only been sighted in wetlands that have received environmental water flows, with no snakes being detected in dry phase wetlands (Michael et al. 2020). This suggests its detectability and activity patterns may be related to wetland inundation regimes and suitable weather conditions (DCCEEW 2022). Grey Snakes have not been detected when wetlands are in a NSW Threatened Species Scientific Committee Established under the Biodiversity Conservation Act 2016 Locked Bag 5022 Parramatta NSW 2124 (02) 9585 6940 scientific.committee@environment.nsw.gov.au summer dry phase or in other vegetation types adjacent to wetlands (D. Michael pers. obs.).	Highly unlikely	Low	No suitable habitat present and not previously recorded in locality.
Reptile	<i>Strophurus elderi</i>	Jewelled Gecko	V		Bionet (NSW DCCEEW 2025b), GHD November 2024 targeted fauna surveys	17	The Jewelled Gecko is found in a range of habitats throughout the arid areas of central Australia, though all have Spinifex present as the ground layer. Extends east to the 'Murray Mallee' in South Australia and south west NSW where it occurs in spinifex mallee (and rarely in pine with spinifex understorey). In this region they have been recorded from near Menindee and Coombah in the north south to near the Murray River, and from the NSW-SA border east to near Hatfield. The Species is restricted to habitats containing spinifex on red sandy plains or dunes and to a lesser extent stony hills. Spinifex may occur as a dominant groundcover with little to no overstorey vegetation or in association with mallee, cypress pine or acacia woodlands.	Present	Likely	Species recorded within the Study area, occupied habitat would be removed. If no precautions are taken, clearing activities have the potential to harm some individuals, and provide increased access to exotic predators such as Red Fox and Cat, to an area of otherwise largely intact vegetation. If existing preclearance procedures are followed (including spinifex raking surveys), and appropriate predator baiting programs are completed, likelihood and consequence of impacts can be reduced.
Flora	<i>Brachyscome papillosa</i>	Mossgiel Daisy	V	V	PMST (DCCEEW 2025a)	0	The Mossgiel Daisy is endemic to NSW and chiefly occurs within the Riverina Bioregion, from Mossgiel in the north, Murrumbidgee Valley (Yanga) National Park in the south west to Urana in the south east. Sites are scattered across this Bioregion including the Jerilderie area, the Hay Plain (Maude and Oxley) and around Darlington Point. In addition, there are a number of records from the Willandra Lakes World Heritage Area (including Mungo National Park) with a north-western outlier at Byrnedale Station, north of Menindee. The only known site on South Western Slopes is Ganmain Reserve. Recorded primarily in clay soils on Bladder Saltbush (<i>Atriplex vesicaria</i>) and Leafless Bluebush (<i>Maireana aphylla</i>) plains, but also in grassland and in Inland Grey Box (<i>Eucalyptus microcarpa</i>) - Cypress Pine (<i>Callitris</i> spp.) woodland.	Unlikely	Very low	No suitable habitat present and not previously recorded in locality.

Class	Scientific name	Common name	BC Status	EPBC Status	Source	No. Records	Habitat requirements (OEH 2020b)	Likelihood of occurrence	Likelihood of impacts	Justification
Flora	<i>Lepidium monoplacoides</i>	Winged Peppercress	E	E	PMST (DCCEEW 2025a), Bionet (NSW DCCEEW 2025b)	1	Widespread in the semi-arid western plains regions of NSW. Collected from widely scattered localities, with large numbers of historical records but few recent collections. Also previously recorded from Bourke, Cobar, Urana, Lake Cargelligo, Balranald, Wanganella and Deniliquin. Recorded more recently from the Hay Plain, south-eastern Riverina, and from near Pooncarie. Occurs on seasonally moist to waterlogged sites, on heavy fertile soils, with a mean annual rainfall of around 300-500 mm. Predominant vegetation is usually an open woodland dominated by <i>Allocasuarina leuhmannii</i> (Bulloak) and/or eucalypts, particularly <i>Eucalyptus largiflorens</i> (Black Box) or <i>Eucalyptus populnea</i> (Poplar Box). The field layer of the surrounding woodland is dominated by tussock grasses. Recorded in a wetland-grassland community comprising <i>Eragrostis australasicus</i> , <i>Agrostis avenacea</i> , <i>Austrodanthonia duttoniana</i> , <i>Homopholis proluta</i> , <i>Myriophyllum crispatum</i> , <i>Utricularia dichotoma</i> and <i>Pycnosorus globosus</i> , on waterlogged grey-brown clay. Also recorded from a <i>Maireana pyramidata</i> shrubland.	Unlikely	Low	No suitable habitat present and not previously recorded in locality.
Flora	<i>Solanum karsense</i>	Menindee Nightshade	V	V	PMST (DCCEEW 2025a)	0	Menindee Nightshade is the only species of <i>Solanum</i> endemic to NSW and is restricted to the far south-western plains, extending up the Darling River to the Menindee and Wilcannia districts. Mainly restricted to the area between the Darling and Lachlan Rivers. Localities include Kars Station, Lake Tandou, Lake Cawndilla, Oxley area, between Broken Hill and Menindee, and the Darling River. It has been recorded from Kinchega National Park and Nearie Lake Nature Reserve. Grows in occasionally flooded depressions with heavy soil, including level river floodplains of grey clay with Black Box and Old Man Saltbush, and open treeless plains with solonized brown soils. Habitats are generally lake beds or floodplains of heavy grey clays with a highly self-mulching surface. Also found on sandy floodplains and ridges and in calcareous soils, red sands, red-brown earths and loamy soils.	Unlikely	Low	No suitable habitat present.
Flora	<i>Swainsona murrayana</i>	Slender Darling-pea	V	V	PMST (DCCEEW 2025a)	0	Found throughout NSW, it has been recorded in the Jerilderie and Deniliquin areas of the southern riverine plain, the Hay plain as far north as Willandra National Park, near Broken Hill and in various localities between Dubbo and Moree. Occurs in grassland, herbland and open Black-box woodland. Associated with low chenopod shrubs <i>Maireana</i> species, Wallaby-grass (<i>Austrodanthonia</i> spp.) and Speargrass (<i>Austrostipa</i> spp.). Flowers from spring to early summer. Grows on heavy grey or brown clay, loam, or red cracking clays. Grows in a variety of vegetation types including bladder saltbush, black box and grassland communities on level plains, floodplains and depressions and is often found with <i>Maireana</i> species. Plants have been found in remnant native grasslands or grassy woodlands that have been intermittently grazed or cultivated.	Unlikely	Low	Suitable habitat present however species not recorded during targeted surveys completed at an appropriate time of year.
Flora	<i>Swainsona pyrophila</i>	Yellow Swainson-pea	V	V	PMST (DCCEEW 2025a)	0	In NSW, it occurs within the south-western plains. Grows in mallee scrub on sandy or loamy soil, usually found only after fire. Sites include cleared and burnt mallee scrub on red loam to sand, previously burnt <i>Eucalyptus dumosa</i> mallee, disturbed woodland in sheltered aspects, a bulldozed firebreak adjacent to wheat paddocks, roadsides, claypans and at the edge of fire ash.	Possible	Low	Suitable habitat present however species not recorded during targeted surveys completed at an appropriate time of year.

Class	Scientific name	Common name	BC Status	EPBC Status	Source	No. Records	Habitat requirements (OEH 2020b)	Likelihood of occurrence	Likelihood of impacts	Justification
Flora	<i>Atriplex infrequens</i>	A saltbush	V	V	BAM-C	0	Confined to the NSW far western plains. North western records recorded from east of Tibooburra, south east of Brewarrina and near Wilcannia with isolated collections from the Pooncarie area in the south. Also recorded in 1917 in South Australia. <i>Atriplex infrequens</i> is associated with broad drainage tracts, clay flats and possibly occasionally inundated habitats. Very little ecological information is available for this species so it's critical habitat components can only be speculated as relatively undisturbed and ungrazed drainage lines and flats.	Unlikely	Low	No drainage lines present within Development footprint.
Flora	<i>Austrostipa metatoris</i>	A spear-grass	V	V	BAM-C	0	Most records occur in the Murray Valley with sites including Cunninyeuk Station, Stony Crossing, Kyalite State Forest (now part of Murrumbidgee Valley Regional Park) and Lake Benanee. Scattered records also occur in central NSW including Lake Cargelligo, east of Goolgowi, Condobolin and south west of Nymagee. Otherwise only known from near Bordertown in south east South Australia, where it may be locally extinct. Grows in sandy areas of the Murray Valley; habitats include sandhills, sandridges, undulating plains and flat open mallee country, with red to red-brown clay-loam to sandy-loam soils. Associated species include <i>Eucalyptus populnea</i> , <i>E. intertexta</i> , <i>Callitris glaucophylla</i> , <i>Casuarina cristata</i> , <i>Santalum acuminatum</i> and <i>Dodonaea viscosa</i> .	Unlikely	Low	Not previously recorded within 100 km of site and no associated species present.
Flora	<i>Calotis moorei</i>	A burr-daisy	E	E	BAM-C	0	The species is confined to NSW and is known from only four populations in NSW, the type locality north-west of Louth near the homestead of Mt Mulyan sheep station, west of Wilcannia, around the Menindee area and an old record at Zara Station near Deniliquin. The species grows in sandy soil and appears to be associated with Acacia woodlands and chenopod shrublands. At Mt Mulyah, <i>Calotis moorei</i> grows in an area cleared of original Gidgee (<i>Acacia cambagei</i>) woodland and subsequently invaded by <i>Dodonaea viscosa</i> subsp. <i>angustissima</i> which repressed the growth of herbaceous species.	Unlikely	Low	Suitable habitat present however species not recorded during targeted surveys completed at an appropriate time of year.

Appendix C

Species Recorded in the Study Area

Table C.2 Flora recorded within Study area

Family	Exotic	Scientific Name	Common Name	BC Act Status	EPBC Act Status
Aizoaceae		<i>Tetragonia</i> spp.			
Amaranthaceae		<i>Ptilotus exaltatus</i> var. <i>exaltatus</i>	Tall Mulla Mulla		
Amaranthaceae		<i>Ptilotus spathulatus</i> f. <i>spathulatus</i>	Pussy-tails		
Amaranthaceae		<i>Ptilotus</i> spp.			
Anthericaceae		<i>Thysanotus baueri</i>	Fringe-lily		
Anthericaceae		<i>Thysanotus tuberosus</i>	Common Fringe-lily		
Apocynaceae		<i>Marsdenia</i> spp.			
Asphodelaceae	*	<i>Asphodelus fistulosus</i>	Onion Weed		
Asphodelaceae		<i>Bulbine semibarbata</i>	Wild Onion		
Asteraceae		<i>Actinobole uliginosum</i>	Flannel Cudweed		
Asteraceae		<i>Brachyscome ciliaris</i>	Variable Daisy		
Asteraceae		<i>Brachyscome lineariloba</i>	Hard-headed Daisy		
Asteraceae	*	<i>Calendula palaestina</i>	Palestine Marigold		
Asteraceae	*	<i>Hypochaeris radicata</i>	Catsear		
Asteraceae		<i>Minuria cunninghamii</i>	Bush Minuria		
Asteraceae		<i>Olearia muelleri</i>	Mueller's Daisy Bush		
Asteraceae		<i>Olearia pimeleoides</i>			
Asteraceae	*	<i>Onopordum acaulon</i>	Stemless Thistle		
Asteraceae		<i>Podolepis capillaris</i>	Invisible Plant		
Asteraceae		<i>Rhodanthe floribunda</i>	Common White Sunray		
Asteraceae	*	<i>Sonchus oleraceus</i>	Common Sowthistle		
Asteraceae		<i>Vittadinia cervicalis</i>			
Asteraceae		<i>Vittadinia condyloides</i>			
Asteraceae		<i>Vittadinia dissecta</i> var. <i>hirta</i>			
Asteraceae		<i>Vittadinia</i> spp.	Fuzzweed		

Family	Exotic	Scientific Name	Common Name	BC Act Status	EPBC Act Status
Asteraceae		<i>Waitzia acuminata</i>	Orange Immortelle		
Boraginaceae		<i>Halgania cyanea</i>	Rough Halgania		
Boraginaceae	*	<i>Heliotropium curassavicum</i>	Smooth Heliotrope		
Brassicaceae	*	<i>Alyssum linifolium</i>	Flax-leaf Alyssum		
Brassicaceae		<i>Arabidella nasturtium</i>			
Brassicaceae	*	<i>Brassica tournefortii</i>	Mediterranean Turnip		
Brassicaceae	*	<i>Carrichtera annua</i>	Ward's Weed		
Brassicaceae		<i>Harmsiodoxa brevipes</i>			
Brassicaceae		<i>Lepidium leptopetalum</i>			
Brassicaceae		<i>Lepidium phlebopetalum</i>	Veined Peppercress		
Brassicaceae	*	<i>Lepidium</i> spp.	A Peppercress		
Brassicaceae	*	<i>Rorippa</i> spp.			
Brassicaceae		<i>Stenopetalum sphaerocarpum</i>			
Caryophyllaceae	*	<i>Silene apetala</i>			
Caryophyllaceae		<i>Silene</i> spp.			
Casuarinaceae		<i>Casuarina pauper</i>	Black Oak		
Chenopodiaceae		<i>Atriplex stipitata</i>	Mallee Saltbush		
Chenopodiaceae		<i>Chenopodium curvispicatum</i>			
Chenopodiaceae		<i>Chenopodium desertorum</i>	Desert Goosefoot		
Chenopodiaceae		<i>Dissocarpus paradoxus</i>	Cannonball Burr		
Chenopodiaceae		<i>Einadia nutans</i>	Climbing Saltbush		
Chenopodiaceae		<i>Enchylaena tomentosa</i>	Ruby Saltbush		
Chenopodiaceae		<i>Maireana appressa</i>			
Chenopodiaceae		<i>Maireana brevifolia</i>			
Chenopodiaceae		<i>Maireana georgei</i>	Slit-wing Bluebush		
Chenopodiaceae		<i>Maireana pentatropis</i>			

Family	Exotic	Scientific Name	Common Name	BC Act Status	EPBC Act Status
Chenopodiaceae		<i>Maireana pyramidata</i>	Black Bluebush		
Chenopodiaceae		<i>Maireana sclerolaenoides</i>			
Chenopodiaceae		<i>Maireana</i> spp.	Cotton Bush, Bluebush, Fissure-weed		
Chenopodiaceae		<i>Maireana trichoptera</i>			
Chenopodiaceae		<i>Maireana triptera</i>	Three-wing Bluebush		
Chenopodiaceae		<i>Maireana turbinata</i>			
Chenopodiaceae		<i>Rhagodia spinescens</i>	Thorny Saltbush		
Chenopodiaceae		<i>Salsola kali</i> var. <i>kali</i>	Blackbush		
Chenopodiaceae		<i>Sclerolaena diacantha</i>	Grey Copperburr		
Chenopodiaceae		<i>Sclerolaena obliquicuspis</i>			
Chenopodiaceae		<i>Sclerolaena parviflora</i>			
Chenopodiaceae		<i>Sclerolaena</i> spp.	Copperburr, Poverty-bush		
Convolvulaceae		<i>Convolvulus remotus</i>			
Convolvulaceae		<i>Convolvulus</i> spp.	A Bindweed		
Cupressaceae		<i>Callitris</i> spp.			
Cyperaceae		<i>Schoenus subaphyllus</i>	Desert Bog-rush		
Euphorbiaceae		<i>Euphorbia dallachyana</i>	Caustic Weed		
Fabaceae		<i>Senna artemisioides</i> subsp. <i>X artemisioides</i>			
Fabaceae (Caesalpinioideae)		<i>Senna artemisioides</i> subsp. <i>zygophylla</i>			
Fabaceae (Caesalpinioideae)		<i>Senna</i> form taxon ' <i>petiolaris</i> '	Woody Cassia		
Fabaceae (Faboideae)		<i>Eutaxia microphylla</i>			
Fabaceae (Faboideae)	*	<i>Medicago minima</i>	Woolly Burr Medic		
Fabaceae (Faboideae)	*	<i>Medicago polymorpha</i>	Burr Medic		
Fabaceae (Faboideae)	*	<i>Medicago</i> spp.	A Medic		
Fabaceae (Faboideae)	*	<i>Medicago truncatula</i>	Barrel Medic		
Fabaceae (Faboideae)		<i>Templetonia egena</i>	Desert Broombush		

Family	Exotic	Scientific Name	Common Name	BC Act Status	EPBC Act Status
Fabaceae (Mimosoideae)		<i>Acacia colletioides</i>	Wait-a-while		
Fabaceae (Mimosoideae)		<i>Acacia halliana</i>			
Fabaceae (Mimosoideae)		<i>Acacia homalophylla</i>	Yarran		
Fabaceae (Mimosoideae)		<i>Acacia ligulata</i>	Sandhill Wattle		
Fabaceae (Mimosoideae)		<i>Acacia melvillei</i>	Yarran		
Fabaceae (Mimosoideae)		<i>Acacia oxycedrus</i>	Spike Wattle		
Fabaceae (Mimosoideae)		<i>Acacia rigens</i>	Needle Wattle		
Geraniaceae		<i>Erodium crinitum</i>	Blue Crowfoot		
Goodeniaceae		<i>Goodenia fascicularis</i>	Mallee Goodenia		
Goodeniaceae		<i>Goodenia</i> spp.			
Goodeniaceae		<i>Scaevola spinescens</i>			
Lamiaceae	*	<i>Marrubium vulgare</i>	White Horehound		
Lamiaceae	*	<i>Salvia</i> spp.			
Lamiaceae	*	<i>Salvia verbenaca</i>	Vervain		
Lomandraceae		<i>Lomandra effusa</i>	Scented Mat-rush		
Lomandraceae		<i>Lomandra leucocephala</i>	Woolly Mat-rush		
Malvaceae		<i>Sida corrugata</i>	Corrugated Sida		
Malvaceae		<i>Sida fibulifera</i>	Pin Sida		
Malvaceae	*	<i>Sida</i> spp.			
Marsileaceae		<i>Marsilea</i> spp.	A Nardoo		
Myoporaceae		<i>Eremophila glabra</i>	Tar Bush		
Myoporaceae		<i>Eremophila sturtii</i>	Turpentine Bush		
Myoporaceae		<i>Myoporum platycarpum</i>	Sugarwood		
Myrtaceae		<i>Eucalyptus costata</i> subsp. <i>murrayana</i>	Ridge-fruited Mallee		
Myrtaceae		<i>Eucalyptus dumosa</i>	White Mallee		
Myrtaceae		<i>Eucalyptus gracilis</i>	Snap and Rattle		

Family	Exotic	Scientific Name	Common Name	BC Act Status	EPBC Act Status
Myrtaceae		<i>Eucalyptus leucoxylon subsp. Connata</i>			
Myrtaceae		<i>Eucalyptus socialis</i>	Red Mallee		
Orchidaceae		<i>Pterostylis cobarensis</i>	Cobar Greenhood	V	
Orchidaceae		<i>Pterostylis jeansii</i>			
Oxalidaceae		<i>Oxalis perennans</i>			
Poaceae		<i>Aristida holathera var. holathera</i>	Erect Kerosene Grass		
Poaceae		<i>Austrostipa nitida</i>			
Poaceae		<i>Austrostipa scabra subsp. falcata</i>	Rough Speargrass		
Poaceae		<i>Austrostipa</i> spp.	A Speargrass		
Poaceae		<i>Enneapogon nigricans</i>	Niggerheads		
Poaceae		<i>Panicum</i> spp.	Panicum		
Poaceae		<i>Paspalidium constrictum</i>	Knottybutt Grass		
Poaceae		<i>Paspalidium</i> spp.			
Poaceae		<i>Rytidosperma richardsonii</i>	Straw Wallaby-grass		
Poaceae		<i>Rytidosperma</i> spp.	Wallaby Grass		
Poaceae		<i>Triodia scariosa</i>	Porcupine Grass		
Poaceae		<i>Triodia</i> spp.	Spinifex		
Portulacaceae		<i>Calandrinia eremaea</i>	Small Purslane		
Rutaceae		<i>Geijera parviflora</i>	Wilga		
Santalaceae		<i>Exocarpos aphyllus</i>	Leafless Ballart		
Santalaceae		<i>Exocarpos</i> spp.	Ballard		
Sapindaceae		<i>Alectryon oleifolius</i>	Western Rosewood		
Sapindaceae		<i>Alectryon</i> spp.			
Sapindaceae		<i>Dodonaea viscosa subsp. angustissima</i>	Narrow-leaved Hopbush		
Solanaceae		<i>Nicotiana suaveolens</i>	Native Tobacco		
Solanaceae		<i>Solanum esuriale</i>	Quena		

Family	Exotic	Scientific Name	Common Name	BC Act Status	EPBC Act Status
Zygophyllaceae		<i>Zygophyllum iodocarpum</i>	Violet Twinleaf		
Zygophyllaceae		<i>Roepera</i> spp.	Twinleaf		

Key : * - exotic species

V – listed as a vulnerable species.

Table C.3 Fauna recorded in the Study area

Species group	Common name	Scientific name	Exotic	BC Act Status	EPBC Status	Species recorded
Bird	Apostlebird	<i>Struthidea cinerea</i>				X
Bird	Australian Magpie	<i>Gymnorhina tibicen</i>				X
Bird	Australian Owlet-nightjar	<i>Aegotheles cristatus</i>				X
Bird	Australian Raven	<i>Corvus coronoides</i>				X
Bird	Australian Ringneck	<i>Barnardius zonarius zonarius</i>				X
Bird	Black-faced Cuckooshrike	<i>Coracina novaehollandiae</i>				X
Bird	Brown Falcon	<i>Falco berigora</i>				X
Bird	Brown Treecreeper	<i>Climacteris picumnus picumnus</i>				X
Bird	Brown-headed Honeyeater	<i>Melithreptus brevirostris</i>				X
Bird	Budgerigar	<i>Melopsittacus undulatus</i>				Study area
Bird	Chestnut Quail-thrush	<i>Cinclosoma castanotum</i>		VU	MBEC - Specialist	X
Bird	Chesnut-rumped Thornbill	<i>Acanthiza uropygialis</i>				X
Bird	Common Bronzewing	<i>Phaps chalcoptera</i>				X
Bird	Crested Bellbird	<i>Oreoica gutturalis</i>			MBEC - Dependent	X
Bird	Crested Pigeon	<i>Ocyphaps lophotes</i>				X
Bird	Emu	<i>Dromaius novaehollandiae</i>				X
Bird	Great Egret	<i>Ardea alba modesta</i>				X
Bird	Grey Butcherbird	<i>Cracticus torquatus</i>				X
Bird	Grey Shrike-thrush	<i>Colluricincla harmonica</i>				X
Bird	Horsfield's Bronze-Cuckoo	<i>Chalcites basalis</i>				X
Bird	Hooded Robin (south-eastern)	<i>Melanodryas cucullata cucullata</i>		EN	EN	X
Bird	Jacky Winter	<i>Microeca fascinans</i>			MBEC - Dependent	X
Bird	Little Crow	<i>Corvus bennetti</i>				X
Bird	Magpie-lark	<i>Grallina cyanoleuca</i>				X

Species group	Common name	Scientific name	Exotic	BC Act Status	EPBC Status	Species recorded
Bird	Malleefowl	<i>Leipoa ocellata</i>		EN	VU	Locality
Bird	Masked Woodswallow	<i>Artamus personatus</i>				X
Bird	Mulga Parrot	<i>Psephotellus varius</i>				X
Bird	Nankeen Kestrel	<i>Falco cenchroides</i>				X
Bird	Pied Butcherbird	<i>Cracticus nigrogularis</i>				X
Bird	Pink Cockatoo	<i>Lophochroa leadbeateri</i>		VU	EN	X
Bird	Rainbow Bee-eater	<i>Merops ornatus</i>				X
Bird	Red-backed Kingfisher	<i>Todiramphus pyrrhopygia</i>				X
Bird	Red-capped Robin	<i>Petroica goodenovii</i>				X
Bird	Rufous Whistler	<i>Pachycephala rufiventris</i>				X
Bird	Sacred Kingfisher	<i>Todiramphus sanctus</i>				X
Bird	Singing Honeyeater	<i>Gavicalis virescens</i>				X
Bird	Southern Whiteface	<i>Aphelocephala leucopsis</i>		VU	VU	X
Bird	Spiny-cheeked Honeyeater	<i>Acanthagenys rufogularis</i>				X
Bird	Splendid Fairy-wren	<i>Malurus splendens</i>			MBEC - Dependent	X
Bird	Spotted Pardalote	<i>Pardalotus punctatus</i>			MBEC - Dependent	X
Bird	Striated Pardalote	<i>Pardalotus striatus</i>				X
Bird	Striped Honeyeater	<i>Plectorhyncha lanceolata</i>				X
Bird	Tawny Frogmouth	<i>Podargus strigoides</i>				X
Bird	Wedge-tailed Eagle	<i>Aquila audax</i>				X
Bird	Weebill	<i>Smicronis brevirostris</i>				X
Bird	Welcome Swallow	<i>Hirundo neoxena</i>				X
Bird	White-browed Babbler	<i>Pomatostomus superciliosus</i>				X
Bird	White-browed Woodswallow	<i>Artamus superciliosus</i>				X
Bird	White-eared Honeyeater	<i>Nesoptilotis leucotis</i>			MBEC - Dependent	X
Bird	White-fronted Honeyeater	<i>Purnella albifrons</i>			MBEC - Dependent	X

Species group	Common name	Scientific name	Exotic	BC Act Status	EPBC Status	Species recorded
Bird	White-winged Chough	<i>Corcorax melanorhamphos</i>				X
Bird	Willie Wagtail	<i>Rhipidura leucophrys</i>				X
Bird	Yellow-plumed Honeyeater	<i>Ptilotula ornata</i>			MBEC - Dependent	X
Bird	Yellow-throated Miner	<i>Manorina flavigula</i>				X
Mammal	Common Dunnart	<i>Sminthopsis murina</i>		VU		Locality
Reptile	Barking Gecko	<i>Underwoodosaurus milii</i>				X
Reptile	Beaded Gecko	<i>Lucasium damaeum</i>				X
Reptile	Bearded Dragon	<i>Pogona vitticeps</i>				X
Reptile	Box-patterned Gecko	<i>Lucasium steindachneri</i>				X
Reptile	Burton's Snake Lizard	<i>Lialis burtonis</i>				X
Reptile	Butler's Legless Lizard	<i>Delma butleri</i>				X
Reptile	Common Dwarf Skink	<i>Menetia greyii</i>				X
Reptile	Coral Snake	<i>Brachyuropsis australis</i>				X
Reptile	Desert Skink	<i>Liopholis inornata</i>				X
Reptile	Dwarf Three-toed Slider	<i>Lerista timida</i>				X
Reptile	Eastern Beaked Gecko	<i>Rhynchoedura ormsbyi</i>				X
Reptile	Eastern Robust Slider	<i>Lerista punctatovittata</i>				X
Reptile	Eastern Stone Gecko	<i>Diplodactylus vittatus</i>				X
Reptile	Eastern Tree Dtella	<i>Gehyra versicolor</i>				X
Reptile	Inland Snake-eyed Skink	<i>Cryptoblepharus australis</i>				X
Reptile	Jewelled Gecko	<i>Strophurus elderi</i>		VU		X
Reptile	Mulga Snake	<i>Pseudechis australis</i>				X
Reptile	Nobbi Dragon	<i>Diporiphora nobbi</i>				X
Reptile	Royal Ctenotus	<i>Ctenotus regius</i>				X
Reptile	Shingleback	<i>Tiliqua rugosa</i>				X
Reptile	Short-clawed Ctenotus	<i>Ctenotus brachyonyx</i>				X

Species group	Common name	Scientific name	Exotic	BC Act Status	EPBC Status	Species recorded
Reptile	Smooth Knob-tailed Gecko	<i>Nephurus levis</i>				X
Reptile	South-eastern Morethia Skink	<i>Morethia boulengeri</i>				X
Reptile	Southern Mallee Ctenotus	<i>Ctenotus atlas</i>				X
Reptile	Southern Spiny-tailed Gecko	<i>Strophurus intermedius</i>				X
Reptile	Tree Skink	<i>Egernia striolata</i>				X

Key: X = recorded within the Development footprint.

Study area = recorded within the area surrounding the Development footprint.

Locality = recorded within the 10km radius of the Development footprint.

VU= listed as a vulnerable species EN = listed as an endangered species.

MBEC = Mallee Bird Ecological Community: Specialist / Dependent species, as defined in the conservation advice (DAWE 2021).

Appendix D

Vegetation Integrity Plot Data

Table D.4 Vegetation integrity plot data imported into the BAM-C

Veg zone	Plot	PCT	Area	Patch size	Condition	Zone	Easting	Northing	Bearing	Tree composition	Shrub composition	Grass composition	Forb composition	Fern composition	Other composition	Tree structure	shrub structure	Grass structure	Forb structure	Fern structure	Other structure	Large trees	Hollows	Litter	Fallen logs	Tree DBH	Tree DBH	Tree DBH	Tree DBH	Tree DBH	Regeneration	High threat exotics
																										5-9 (cm)	10-19 (cm)	20-29 (cm)	30-49 (cm)	50-79 (cm)		
1	BJ009	171	4.42	101	intact	54	718238	6251305	60	3	7	4	3	0	0	23.0	136.0	60.0	63.0	0.0	0.0	0	0	14.4	10.0	1	1	0	0	0	1	0.0
1	BJ010	171	4.42	101	intact	54	718209	6251159	102	1	12	4	2	0	0	2.0	1.2	2.2	0.2	0.0	0.0	0	2	33.8	9.0	1	1	0	0	0	1	0.0
1	ZJ02	171	4.42	101	intact	54	718017	6249924	180	3	10	3	4	0	0	7.0	1.2	35.2	0.4	0.0	0.0	0	0	23.8	2.0	1	1	0	0	1	0	0.0
2	BJ007	170	16.26	101	intact	54	718323	6251904	147	2	9	2	4	0	1	25	1.8	2	0.4	0	0.1	0	0	55.0	2.0	1	1	0	0	0	1	0.0
2	BJ008	170	16.26	101	intact	54	718253	6251460	71	2	9	2	4	0	1	25.0	1.8	2.0	0.4	0.0	0.1	0	7	73.0	15.0	1	1	0	0	0	1	0.0
2	BJ005	170	16.26	101	intact	54	718124	6251061	55	2	13	3	3	0	0	18.0	2.5	2.2	0.3	0.0	0.0	0	0	18.0	6.0	1	1	0	0	0	1	0.0
2	AQBJ06	170	16.26	101	intact	54	718464	6253526	143	3	8	2	3	0	0	18.0	7.9	3.3	0.3	0.0	0.0	0	0	45.0	4.0	1	1	0	0	0	1	0.0
3	BJ006	143	5.54	101	intact	54	718339	6252595	129	0	9	2	4	0	0	0.0	29.2	5.0	0.4	0.0	0.0	0	0	22.4	0.0	0	0	0	0	0	0	0.0
3	AQBJ08	143	5.54	101	intact	54	718378	6252992	101	0	14	3	8	0	1	0.0	21.3	16.0	0.8	0.0	0.1	0	0	48.0	0.0	0	0	0	0	0	0	0.0
3	AQBJ09	143	5.54	101	intact	54	718378	6252854	163	0	11	3	10	0	0	0.0	26.4	22.5	1.0	0.0	0.0	0	0	47.0	0.0	0	0	0	0	0	0	0.0
4	AQBJ05	58	14.42	101	intact	54	718458	6254138	235	3	11	3	11	0	1	11.0	16.5	10.6	2.0	0.0	0.1	0	1	56.0	49.0	0	1	1	1	0	1	0.1
4	BJ003	58	14.42	101	intact	54	718099	6250517	277	1	13	3	3	0	1	20.0	6.9	1.7	0.3	0.0	0.5	0	1	50.0	63.0	0	1	1	1	0	0	0.0
4	GM01	58	14.42	101	intact	54	718049	6250165	120	1	14	1	2	0	1	15.0	3.1	0.1	0.6	0.0	0.1	9	8	33.0	26.0	1	1	1	1	1	0	0.0
5	BJ002	58	4.42	101	disturbed	54	718025	6250324	66	0	12	2	1	0	0	0.0	10.6	2.5	0.1	0.0	0.0	0	0	18.0	16.0	0	0	0	0	0	0	0.0
5	BJ004	58	4.42	101	disturbed	54	718112	6250844	30	2	13	2	3	0	0	20.0	14.2	5.2	0.3	0.0	0.0	2	0	8.5	3.0	0	1	0	1	1	0	0.0
5	ZJ01	58	4.42	101	disturbed	54	718028	6249676	120	1	7	1	6	0	0	0.5	13.8	0.3	0.6	0.0	0.0	0	0	9.6	0.0	0	0	0	0	0	0	0.0
6	AQBJ7	58	5.35	101	cleared	54	718482	6253987	163	1	14	2	3	0	1	1.0	11.3	4.5	0.3	0.0	0.1	0	0	60.0	0.0	0	0	0	0	0	1	0.0
6	ZJ03	58	5.35	101	cleared	54	718519	6254373	30	1	4	1	7	0	1	0.5	6.1	0.3	0.8	0.0	0.1	0	0	12.0	1.0	0	0	0	0	0	0	0.0
6	ZJEP02	58	5.35	101	cleared	54	718463	6254416	275	0	4	2	3	0	1	0.0	7.3	3.1	0.3	0.0	0.1	0	0	12.6	0.0	0	0	0	0	0	0	0.1

Appendix E

Biodiversity Credit Reports



BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00051304/BAAS17098/24/00051305	Atlas campaspe - MOD 6 BDAR	09/04/2026
Assessor Name	Assessor Number	BAM Data version *
Arien Quin	BAAS17098	Current classification (live - default) (94)
Proponent Names	Report Created	BAM Case Status
	22/06/2026	Finalised
Assessment Revision	BOS entry trigger	Assessment Type
3		Major Projects
Date Finalised	* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.	
22/06/2026		

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Nil		
Species		
Nil		

Additional Information for Approval

Assessment Id	Proposal Name
00051304/BAAS17098/24/00051305	Atlas campaspe - MOD 6 BDAR



BAM Biodiversity Credit Report (Like for like)

PCT Outside Ibra Added

None added

PCTs With Customized Benchmarks

PCT

No Changes

Predicted Threatened Species Not On Site

Name

Grantiella picta / Painted Honeyeater

Haliaeetus leucogaster / White-bellied Sea-Eagle

Ecosystem Credit Summary (Number and class of biodiversity credits to be retired)

BAM Biodiversity Credit Report (Like for like)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
171-Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion	Not a TEC	4.4	97	0	97
170-Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones	Mallee Bird Community of the Murray Darling Depression Bioregion	16.3	402	0	402
143-Narrow-leaved Hopbush - Scrub Turpentine - Senna shrubland on semi-arid and arid sandplains and dunes.	Not a TEC	5.5	0	186	186
58-Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion	Not a TEC	24.2	438	104	542

58-Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region
Semi-arid Sand Plain Woodlands This includes PCT's: 58, 252	Semi-arid Sand Plain Woodlands >=50% and <70%	58_Intact	Yes	438	South Olary Plain, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Semi-arid Sand Plain Woodlands This includes PCT's: 58, 252	Semi-arid Sand Plain Woodlands >=50% and <70%	58_Disturbed	No	49	South Olary Plain, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

BAM Biodiversity Credit Report (Like for like)

	Semi-arid Sand Plain Woodlands This includes PCT's: 58, 252	Semi-arid Sand Plain Woodlands >=50% and <70%	58_Cleared	No	55	South Olary Plain, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
143-Narrow-leaved Hopbush - Scrub Turpentine - Senna shrubland on semi-arid and arid sandplains and dunes.	Like-for-like credit retirement options					
	Class	Trading group	Zone	HBT	Credits	IBRA region
	Sand Plain Mulga Shrublands This includes PCT's: 69, 119, 124, 128, 129, 139, 140, 143, 199, 215, 220, 232	Sand Plain Mulga Shrublands <50%	143_Intact	No	186	South Olary Plain, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
170-Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones	Like-for-like credit retirement options					
	Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region

BAM Biodiversity Credit Report (Like for like)

	Mallee Bird Community of the Murray Darling Depression Bioregion This includes PCT's: 170, 171, 172, 173, 174, 190, 191, 193	-	170_Intact	Yes	402	South Olary Plain, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
171-Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion	Like-for-like credit retirement options					
	Class	Trading group	Zone	HBT	Credits	IBRA region
	Dune Mallee Woodlands This includes PCT's: 171, 172, 191	Dune Mallee Woodlands <50%	171_Intact	Yes	97	South Olary Plain, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

Species	Vegetation Zone/s	Area / Count	Credits
Pterostylis cobarensis / Greenhood Orchid	171_Intact, 170_Intact	20.7	531.00

BAM Biodiversity Credit Report (Like for like)

Credit Retirement Options

Like-for-like credit retirement options

Pterostylis cobarensis / Greenhood Orchid	Spp	IBRA subregion
	Pterostylis cobarensis / Greenhood Orchid	Any in NSW

BAM Predicted Species Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00051304/BAAS17098/24/00051305	Atlas campaspe - MOD 6 BDAR	09/04/2026
Assessor Name	Report Created	BAM Data version *
Arien Quin	22/06/2026	Current classification (live - default) (94)
Assessor Number	Assessment Type	BAM Case Status
BAAS17098	Major Projects	Finalised
Assessment Revision	BOS entry trigger	Date Finalised
3		22/06/2026

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Threatened species reliably predicted to utilise the site. No surveys are required for these species. Ecosystem credits apply to these species.

Common Name	Scientific Name	Vegetation Types(s)
Bardick	Echiopsis curta	171-Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion
Black Falcon	Falco subniger	171-Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion
		170-Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones
		143-Narrow-leaved Hopbush - Scrub Turpentine - Senna shrubland on semi-arid and arid sandplains and dunes.
		58-Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion
Black-breasted Buzzard	Hamirostra melanosternon	171-Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion
		170-Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones
		143-Narrow-leaved Hopbush - Scrub Turpentine - Senna shrubland on semi-arid and arid sandplains and dunes.

BAM Predicted Species Report

Black-breasted Buzzard	Hamirostra melanosternon	58-Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion
Blue-winged Parrot	Neophema chrysostoma	170-Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones 58-Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion
Bolam's Mouse	Pseudomys bolami	171-Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion 170-Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones 58-Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion
Chestnut Quail-thrush	Cinclosoma castanotum	171-Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion 170-Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones
Corben's Long-eared Bat	Nyctophilus corbeni	171-Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion 170-Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones 58-Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion
Diamond Firetail	Stagonopleura guttata	170-Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones 58-Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion
Dusky Woodswallow	Artamus cyanopterus cyanopterus	171-Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion 170-Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones 143-Narrow-leaved Hopbush - Scrub Turpentine - Senna shrubland on semi-arid and arid sandplains and dunes. 58-Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion

BAM Predicted Species Report

Gilbert's Whistler	<i>Pachycephala inornata</i>	171-Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion
		170-Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones
		58-Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion
Grey Falcon	<i>Falco hypoleucos</i>	171-Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion
		170-Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones
		143-Narrow-leaved Hopbush - Scrub Turpentine - Senna shrubland on semi-arid and arid sandplains and dunes.
		58-Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion
Grey-crowned Babbler (eastern subspecies)	<i>Pomatostomus temporalis temporalis</i>	143-Narrow-leaved Hopbush - Scrub Turpentine - Senna shrubland on semi-arid and arid sandplains and dunes.
		58-Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion
Inland Forest Bat	<i>Vespadelus baverstocki</i>	171-Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion
		170-Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones
		143-Narrow-leaved Hopbush - Scrub Turpentine - Senna shrubland on semi-arid and arid sandplains and dunes.
		58-Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion
Interior Blind Snake	<i>Anilius endoterus</i>	143-Narrow-leaved Hopbush - Scrub Turpentine - Senna shrubland on semi-arid and arid sandplains and dunes.
Jewelled Gecko	<i>Strophurus elderi</i>	171-Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion
		170-Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones
Kultarr	<i>Antechinomys laniger</i>	171-Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion
		170-Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones

BAM Predicted Species Report

Kultarr	<i>Antechinomys laniger</i>	143-Narrow-leaved Hopbush - Scrub Turpentine - Senna shrubland on semi-arid and arid sandplains and dunes.
		58-Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion
Latham's Snipe	<i>Gallinago hardwickii</i>	143-Narrow-leaved Hopbush - Scrub Turpentine - Senna shrubland on semi-arid and arid sandplains and dunes.
Little Eagle	<i>Hieraaetus morphnoides</i>	171-Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion
		170-Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones
		143-Narrow-leaved Hopbush - Scrub Turpentine - Senna shrubland on semi-arid and arid sandplains and dunes.
		58-Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion
Little Pied Bat	<i>Chalinolobus picatus</i>	171-Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion
		170-Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones
		143-Narrow-leaved Hopbush - Scrub Turpentine - Senna shrubland on semi-arid and arid sandplains and dunes.
		58-Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion
Mallee Slender Blue-tongue Lizard	<i>Cyclodomorphus melanops elongatus</i>	171-Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion
Mallee Worm-lizard	<i>Aprasia inaurita</i>	171-Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion
		170-Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones
Malleefowl	<i>Leipoa ocellata</i>	171-Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion
		170-Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones
Marble-faced Delma	<i>Delma australis</i>	171-Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion
		170-Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones

BAM Predicted Species Report

Pied Honeyeater	<i>Certhionyx variegatus</i>	171-Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion
		170-Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones
		143-Narrow-leaved Hopbush - Scrub Turpentine - Senna shrubland on semi-arid and arid sandplains and dunes.
		58-Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion
Pink Cockatoo	<i>Lophochroa leadbeateri</i>	171-Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion
		170-Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones
		143-Narrow-leaved Hopbush - Scrub Turpentine - Senna shrubland on semi-arid and arid sandplains and dunes.
		58-Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion
Purple-crowned Lorikeet	<i>Parvipsitta porphyrocephala</i>	171-Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion
		170-Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones
Purple-gaped Honeyeater	<i>Lichenostomus cratitius</i>	171-Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion
		170-Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones
Regent Parrot (eastern subspecies)	<i>Polytelis anthopeplus monarchoides</i>	171-Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion
		170-Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones
		58-Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion
Ringed Brown Snake	<i>Pseudonaja modesta</i>	171-Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion
		170-Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones
		143-Narrow-leaved Hopbush - Scrub Turpentine - Senna shrubland on semi-arid and arid sandplains and dunes.

BAM Predicted Species Report

Ringed Brown Snake	<i>Pseudonaja modesta</i>	58-Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion
Sandy Inland Mouse	<i>Pseudomys hermannsburgensis</i>	171-Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion 143-Narrow-leaved Hopbush - Scrub Turpentine - Senna shrubland on semi-arid and arid sandplains and dunes. 58-Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion
Scarlet-chested Parrot	<i>Neophema splendida</i>	171-Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion 170-Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones
Shy Heathwren	<i>Hylacola cauta</i>	171-Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion 170-Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones
South-eastern Hooded Robin	<i>Melanodryas cucullata cucullata</i>	171-Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion 170-Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones 143-Narrow-leaved Hopbush - Scrub Turpentine - Senna shrubland on semi-arid and arid sandplains and dunes. 58-Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion
Southern Ningau	<i>Ningau yvonneae</i>	171-Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion 170-Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones
Southern Scrub-robin	<i>Drymodes brunneopygia</i>	171-Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion
Southern Whiteface	<i>Aphelocephala leucopsis</i>	171-Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion 170-Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones 143-Narrow-leaved Hopbush - Scrub Turpentine - Senna shrubland on semi-arid and arid sandplains and dunes.

BAM Predicted Species Report

Southern Whiteface	Aphelocephala leucopsis	58-Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion
Spotted Harrier	Circus assimilis	171-Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion
		170-Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones
		143-Narrow-leaved Hopbush - Scrub Turpentine - Senna shrubland on semi-arid and arid sandplains and dunes.
		58-Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion
Square-tailed Kite	Lophoictinia isura	58-Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion
Stripe-faced Dunnart	Sminthopsis macroura	171-Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion
		143-Narrow-leaved Hopbush - Scrub Turpentine - Senna shrubland on semi-arid and arid sandplains and dunes.
		58-Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion
Varied Sittella	Daphoenositta chrysoptera	171-Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion
		170-Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones
		58-Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion
Wedgesnout Ctenotus	Ctenotus brooksi	171-Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion
		143-Narrow-leaved Hopbush - Scrub Turpentine - Senna shrubland on semi-arid and arid sandplains and dunes.
Western Blue-tongued Lizard	Tiliqua occipitalis	171-Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion
		170-Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones
Western Pygmy Possum	Cercartetus concinnus	171-Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion

BAM Predicted Species Report

Western Pygmy Possum	Cercartetus concinnus	170-Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones
		58-Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion
Yellow-bellied Sheath-tail-bat	Saccolaimus flaviventris	170-Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones
		143-Narrow-leaved Hopbush - Scrub Turpentine - Senna shrubland on semi-arid and arid sandplains and dunes.
		58-Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion
Yellow-tailed Plain Slider	Lerista xanthura	171-Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion
		170-Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones
		143-Narrow-leaved Hopbush - Scrub Turpentine - Senna shrubland on semi-arid and arid sandplains and dunes.
		58-Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion

Threatened species Manually Added

None added

Threatened species assessed as not within the vegetation zone(s) for the PCT(s)

Common Name	Scientific Name	Plant Community Type(s)
Painted Honeyeater	Grantiella picta	143-Narrow-leaved Hopbush - Scrub Turpentine - Senna shrubland on semi-arid and arid sandplains and dunes.
		58-Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion
White-bellied Sea-Eagle	Haliaeetus leucogaster	171-Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion
		170-Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones
		143-Narrow-leaved Hopbush - Scrub Turpentine - Senna shrubland on semi-arid and arid sandplains and dunes.

BAM Predicted Species Report

White-bellied Sea-Eagle	Haliaeetus leucogaster	58-Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion
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Threatened species assessed as not within the vegetation zone(s) for the PCT(s)

Refer to BAR for detailed justification

Common Name	Scientific Name	Justification in the BAM-C
Painted Honeyeater	Grantiella picta	Refer to BAR
White-bellied Sea-Eagle	Haliaeetus leucogaster	Refer to BAR

BAM Candidate Species Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00051304/BAAS17098/24/00051305	Atlas campaspe - MOD 6 BDAR	09/04/2026
Assessor Name	Report Created	BAM Data version *
Arien Quin	22/06/2026	Current classification (live - default) (94)
Assessor Number	Assessment Type	BAM Case Status
BAAS17098	Major Projects	Finalised
Assessment Revision	BOS entry trigger	Date Finalised
3		22/06/2026

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List of Species Requiring Survey

Name	Presence	Survey Months
<i>Acacia acanthoclada</i> Harrow Wattle	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☒ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
<i>Acacia carneorum</i> Purple-wood Wattle	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☒ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
<i>Ardeotis australis</i> Australian Bustard	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☒ Nov ☐ Dec ☐ Survey month outside the specified months?

BAM Candidate Species Report

<i>Austrostipa metatoris</i> A spear-grass	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☒ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
<i>Burhinus grallarius</i> Bush Stone-curlew	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☒ Nov ☐ Dec ☐ Survey month outside the specified months?
<i>Calotis moorei</i> A burr-daisy	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☒ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
<i>Cratystylis conocephala</i> Bluebush Daisy	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☒ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
<i>Dodonaea stenozyga</i> Desert Hopbush	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☒ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
<i>Hieraaetus morphnoides</i> Little Eagle	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☒ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

BAM Candidate Species Report

<i>Lasiopetalum behrii</i> Pink Velvet Bush	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☒ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
<i>Lasiorhinus latifrons</i> Southern Hairy-nosed Wombat	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☒ Nov ☐ Dec ☐ Survey month outside the specified months?
<i>Lepidium monoplocoides</i> Winged Peppergrass	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☒ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
<i>Leptorhynchos waitzia</i> Button Immortelle	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☒ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
<i>Lophoictinia isura</i> Square-tailed Kite	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☒ Nov ☐ Dec ☐ Survey month outside the specified months?
<i>Lucasium microplax</i> Southern Sandplain Gecko	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☒ Nov ☐ Dec ☐ Survey month outside the specified months?

BAM Candidate Species Report

<i>Manorina melanotis</i> Black-eared Miner	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☒ Nov ☐ Dec ☐ Survey month outside the specified months?
<i>Pachycephala rufogularis</i> Red-lored Whistler	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☒ Nov ☐ Dec ☐ Survey month outside the specified months?
<i>Pseudomys desertor</i> Desert Mouse	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☒ Nov ☐ Dec ☐ Survey month outside the specified months?
<i>Pterostylis cobarensis</i> Greenhood Orchid	Yes (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☒ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
<i>Santalum murrayanum</i> Bitter Quandong	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☒ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
<i>Swainsona colutoides</i> Bladder Senna	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☒ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

BAM Candidate Species Report

<i>Swainsona pyrophila</i> Yellow Swainson-pea	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☒ Oct ☐ Nov ☐ Dec
		☐ Survey month outside the specified months?

Threatened species Manually Added

None added

Threatened species assessed as not on site

Refer to BAR for detailed justification

Common name	Scientific name	Justification in the BAM-C
A saltbush	<i>Atriplex infrequens</i>	Habitat degraded
Black-breasted Buzzard	<i>Hamirostra melanosternon</i>	Habitat constraints
Fleshy Minuria	<i>Kippistia suaedifolia</i>	Habitat constraints
Painted Burrowing Frog	<i>Neobatrachus pictus</i>	Habitat degraded
Pink Cockatoo	<i>Lophochroa leadbeateri</i>	Refer to BAR
Regent Parrot (eastern subspecies)	<i>Polytelis anthopeplus monarchoides</i>	Refer to BAR
Thyme Rice-Flower	<i>Pimelea serpyllifolia</i> subsp. <i>serpyllifolia</i>	Refer to BAR
White-bellied Sea-Eagle	<i>Haliaeetus leucogaster</i>	Habitat constraints

BAM Vegetation Zones Report

Proposal Details

Assessment Id	Assessment name	BAM data last updated *
00051304/BAAS17098/24/00051305	Atlas campaspe - MOD 6 BDAR	09/04/2026
Assessor Name	Report Created	BAM Data version *
Arien Quin	22/06/2026	Current classification (live - default) (94)
Assessor Number	Assessment Type	BAM Case Status
BAAS17098	Major Projects	Finalised
Assessment Revision	BOS entry trigger	Date Finalised
3		22/06/2026

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Vegetation Zones

#	Name	PCT	Condition	Area	Minimum number of plots	Management zones
1	171_Intact	171-Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion	Intact	4.42	2	

BAM Vegetation Zones Report

2	170_Intact	170-Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones	Intact	16.26		
3	143_Intact	143-Narrow-leaved Hopbush - Scrub Turpentine - Senna shrubland on semi-arid and arid sandplains and dunes.	Intact	5.54	3	
4	58_Intact	58-Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion	Intact	14.42	3	
5	58_Disturbed	58-Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion	Disturbed	4.42	2	
6	58_Cleared	58-Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion	Cleared	5.35	3	

Atlas campaspe - MOD 6 BDAR

STATUS: FINALISED

1. Assessment details

Table 1.1 - Assessment case details

Assessment data	BAM-C details
Proposal name	Atlas campaspe - MOD 6 BDAR
Assessment type	Major Projects
Assessment ID	00051304/BAAS17098/24/00051305
Assessment revision Number	3
Case status	Finalised
Assessor Name	Arien Quin
Assessor ID	BAAS17098
BOS entry reason	
IBRA bioregion	Murray Darling Depression
IBRA subregion	South Olary Plain
NSW Mitchell's Landscape	Mungo - Marona Linear Dunes

2. Executive Summary

Table 2.1 - Site context

Site Context	Details
IBRA bioregion	Murray Darling Depression
IBRA subregion	South Olary Plain
NSW Mitchell landscape	Mungo - Marona Linear Dunes
Landscape features	
Feature name	
Percentage Native Vegetation cover	78

Table 2.2 - Plant community types

PCT ID	PCT Name	Total area (ha)	TEC	Potential SAI
58	Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion	24.19	Not a TEC	No
143	Narrow-leaved Hopbush - Scrub Turpentine - Senna shrubland on semi-arid and arid sandplains and dunes.	5.54	Not a TEC	No
170	Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones	16.26	Mallee Bird Community of the Murray Darling Depression Bioregion	No
171	Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion	4.42	Not a TEC	No

Table 2.3 - Direct impacts on native vegetation and threatened ecological communities

Veg Zone ID	PCT (condition)	TEC	BC Act	EPBC Act	Potential SAI	Area (ha)	VI score	Future VIS
1	171 (Intact)	Not a TEC			No	4.42	58.6	0
2	170 (Intact)	Mallee Bird Community of the Murray Darling Depression Bioregion	Not Listed	EN	No	16.26	49.5	0
3	143 (Intact)	Not a TEC			No	5.54	89.7	0
4	58 (Intact)	Not a TEC			No	14.42	69.4	0
5	58 (Disturbed)	Not a TEC			No	4.42	25.2	0
6	58 (Cleared)	Not a TEC			No	5.35	23.6	0

Table 2.4 - Direct impacts on threatened species

Common name	Species name	BC Act	EPBC Act	Potential SAI	Area / Count
Greenhood Orchid	<i>Pterostylis cobarensis</i>	VU	Not Listed	No	20.68 ha

Table 2.5 - List of relevant MNES ecosystems

PCT ID	MNES ecosystem	Area (ha)	EPBC listing status	Credit obligation
170	Mallee Bird Community of the Murray Darling Depression Bioregion	16.26	EN	402

Table 2.6 - List of relevant MNES species

Common name	Species name	Area / Count	EPBC listing status	Credit obligation

Table 2.7 - Biodiversity credit obligation - Ecosystem

PCT ID	PCT Name	TEC	OTG	Potential SAI	HBT credits	Non HBT credits	Credit obligation	IBRA Subregion
58	Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion	Not a TEC	Semi-arid Sand Plain Woodlands - $\geq 50\%$ - $< 70\%$ cleared group (including Tier 3 or higher threat status).	No	438	104	542	South Olary Plain, Barrier Range Outwash, Darling Depression, Great Darling Anabranch, Lachlan, Menindee, Murray Fans, Murray Scroll Belt, Murrumbidgee, Pooncarie-Darling and Robinvale Plains. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

PCT ID	PCT Name	TEC	OTG	Potential SAI	HBT credits	Non HBT credits	Credit obligation	IBRA Subregion
143	Narrow-leaved Hopbush - Scrub Turpentine - Senna shrubland on semi-arid and arid sandplains and dunes.	Not a TEC	Sand Plain Mulga Shrublands - < 50% cleared group (including Tier 4 or higher threat status).	No	0	186	186	South Olary Plain, Barrier Range Outwash, Darling Depression, Great Darling Anabranch, Lachlan, Menindee, Murray Fans, Murray Scroll Belt, Murrumbidgee, Pooncarie-Darling and Robinvale Plains. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
170	Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones	Mallee Bird Community of the Murray Darling Depression Bioregion	Mallee Bird Community of the Murray Darling Depression Bioregion	No	402	0	402	South Olary Plain, Barrier Range Outwash, Darling Depression, Great Darling Anabranch, Lachlan, Menindee, Murray Fans, Murray Scroll Belt, Murrumbidgee, Pooncarie-Darling and Robinvale Plains. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

PCT ID	PCT Name	TEC	OTG	Potential SAI	HBT credits	Non HBT credits	Credit obligation	IBRA Subregion
171	Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion	Not a TEC	Dune Mallee Woodlands - < 50% cleared group (including Tier 4 or higher threat status).	No	97	0	97	South Olary Plain, Barrier Range Outwash, Darling Depression, Great Darling Anabranch, Lachlan, Menindee, Murray Fans, Murray Scroll Belt, Murrumbidgee, Pooncarie-Darling and Robinvale Plains. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

HBT- Hollow Bearing Tree, OTG-Offset Trading Group, TEC-Threatened Ecological Community

Table 2.8 - Biodiversity credit obligation - Species

Common name	Species name	BC Act listing status	Potential SAI	Credit obligation
Greenhood Orchid	<i>Pterostylis cobarensis</i>	VU	No	531

3. Landscape context (BAM Section 3)

Table 3.1 - Landscape features

Landscape feature	Details
IBRA bioregion	Murray Darling Depression
IBRA subregion	South Olary Plain
NSW Mitchell landscape	Mungo - Marona Linear Dunes
Rivers, streams, estuaries and wetlands, classified according to stream order	Absent
Habitat connectivity	Absent
Karst, caves, crevices, cliffs, rocks and other geological features of significance	Absent
Areas of outstanding biodiversity value	Absent
Other landscape features	Absent
Percentage Native Vegetation cover	78

4. Native vegetation (BAM Section 4)

Table 4.1 - Plant community types

PCT ID	PCT Name	Area (ha)	Added from outside IBRA subregion
171	Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion	4.42	No
143	Narrow-leaved Hopbush - Scrub Turpentine - Senna shrubland on semi-arid and arid sandplains and dunes.	5.54	No
58	Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion	24.19	No
170	Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones	16.26	No

Table 4.2.1 - Plant community type profile

PCT 171 - Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion	
Vegetation Formation	Semi-arid Woodlands (Shrubby sub-formation)
Vegetation Class	Dune Mallee Woodlands
Percent Cleared	19
TEC	Not a TEC
BC Act listing status	
EPBC Act listing status	
SAll candidate	No

BioNet description

Mallee shrubland or open shrubland most about 5 m tall but up to 8 m, most often in a whipstick habit, dominated by a number of mallee species including White Mallee (*Eucalyptus dumosa*), Red Mallee (*Eucalyptus socialis*) and Snap and Rattle (*Eucalyptus gracilis*) and Ridge-fruited Mallee (*Eucalyptus costata*). Narrow-leaved Red Mallee (*Eucalyptus leptophylla*) is also often present along with Sand Dune Pine (*Callitris verrucosa*). This community contains a species-rich understorey that is dominated by Porcupine Grass (*Triodia scariosa*). A mid-dense to sparse shrub cover includes *Acacia colletioides*, *Dodonaea viscosa* subsp. *angustissima*, *Eremophila glabra*, *Olearia pimelioides*, *Maireana pentratropis*, and *Grevillea huegeilii*. Mulga (*Acacia aneura*) and Wilga (*Geijera parviflora*) may occur in northern and eastern areas. Besides Porcupine Grass, the ground cover includes fuzz-weed (*Vittadinia cuneata*), *Austrostipa nitida*, *Podolepis capillaris* and copperburrs such as *Sclerolaena diacantha* and *Sclerolaena obliquicuspis*. After rainfall many ephemeral species germinate including daisies and other forbs. Weeds are few in number and cover but Onion Weed (*Asphodelus fistulosus*) can be a localised problem. The swales between the dunes are most often more loamy-clay and often contain different vegetation such as Belah or box woodlands. This community occurs on calcareous brown-red sand or loamy sand sometimes overlying grey clay on east-west linear sand dunes mainly in the Murray Darling Depression Bioregion in south far western plain of NSW extending into South Australia and Victoria. Mainly restricted to the arid zone and semi-arid (warm) climatic zones in NSW. In relatively good condition compared to most other inland plant communities due to a low proportion having been cleared and low stocking rates. However eastern-most areas have been cleared with little in the Murray CMA. Rabbits are a problem in some areas. Burnt by wildfires every two or three decades or more regularly by landholders. Frequent fire may threaten the survival of mallee species.

Table 4.2.2 - Plant community type profile

PCT 143 - Narrow-leaved Hopbush - Scrub Turpentine - Senna shrubland on semi-arid and arid sandplains and dunes.	
Vegetation Formation	Arid Shrublands (Acacia sub-formation)
Vegetation Class	Sand Plain Mulga Shrublands
Percent Cleared	30
TEC	Not a TEC
BC Act listing status	
EPBC Act listing status	
SAll candidate	No
BioNet description Tall open shrubland to 4 m high dominated by Narrow-leaved Hopbush (<i>Dodonaea viscosa</i> subsp. <i>angustissima</i>), Turpentine (<i>Eremophila sturtii</i>) and various sub-species of <i>Senna artemisioides</i> often with Mulga (<i>Acacia aneura</i>), <i>Olearia pimeleoides</i> , Black Bluebush (<i>Maireana pyramidata</i>), Thorny Saltbush (<i>Rhagodia spinescens</i>) and a number of other <i>Eremophila</i> species. The ground cover includes small shrubs such as the copperburrs <i>Sclerolaena obliquicuspis</i> , <i>Sclerolaena diacantha</i> and <i>Sclerolaena decurrens</i> , <i>Salsola tragus</i> , Cannonball Burr (<i>Dissocarpus paradoxus</i>), Ruby Saltbush (<i>Enchylaena tomentosa</i>), <i>Atriplex limbata</i> , Mallee Saltbush (<i>Atriplex stipitata</i>) and <i>Maireana pentatropis</i> . Common grass species include Kerosene Grass (<i>Aristida contorta</i>), bottlenasher (<i>Enneapogon avenaceus</i>), <i>Austrostipa nitida</i> , <i>Austrostipa scabra</i> , Button Grass (<i>Dactyloctenium radulans</i>) and Woollybutt (<i>Eragrostis eriopoda</i>). Common forbs include <i>Rhodanthe floribunda</i> , <i>Rutidosis helichrysoides</i> , <i>Tetragonia eremaea</i> and <i>Portulaca olera</i>	

Table 4.2.3 - Plant community type profile

PCT 58 - Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion	
Vegetation Formation	Semi-arid Woodlands (Shrubby sub-formation)
Vegetation Class	Semi-arid Sand Plain Woodlands
Percent Cleared	50
TEC	Not a TEC
BC Act listing status	
EPBC Act listing status	
SAll candidate	No
BioNet description Mid-high (about 7 m high) low open woodland or isolated clumps of trees dominated by Black Oak (<i>Casuarina pauper</i>) and Western Rosewood (<i>Alectryon oleifolius</i> subsp. <i>canescens</i>) with either a shrubby or grassy understorey. These two tree species often form clumps and may or may not mix. Other low trees include Sugarwood (<i>Myoporum platycarpum</i> subsp. <i>platycarpum</i>) and <i>Pittosporum angustifolium</i> . The shrub layer is sparse or very sparse. It includes species such as Wilga (<i>Geijera parviflora</i>), <i>Senna artemisioides</i> sens lat., Leafless Ballart (<i>Exocarpos aphyllus</i>), Thorny Saltbush (<i>Rhagodia spinescens</i>), Black Bluebush (<i>Maireana pyramidata</i>), <i>Olearia muelleri</i> , <i>Eremophila deserti</i> , <i>Eremophila sturtii</i> , <i>Eremophila glabra</i> , <i>Acacia oswaldii</i> , <i>Acacia colletioides</i> , <i>Dodonaea viscosa</i> subsp. <i>angustissima</i> , <i>Chenopodium curvispicatum</i> and <i>Zygophyllum aurantiacum</i> . The ground cover is generally very sparse and includes low shrubs such as <i>Sclerolaena diacantha</i> , <i>Dissocarpus paradoxus</i> , <i>Sclerolaena patentiscuspis</i> , <i>Sclerola</i>	

Table 4.2.4 - Plant community type profile

PCT 170 - Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones	
Vegetation Formation	Semi-arid Woodlands (Shrubby sub-formation)
Vegetation Class	Sand Plain Mallee Woodlands
Percent Cleared	41
TEC	Mallee Bird Community of the Murray Darling Depression Bioregion
BC Act listing status	Not Listed
EPBC Act listing status	Endangered
SAll candidate	No

BioNet description

Mallee woodland or open mallee shrubland most usually about 8 m tall dominated by several mallee species including White Mallee (*Eucalyptus dumosa*), Red Mallee (*Eucalyptus socialis*), Glossy-leaved Red Mallee (*Eucalyptus oleosa*) and Snap and Rattle (*Eucalyptus gracilis*). White Cypress Pine (*Callitris glaucophylla*) or Slender Pine (*Callitris gracilis* subsp. *murrayensis*) may be present. The mallee species occur in different proportions across the distributional range. The structure can either be bull mallee woodland or whipstick mallee shrubland depending on time since the last fire, other disturbance, or the clay content of the soil. Chenopods shrubs form a major component of the understorey compared to mallee on sandy dunes (IDs 171, 172) or the mallee communities of the slightly wetter areas in the east (IDs 173-175). Common shrubs include *Chenopodium curvispicatum*, *Enchylaena tomentosa*, *Atriplex stipitata*, *Dissocarpus paradoxus*, *Chenopodium desertorum* subsp. *desertorum*, *Maireana pentatropis*, *Maireana georgei*, *Maireana pyramidata*, *Maireana sedifolia*, *Sclerolaena obliquicuspis*, *Acacia microcarpa*, *Myoporum platycarpum*, *Senna* form taxon 'filifolia' and *Rhagodia spinescens*. Forbs include *Zygophyllum aurantiacum*, *Zygophyllum apiculatum*, *Ptilotus exaltatus* var. *exaltatus* and *Vittadinia cuneata*. Grasses include *Austrostipa* and *Austrodanthonia* species. A cryptogam soil crust composed of algae and lichens is commonly present in areas that are protected from trampled by stock or goats. The floristic composition of the ground flora varies markedly from season to season, with changes in grazing regimes and after fire. Pearl Bluebush (*Maireana sedifolia*) understorey is more common in the Scotia region where more limey soils occur. Heavily grazed areas contain fewer species and a simpler structure. In areas unburnt for decades large bull mallee trees may feature with large amounts of leaf litter on the ground. This community occurs on calcareous red-brown, sandy-loam or loamy clay soils, sometimes containing limestone nodules, on eolian sandplains or in inter-dune plains or swales. The largest occurrences of this community are north-west of Balranald forming a transition between the dune mallee and the Riverine Plain, south and east of Mungo National Park, north of Mildura on the Darling River plain and in the Scotia Mallee, and south-east of Menindee. It is mainly restricted to the Murray-Darling Depression Bioregion of NSW with small outliers to the north. Extends into Victoria and South Australia. Tends to occur in regions receiving less than 300 mm of annual rainfall. Significant areas have been cleared for grazing or cropping but large areas remain uncleared. Most areas outside reserves are grazed by stock and trampling of soils leads to soil erosion. Fire and is a key disturbance factor in mallee and it may be subject to wildfire every 2-3 decades but it is burnt by landholders more often in some locations.

Table 4.3 - Threatened ecological communities

TEC	BC Act status	EPBC Act status	Associated PCTs	Vegetation zones	Area (ha)
Mallee Bird Community of the Murray Darling Depression Bioregion	Not Listed	EN	170	170_Intact	16.26

Table 4.4 - Vegetation zones

Veg zone ID	PCT ID	Condition	Area (ha)	Patch Size	No. VI Plots required	No. VI Plots completed	Plot IDs	Vegetation integrity score
1	171	Intact	4.42	101	3	3	BJ009,BJ010,ZJ02	58.6
2	170	Intact	16.26	101	4	4	BJ007,BJ008,BJ005,AQBJ6	49.5
3	143	Intact	5.54	101	3	3	BJ006,AQBJ08,AQBJ09	89.7
4	58	Intact	14.42	101	3	3	AQBJ05,BJ003,GM01	69.4
5	58	Disturbed	4.42	101	3	3	BJ002,BJ004,ZJ01	25.2
6	58	Cleared	5.35	101	4	3	AQBJ007,ZJ03,ZJEP02	23.6

Table 4.5 - Current vegetation integrity scores

Veg zone ID	PCT ID	Condition	Composition	Structure	Function	Vegetation integrity score	Hollow bearing trees?
1	171	Intact	98.9	54.2	37.5	58.6	No
2	170	Intact	92.4	29.6	44.3	49.5	No
3	143	Intact	85.7	93.8		89.7	No
4	58	Intact	95.1	41.2	85.4	69.4	Yes
5	58	Disturbed	78.6	29.1	7	25.2	No
6	58	Cleared	76.3	9.9	17.4	23.6	No

5. Threatened species (BAM Section 5)

Table 5.1 - Candidate species credit species habitat suitability assessment

Common name	Species name	Habitat/ geographic constraints	Suitability	BAM-C reason	Survey period	Survey Month
Harrow Wattle	<i>Acacia acanthoclada</i>	Other; Deep silicious sands	Included		August; September; October; November	Oct
Purple-wood Wattle	<i>Acacia carneorum</i>		Included		January; February; March; April; May; June; July; August; September; October; November; December	Oct
Australian Bustard	<i>Ardeotis australis</i>		Included		January; February; March; April; May; June; July; August; September; October; November; December	Nov

Common name	Species name	Habitat/ geographic constraints	Suitability	BAM-C reason	Survey period	Survey Month
A saltbush	<i>Atriplex infrequens</i>		Excluded	Habitat degraded		
A spear-grass	<i>Austrostipa metatoris</i>		Included		October; November	Oct
Bush Stone- curlew	<i>Burhinus grallarius</i>	Fallen/standing dead timber including logs;Null	Included		January; February; March; April; May; June; July; August; September; October; November; December	Nov
A burr-daisy	<i>Calotis moorei</i>		Included		September; October; November	Oct
Bluebush Daisy	<i>Cratystylis conocephala</i>		Included		January; February; March; April; May; June; July; August; September; October; November; December	Oct

Common name	Species name	Habitat/ geographic constraints	Suitability	BAM-C reason	Survey period	Survey Month
Desert Hopbush	<i>Dodonaea stenozyga</i>		Included		January; February; March; April; May; June; July; August; September; October; November; December	Oct
White-bellied Sea-Eagle	<i>Haliaeetus leucogaster</i>		Excluded			
Black-breasted Buzzard	<i>Hamirostra melanosternon</i>		Excluded			
Little Eagle	<i>Hieraaetus morphnoides</i>	Other; Nest trees - live (occasionally dead) large old trees within vegetation)	Included		August; September; October	Oct
Fleshy Minuria	<i>Kippistia suaedifolia</i>		Excluded			

Common name	Species name	Habitat/ geographic constraints	Suitability	BAM-C reason	Survey period	Survey Month
Pink Velvet Bush	<i>Lasiopetalum behrii</i>	Other;Shallow, sandy soils	Included		January; February; March; April; May; June; July; August; September; October; November; December	Oct
Southern Hairy- nosed Wombat	<i>Lasiorhinus latifrons</i>		Included		January; February; March; April; May; June; July; August; September; October; November; December	Nov
Winged Peppercress	<i>Lepidium monoplocoides</i>		Included		September; October; November; December	Oct
Button Immortelle	<i>Leptorhynchus waitzia</i>		Included		September; October; November	Oct

Common name	Species name	Habitat/ geographic constraints	Suitability	BAM-C reason	Survey period	Survey Month
Pink Cockatoo	<i>Lophochroa leadbeateri</i>	Living or dead tree(s) with hollows at least 3 m above the ground, tree stems with a DBH of ≥ 30 cm, and hollow diameter ≥ 8 cm.	Excluded			
Square-tailed Kite	<i>Lophoictinia isura</i>	Other; Nest trees	Included		January; September; October; November; December	Nov
Southern Sandplain Gecko	<i>Lucasium microplax</i>		Included		January; February; March; October; November; December	Nov
Black-eared Miner	<i>Manorina melanotis</i>		Included		January; August; September; October; November; December	Nov
Painted Burrowing Frog	<i>Neobatrachus pictus</i>		Excluded	Habitat degraded		

Common name	Species name	Habitat/ geographic constraints	Suitability	BAM-C reason	Survey period	Survey Month
Red-lored Whistler	<i>Pachycephala rufogularis</i>		Included		January; February; March; April; May; June; July; August; September; October; November; December	Nov
Thyme Rice-Flower	<i>Pimelea serpyllifolia subsp. serpyllifolia</i>		Excluded			
Regent Parrot (eastern subspecies)	<i>Polytelis anthopeplus monarchoides</i>	Living or dead E. camaldulensis with hollows ≥ 5 cm diameter, trees with DBH ≥ 40 cm, within 20km of mallee shrublands or woodlands.	Excluded			
Desert Mouse	<i>Pseudomys desertor</i>		Included		March; April; May; June; August; September; October; November; December	Nov

Common name	Species name	Habitat/ geographic constraints	Suitability	BAM-C reason	Survey period	Survey Month
Greenhood Orchid	<i>Pterostylis cobarensis</i>		Included		October	Oct
Bitter Quandong	<i>Santalum murrayanum</i>	Other;Sandy loam or loamy sand	Included		January; February; March; April; May; June; July; August; September; October; November; December	Oct
Bladder Senna	<i>Swainsona colutoides</i>		Included		January; February; March; April; May; June; July; August; September; October; November; December	Oct
Yellow Swainson-pea	<i>Swainsona pyrophila</i>		Included		September; October; November	Oct

Table 5.2 - Candidate species credit assessment results

Common name	Species name	Species presence	Potential SAI
Harrow Wattle	<i>Acacia acanthoclada</i>	No (surveyed)	No
Purple-wood Wattle	<i>Acacia carneorum</i>	No (surveyed)	Yes
Australian Bustard	<i>Ardeotis australis</i>	No (surveyed)	No
A spear-grass	<i>Austrostipa metatoris</i>	No (surveyed)	No
Bush Stone-curlew	<i>Burhinus grallarius</i>	No (surveyed)	No
A burr-daisy	<i>Calotis moorei</i>	No (surveyed)	Yes
Bluebush Daisy	<i>Cratystylis conocephala</i>	No (surveyed)	No
Desert Hopbush	<i>Dodonaea stenozyga</i>	No (surveyed)	Yes
Little Eagle	<i>Hieraaetus morphnoides</i>	No (surveyed)	No
Pink Velvet Bush	<i>Lasiopetalum behrii</i>	No (surveyed)	Yes

Common name	Species name	Species presence	Potential SAI
Southern Hairy-nosed Wombat	<i>Lasiorhinus latifrons</i>	No (surveyed)	No
Winged Peppercreess	<i>Lepidium monoplocoides</i>	No (surveyed)	No
Button Immortelle	<i>Leptorhynchos waitzia</i>	No (surveyed)	Yes
Square-tailed Kite	<i>Lophoictinia isura</i>	No (surveyed)	No
Southern Sandplain Gecko	<i>Lucasium microplax</i>	No (surveyed)	No
Black-eared Miner	<i>Manorina melanotis</i>	No (surveyed)	Yes
Red-lored Whistler	<i>Pachycephala rufogularis</i>	No (surveyed)	Yes
Desert Mouse	<i>Pseudomys desertor</i>	No (surveyed)	Yes
Greenhood Orchid	<i>Pterostylis cobarensis</i>	Yes (surveyed)	No
Bitter Quandong	<i>Santalum murrayanum</i>	No (surveyed)	No
Bladder Senna	<i>Swainsona colutoides</i>	No (surveyed)	No

Common name	Species name	Species presence	Potential SAI
Yellow Swainson-pea	<i>Swainsona pyrophila</i>	No (surveyed)	No

Table 5.3 - Species habitat polygons and population size

Common name	Species name	Month(s) surveyed	Polygon area (ha) (area species)	Count of species
Harrow Wattle	<i>Acacia acanthoclada</i>	Oct	0	
Purple-wood Wattle	<i>Acacia carneorum</i>	Oct	0	
Australian Bustard	<i>Ardeotis australis</i>	Nov	0	
A spear-grass	<i>Austrostipa metatoris</i>	Oct	0	
Bush Stone-curlew	<i>Burhinus grallarius</i>	Nov	0	
A burr-daisy	<i>Calotis moorei</i>	Oct	0	
Bluebush Daisy	<i>Cratystylis conocephala</i>	Oct		0
Desert Hopbush	<i>Dodonaea stenozyga</i>	Oct		0
Little Eagle	<i>Hieraaetus morphnoides</i>	Oct	0	

Common name	Species name	Month(s) surveyed	Polygon area (ha) (area species)	Count of species
Pink Velvet Bush	<i>Lasiopetalum behrii</i>	Oct	0	
Southern Hairy-nosed Wombat	<i>Lasiorhinus latifrons</i>	Nov	0	
Winged Peppergrass	<i>Lepidium monoplacoides</i>	Oct	0	
Button Immortelle	<i>Leptorhynchus waitzia</i>	Oct	0	
Square-tailed Kite	<i>Lophoictinia isura</i>	Nov	0	
Southern Sandplain Gecko	<i>Lucasium microplax</i>	Nov	0	
Black-eared Miner	<i>Manorina melanotis</i>	Nov	0	
Red-lored Whistler	<i>Pachycephala rufogularis</i>	Nov	0	
Desert Mouse	<i>Pseudomys desertor</i>	Nov	0	
Greenhood Orchid	<i>Pterostylis cobarensis</i>	Oct	20.7	

Common name	Species name	Month(s) surveyed	Polygon area (ha) (area species)	Count of species
Bitter Quandong	<i>Santalum murrayanum</i>	Oct		0
Bladder Senna	<i>Swainsona colutoides</i>	Oct	0	
Yellow Swainson-pea	<i>Swainsona pyrophila</i>	Oct	0	

BAM STAGE 2 - IMPACT ASSESSMENT

8. Impact assessment (BAM Section 8)

Table 8.1 - Direct impacts on native vegetation and threatened ecological communities

Veg Zone ID	Veg Zone Name	PCT ID	BC Act	EPBC Act	Potential SAIL	Area (ha)	VI score	Future VIS	Change in VI	Partial Loss
1	171_Intact	171			No	4.42	58.6	0	-58.6	No
2	170_Intact	170	Not Listed	EN	No	16.26	49.5	0	-49.5	No
3	143_Intact	143			No	5.54	89.7	0	-89.7	No
4	58_Intact	58			No	14.42	69.4	0	-69.4	No
5	58_Disturbed	58			No	4.42	25.2	0	-25.2	No
6	58_Cleared	58			No	5.35	23.6	0	-23.6	No

Table 8.2 - Direct impacts on threatened species

Common name	Species name	BC Act	EPBC Act	Potential SAIL	Area / Count
Greenhood Orchid	<i>Pterostylis cobarensis</i>	VU	Not Listed	No	20.68 ha

10. Credit obligation - Biodiversity Offsets (BAM Section 10)

Table 10.1 - Ecosystem credit obligation

PCT ID	PCT Name	TEC	OTG	Potential SAIL	HBT credits	No HBT credits	Credit obligation	IBRA Subregion
58	Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion	Not a TEC	Semi-arid Sand Plain Woodlands - $\geq$ 50% - < 70% cleared group (including Tier 3 or higher threat status).	No	438	104	542	South Olary Plain, Barrier Range Outwash, Darling Depression, Great Darling Anabranch, Lachlan, Menindee, Murray Fans, Murray Scroll Belt, Murrumbidgee, Pooncarie-Darling and Robinvale Plains. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

PCT ID	PCT Name	TEC	OTG	Potential SAI	HBT credits	No HBT credits	Credit obligation	IBRA Subregion
143	Narrow-leaved Hopbush - Scrub Turpentine - Senna shrubland on semi-arid and arid sandplains and dunes.	Not a TEC	Sand Plain Mulga Shrublands - < 50% cleared group (including Tier 4 or higher threat status).	No	0	186	186	South Olary Plain, Barrier Range Outwash, Darling Depression, Great Darling Anabranch, Lachlan, Menindee, Murray Fans, Murray Scroll Belt, Murrumbidgee, Pooncarie-Darling and Robinvale Plains. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
170	Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones	Mallee Bird Community of the Murray Darling Depression Bioregion	Mallee Bird Community of the Murray Darling Depression Bioregion	No	402	0	402	South Olary Plain, Barrier Range Outwash, Darling Depression, Great Darling Anabranch, Lachlan, Menindee, Murray Fans, Murray Scroll Belt, Murrumbidgee, Pooncarie-Darling and Robinvale Plains. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

PCT ID	PCT Name	TEC	OTG	Potential SAI	HBT credits	No HBT credits	Credit obligation	IBRA Subregion
171	Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion	Not a TEC	Dune Mallee Woodlands - < 50% cleared group (including Tier 4 or higher threat status).	No	97	0	97	South Olary Plain, Barrier Range Outwash, Darling Depression, Great Darling Anabranch, Lachlan, Menindee, Murray Fans, Murray Scroll Belt, Murrumbidgee, Pooncarie-Darling and Robinvale Plains. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

HBT- Hollow Bearing Tree, OTG-Offset Trading Group, TEC-Threatened Ecological Community

Table 10.2 - Species credit obligation

Common name	Species name	BC Act listing status	Potential SAI	Credit obligation
Greenhood Orchid	<i>Pterostylis cobarensis</i>	VU	No	531

Appendix F

EPBC Act Assessments of Significance

Vulnerable bird species of Mallee woodland: Southern Whiteface (*Aphelocephala leucopsis*), Malleefowl (*Leipoa ocellata*) and Blue-winged Parrot (*Neophema chrysostoma*)

Southern Whiteface

Distribution

The Southern Whiteface (*Aphelocephala leucopsis*) occurs across most of mainland Australia south of the tropics, from the north-eastern edge of the Western Australian wheatbelt, east to the Great Dividing Range (DCCEEW 2023b).

Habitat requirements

The Southern Whiteface inhabits a wide range of open woodlands and shrublands where there is an understorey of grasses or shrubs, or both, generally in areas dominated by acacias or eucalypts on ranges, foothills and lowlands, and plains (DCCEEW 2023b, Higgins & Peter 2002). It forages almost exclusively on the ground, favouring habitat with low tree densities and an herbaceous understorey litter cover (DCCEEW 2023b). When breeding, the Southern Whiteface mainly utilises hollows and crevices, but will nest in low bushes (DCCEEW 2023b, Higgins & Peter 2002).

Habitat in the Study area

There is foraging habitat for the Southern Whiteface throughout the Development footprint (associated PCTs include PCT 58, 143, 170 and 171). The species was observed on one occasion within the Study area, with one individual seen. The species has been regularly observed across the Atlas-Campaspe Mine area over several years of survey in this area (GHD 2022). This species may also nest in denser patches of small trees and shrubs within the Development footprint but would be more likely to breed in larger trees with hollows and crevices (DCCEEW 2023b) outside of the Development footprint in the broader Study area. No evidence of breeding or that the Development footprint was frequently occupied or important to a local population was noted despite diurnal bird surveys and nest tree censuses conducted over two weeks.

No important populations of the Southern Whiteface are noted in the conservation advice for the species (DCCEEW 2023a). According to the MNES significant impact guidelines 1.1 (DotE 2013) an 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are: key source populations either for breeding or dispersal; populations that are necessary for maintaining genetic diversity; and/or populations that are near the limit of the species range.

Given the frequency that the species has been observed across the locality over several years, often in groups, it is likely that this population comprises a key source either for breeding or dispersal and is necessary for maintaining genetic diversity and as such is an important population.

Malleefowl

Distribution

The Malleefowl (*Leipoa ocellata*) in NSW is distributed throughout the mallee in the south west centred on Mallee Cliffs NP and extending east to near Balranald and scattered records as far north as Mungo NP. West of the Darling River a population also occurs in the Scotia mallee including Tarawi NR and Scotia Sanctuary, and is part of a larger population north of the Murray River in South Australia (OEH).

Habitat requirements

Malleefowl predominantly inhabit semi-arid Eucalypt woodland (mallee) communities, preferring tall, dense and floristically-rich mallee in higher rainfall areas. This species utilises mallee with a spinifex understorey, but usually at lower densities than in areas with a shrub understorey, and prefers areas of light sandy to sandy loam soils and habitats with a dense but discontinuous canopy and dense and diverse shrub and herb layers. The species will occupy areas within 5 years of fire, however higher breeding densities are recorded from older age classes. Birds mainly forage in open areas on seeds of Acacias and other native shrubs, buds, flowers and fruits and insects.

Eggs are incubated in large mounds that contain large volumes of sandy soil, and litter within the mounds which must be dampened for it to decompose and provide heat for incubation of eggs. Males monitor the temperature within the egg chamber using their bill, and regularly work the mound during the breeding season to maintain a constant temperature around 34 degrees.

Habitat in the Study area

There is potential habitat for Malleefowl throughout the Development footprint, in both PCT 170 and 171. This species is well known from the broader surrounding locality, with 11 records of the species within the locality (NSW DCCEEW 2025a), and numerous active and inactive mounds recorded over several years during ongoing monitoring of the Atlas-Campaspe Offset area and throughout the existing Campaspe mine alignment (GHD 2018a, GHD 2019a, GHD 2019b, GHD 2019c, GHD 2019c, GHD 2020a, GHD 2020b, GHD 2022a, GHD 2022b, GHD 2023a, GHD 2023b, GHD 2024a, GHD 2024b, GHD 2024c, GHD 2025 and GHD 2026).

Malleefowl occur in a wide range of habitat types and habitat critical to the survival of the species is known only in broad terms. No particular populations or general areas can be described as being of greater importance for the long-term survival of Malleefowl (Benshemesh, 2007). Noting that the Malleefowl is listed as an endangered species in NSW and that the overall area of suitable, occupied habitat is limited, the known population in the locality would be an important population. As such, any individuals that occurred in the Development footprint would form part of an important population.

EPBC Act Assessment of Significance Malleefowl (*Leipoa ocellata*)

According to the DotE (2013) 'significant impact criteria', an action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

Lead to a long-term decrease in the size of an important population

There are no important populations identified in the listing/conservation advice for these species. As described above, Malleefowl occurring at the Development footprint would comprise an important population as defined in the MNES significant impact guidelines 1.1 (DotE 2013).

The factors that could potentially lead to a long-term decrease in the size of an important population of Malleefowl include direct harm, loss of foraging habitat affecting an ecologically significant proportion of local populations or loss of important breeding habitat.

The Development footprint would result in direct impacts to native vegetation and associated threatened species habitat through the clearing of up to 20.68 ha of native vegetation that would provide habitat for the Malleefowl.

The proposed impact mitigation and environmental management measures are likely to mitigate against erosion, sedimentation or any other indirect effects on adjacent habitat during the proposed works.

The Development footprint would remove or modify 50.41 ha of native vegetation in varying condition, 20.68 ha of which provides foraging habitat and potential nesting habitat for Malleefowl. Whilst there is no evidence that Malleefowl has nested previously in the Study area, several more recently active mounds are known from the surrounding area. There is no direct evidence of these species breeding in the Development footprint despite targeted surveys.

Clearing of vegetation may, in general, directly harm resident fauna. The Development footprint would remove 20.68 ha of vegetation, which could comprise shelter for Malleefowl individuals. Most resident birds could easily evade harm once construction activity begins at the Development footprint. The Development footprint would include fauna management protocols including pre-clearing surveys and salvage and treatment of any resident fauna as specified section 8. This would partially mitigate impacts on the local populations of these species and avoid any less mobile nesting individuals or their young, in the Development footprint during vegetation clearing works. The Development footprint would not directly harm a significant proportion of the population of Malleefowl, representing 20.68ha or 0.47% of the approximately 14,293ha of suitable habitat within the existing Atlas-Campaspe biodiversity offset, and over 100,000 ha of potential habitat across a broader landscape of contiguous remnant native vegetation dominated by suitable mallee woodland habitat.

Noise and vibration, light, vehicle movement and other human activities during the operation of the Development footprint have the potential to disturb individuals, in areas adjacent to the Development footprint and may result in individuals foraging elsewhere. These indirect impacts resulting from the Development footprint would be temporary in nature and would only

EPBC Act Assessment of Significance
Malleefowl (*Leipoa ocellata*)

last about 6 months during construction, and vehicle movement would reduce to four movements per hour for the life of the Development footprint (until 2034). Malleefowl are at particular risk of vehicle strike, as this species usually do not flee when approached by traffic, and they are often killed on roads where they frequently feed on spilt grain (DCCEEW 2024). These vehicle strikes however, typically occur on open roads where speed limits are 100km/h, and speed limits are in place in other areas of the mine to reduce vehicle strike risks to this species. Given the low volume and speeds of vehicles that would be utilising the corridor, potential impacts associated with vehicle strikes are anticipated to be minimal.

Despite many years of intensive survey across the Atlas-Campaspe MLA (GHD 2018a, GHD 2019a, GHD 2019b, GHD 2019c, GHD 2019c, GHD 2020a, GHD 2020b, GHD 2022a, GHD 2022b, GHD 2023a, GHD 2023b, GHD 2024a, GHD 2024b, GHD 2024c and GHD 2025), including targeted surveys for Malleefowl and their nest mounds, the closest known previous Malleefowl Mound lies seven kilometres west of the MOD6 corridor, the next closest Malleefowl Mound is located nine kilometres north-west of the MOD6 development (Fig 5.1). There are no known Malleefowl mounds recorded within the immediate area of the MOD6 alignment or the offset to be isolated at present. Breeding birds tend to be sedentary, nesting in the same general area year after year (Frith 1959; Benshemesh 1992, DCCEEW 2024), suggesting Malleefowl are very unlikely to be present in the MOD6 corridor, and therefore vehicle strike to this species is very unlikely.

Tronox maintains a log of vehicle strikes to animals across the Atlas-Campaspe MLA, and haul roads. Over the nine year lifespan of the mine to date, no vehicle strikes to Malleefowl, or any other threatened species have been recorded, or are suspected to have occurred. Most recorded vehicle strikes are to livestock (sheep and cattle), with some to feral goats and kangaroo species (likely Western Grey and Red Kangaroos). The vast majority of these incidents have been recorded on the 135 kilometre haul road to the Ivanhoe processing facility, a largely unfenced public road with a speed limit of 100kmh, where heavy trucks carrying mineral concentrate travel at 80kmh.

In the unlikely scenario that Malleefowl do utilise the south-eastern portion of the offset, the reduced speeds and low traffic volumes of the proposed haul road of 50 kilometres per hour, with an average of four vehicles to use the road an hour suggests collision risks will remain very low, both with Malleefowl and any other mobile fauna species that may pass over the open space of the haul road.

Whilst vehicle strikes to smaller animals are easily missed and some incidents almost certainly go unnoticed or unreported, the risk of vehicle strikes to Malleefowl associated with the MOD6 corridor are considered very unlikely due to two key factors – the 50kmh vehicle speed, and the scarcity or total absence of Malleefowl in this area. Additionally, the clearing will be temporary, with mining operations set to cease by June 2034, and the MOD6 area set to be rehabilitated to native vegetation after this occurs. Any potential vehicle strike risk (which is already expected to be minor) will be temporary and cease once rehabilitation occurs.

Generation of additional noise and light would occur intensively during the construction phase, for a relatively small portion of the 8-year life of the Development footprint. Vegetation management measures recommended for the Development footprint would help to avoid direct impacts and minimise indirect impacts on habitat adjoining the Development footprint. Extensive areas of comparable foraging and nesting habitat are present in surrounding areas and so the temporary displacement of fauna over short distances would have a minor consequence. The likely magnitude of edge effects or other indirect effects would not be sufficient to tangibly affect the life cycle of these threatened species. The Development footprint is therefore unlikely to adversely affect the lifecycle of Malleefowl such that an important population would decline in size.

Reduce the area of occupancy of an important population

The Development footprint would remove or modify up to 20.68 hectares of native vegetation that is habitat for Malleefowl. Noise and human activity has the potential to affect the quality or occupation of habitat adjoining the Development footprint during construction and for short periods of maintenance. The Development footprint would create a small-scale gap in habitat that could be easily passed over or through by these bird species particularly during the majority of the 8-year life of the Development footprint when the services corridor is operational. Given the mobility of these bird species and the very large extent of habitat in the locality, important populations of the species would persist in the local area and region. Therefore, despite removing or modifying a small area of habitat the Development footprint would not reduce the overall area of occupancy for the Malleefowl.

EPBC Act Assessment of Significance
Malleefowl (*Leipoa ocellata*)

Fragment an existing important population into two or more populations

The Proposal has the potential to result in a very marginal increase to the loss of habitat connectivity throughout the broader landscape. The corridor may create a temporary impediment to movement of some smaller, less mobile ground dwelling species, but more mobile species such as threatened microbats, threatened woodland birds and Malleefowl may travel over or forage within the subject site as part of a wider home range, but would not be subject to a notable or significant impact as a result of the construction or operation of the 100m wide services corridor.

The isolation of 534 ha of the existing offset area by the 100m wide MOD6 clearing, and the resultant temporary loss of connectivity is not expected to significantly restrict the movement of, or impact on threatened species. The 100m wide corridor of cleared vegetation with stock proof fence lining both sides may somewhat isolate a 534 ha eastern section of the existing 16,000 ha offset, this area will maintain its current condition and habitat features, and is not completely isolated; remaining adjoined to over 500 ha of remnant native vegetation to its east, combining to create a patch of over a thousand hectares of similar condition remnant native vegetation and habitat. This area is large enough to provide sustained feeding and breeding habitat for all resident local threatened species, including Malleefowl which have home ranges of between 50 and 500ha (DCCEEW 2024).

Despite being ground-based and rarely taking flight, Malleefowl are also highly mobile and considered unlikely to be restricted in their movements by the MOD6 corridor development. Notwithstanding many years of intensive survey across the Atlas-Campaspe MLA (GHD 2018a, GHD 2019a, GHD 2019b, GHD 2019c, GHD 2019c, GHD 2020a, GHD 2020b, GHD 2022a, GHD 2022b, GHD 2023a, GHD 2023b, GHD 2024a, GHD 2024b, GHD 2024c and GHD 2025), including targeted surveys for Malleefowl and their nest mounds, the closest known previous Malleefowl Mound lies seven kilometres west of the MOD6 corridor, the next closest Malleefowl Mound is located nine kilometres north-west of the MOD6 development (Fig 5.1). There are therefore no known Malleefowl mounds recorded within the immediate area of the MOD6 alignment or the offset to be isolated at present. Breeding birds tend to be sedentary, nesting in the same general area year after year (Frith 1959; Benshemesh 1992, DCCEEW 2024), suggesting that the isolation of the offset area at present is very unlikely to have any immediate impact on Malleefowl, and despite birds sometimes moving several kilometres between nesting seasons (Frith 1959), this would be possible unhindered by the proposed action following its completion and rehabilitation from 2034.

Malleefowl chicks are capable of dispersing widely almost immediately after emerging from their nests and do not seem confined to particular habitat types, mean dispersal rates of over 600m per day have been measured for newly hatched chicks in a radio-tracking study, with some chicks averaging over two kilometres per day (Benshemesh 1992). In this study, dispersing chicks readily moved out of the unburnt habitats in which they were hatched and into recently burnt mallee and open woodlands with little cover. Movements of chicks and their apparent disregard for habitat boundaries may facilitate their dispersal and potential to recolonise patches of habitat even when fragmented.

The proposed MOD6 development is relatively narrow and temporary, and not expected to prevent the movement of, or impact the suitability of this area for threatened species. Additionally, any potential impacts from habitat fragmentation will be resolved once rehabilitation occurs after mining operations cease in 2034.

This species may travel through the site on occasion as an extension of their use of habitat in adjoining areas of native vegetation but would not be limited to, or reliant on, the vegetation or connectivity provided by the site to support their continued use of the local area. The Development footprint would include clearing of native vegetation up to 50.41 ha of land and the construction of an access track, of which 20.68 ha is suitable habitat for Malleefowl. Construction would reduce connectivity through the Development footprint by decreasing shelter and creating open areas that may present physical barriers to some species. Removal of native vegetation cover and operation of the Development footprint would create a gap in habitat connectivity of about 30m across, a relatively small open area within this variable landscape.

Human occupation may also deter Malleefowl from moving through the local area during construction and then during use as a services corridor. The construction and commissioning of the services corridor will take approximately 6 months and is expected to be utilised for the life of the Campaspe mine.

Habitat connectivity would be maintained around the Development footprint through extensive areas of similar semi-arid mallee and Belah woodland. The Development footprint does not include the erection of any large or hazardous structures that would increase the risk or energy cost of movement of any threatened fauna. Removal of vegetation and construction of the services corridor and its associated infrastructure would only result in a minor increase in the degree of fragmentation between retained areas of habitat for these species and would not result in the isolation of any habitat. The Development footprint would create a small-scale gap in habitat that could be easily passed over or through by Malleefowl, particularly during the majority of the 8-year life of the Development footprint. Given the very large extent of suitable habitat across the surrounding landscape, populations of Malleefowl would persist in the local area and region. Therefore, despite removing or modifying a small area of habitat the Development footprint would not fragment an important population of Malleefowl into two or more populations due to generally intact and uncleared nature of the large properties of the surrounding region.

Adversely affect habitat critical to the survival of a species

Habitat critical to the survival of the Malleefowl includes mallee woodlands with light sandy to loamy soils with litter in which to create nesting mounds, and native shrubs in which to forage for seeds, flowers, buds and insects. Key threats include loss and fragmentation of suitable habitat by large-scale land clearing for agriculture and inappropriate fire regimes, predation by foxes and feral cats, and pressure on vegetation from overgrazing native and exotic herbivores.

No Critical Habitat for the species as defined under section 207A of the EPBC Act has been identified or included in the Register of Critical Habitat (DCCEEW 2023b). The Development footprint would remove or modify up to 20.68ha of available

EPBC Act Assessment of Significance
Malleefowl (*Leipoa ocellata*)

suitable habitat representing 0.47% of the approximately 14,293ha of suitable habitat within the existing Atlas-Campaspe biodiversity offset, and over 100,000 ha of potential habitat across a broader landscape of contiguous remnant native vegetation dominated by suitable mallee woodland habitat. This is a very small proportion of the extent of similar habitat in the locality and region, which includes extensive cover of similar semi-arid woodland and shrubland. The Development footprint does not contain any nest mounds, despite targeted survey and the Proposal would not remove or otherwise affect any areas essential for roosting and nesting.

EPBC Act Assessment of Significance
Malleefowl (*Leipoa ocellata*)

Disrupt the breeding cycle of an important population

The Development footprint would remove or modify 50.41 ha of native vegetation, all of which 20.68 ha provide potential breeding habitat for the Malleefowl.

Removal of vegetation has the potential to disrupt the breeding cycle of Malleefowl by reducing foraging resources available, displacing or harming nesting birds and/or by affecting the ability of birds to move between breeding and foraging habitat. There is no evidence that Malleefowl has nested previously in the project footprint, notwithstanding many years of intensive survey across the Atlas-Campaspe MLA (GHD 2018a, GHD 2019a, GHD 2019b, GHD 2019c, GHD 2019c, GHD 2020a, GHD 2020b, GHD 2022a, GHD 2022b, GHD 2023a, GHD 2023b, GHD 2024a, GHD 2024b, GHD 2024c, GHD 2025 and GHD 2026), including targeted surveys for Malleefowl and their nest mounds, the closest known previous Malleefowl Mound lies seven kilometres west of the MOD6 corridor, the next closest Malleefowl Mound is located nine kilometres north-west of the MOD6 development (Fig 5.1). There are therefore no known Malleefowl mounds recorded within the immediate area of the MOD6 alignment or the offset to be isolated at present.

The Development footprint would include fauna management protocols including pre-clearing surveys and salvage and treatment of any resident fauna including Malleefowl, and clearing completed outside of the breeding period for these species, following the existing Tronox preclearance protocol, as specified section 8. This would partially mitigate impacts, reducing residual impacts to low levels on the local populations of the species and avoid any less mobile nesting individuals or their young, in the Development footprint during vegetation clearing works, with clearing restricted to seasons outside of the typical breeding period for Malleefowl.

Indirect impacts such as generation of additional noise and light would occur for a small portion of the 8-year life of the Development footprint. Extensive areas of comparable foraging and nesting habitat are present in surrounding areas and so the temporary displacement of fauna over short distances would have a minor consequence.

The Development footprint is therefore highly unlikely to substantially disrupt the breeding cycle of any population of this vulnerable bird species.

Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The Development footprint would remove or modify a maximum of 50.41 ha of native vegetation, 20.68 ha of this is considered potentially suitable Malleefowl habitat. There would be no impact to any large trees, water bodies or any other habitat features that would comprise an important connecting link between any other areas of habitat that may be used by the species considered in this assessment. Malleefowl may travel through the Development footprint on occasion as an extension of their use of habitat in adjoining areas of native vegetation but would not be limited to, or reliant on, the vegetation or connectivity provided by the Development footprint to support their continued use of the local area. Habitat connectivity would be maintained around the Development footprint through extensive areas of similar semi-arid woodland in comparable condition states. The Development footprint does not include the erection of any large or hazardous structures that would substantially increase the risk or energy cost of movement of the Malleefowl. Removal of vegetation and construction of the services corridor would only result in a very minor increase in the degree of fragmentation between retained areas of habitat for these species and would not result in the isolation of any habitat for these mobile species.

The reduction in extent of habitat would be minor. The Development footprint would create a gap in habitat connectivity about 100m wide which would not be sufficient to interrupt any ecological process such as migration or pollination. The surrounding locality and region contain many tens of thousands of hectares of similar, intact remnant native vegetation and equivalent habitat resources. Given this minor quantum of impact and the presence of alternative habitat resources the Development footprint is unlikely to have an adverse effect on habitat for these species to the extent that they would be likely to decline.

Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

Disturbance associated with vegetation clearing and vehicle traffic during construction or ongoing maintenance of the area may, in general, have the potential for the spread, introduction and establishment of weed and pest species. The Development footprint site adjoins important areas of native vegetation, especially the offset area for the Atlas-Campaspe Mine.

Construction and environmental management plans will specify measures for restricting access to native vegetation and minimising the risk of transmitting weed propagules. Environmental inductions, visual barriers and/or exclusion fencing will be used to exclude personnel and vehicles from habitat outside the Development footprint.

To further mitigate the risk of pathogens being brought onto and/or spread through the site all vehicles, plant and equipment will be cleaned down (wash/blow down) and certified weed free prior to initial entry to site; all vehicles, plant and equipment will strictly adhere to the approved roads, tracks, easements and work areas to minimise contact with vegetation.

Altered environmental conditions along new edges and clearings can allow invasion by pest animals specialising in edge habitats and/or change the behaviour of resident animals. Edge zones can be subject to higher levels of predation by introduced mammalian predators, such as foxes and feral cats. Pest mammal control measures will be completed around the Study area as part of the broader mine pest management, to limit the expansion of pest predators into this area.

EPBC Act Assessment of Significance
Malleefowl (*Leipoa ocellata*)

Introduce disease that may cause the species to decline, or

As described for invasive species above, the Development footprint has the potential, in general, increase the potential for the spread, introduction and establishment of pathogens such as exotic plants, though these are managed under the Biodiversity Management Plan. The Development footprint does not include any higher risk activities such as transport of biological material.

Construction and environmental management plans will specify measures for restricting access to native vegetation and minimising the risk of transmitting disease. To further mitigate the risk of pathogens being brought onto and/or spread through the site all vehicles, plant and equipment will be cleaned and inspected. Personnel, vehicles and equipment will be restricted to work areas to minimise contact with sensitive habitat.

Interfere substantially with the recovery of the species

The Development footprint has the potential to interfere with the recovery of these species by removing or modifying habitat, which is noted as a key threat for the Malleefowl (DCCEEW 2023b). As described above, the Development footprint would remove or modify a maximum of 20.68 ha of potential habitat for these species at the Development footprint. The site does not contain any confirmed breeding habitat, large trees, water bodies or any habitat features that would comprise an important connecting link between any other areas of habitat. Malleefowl may occupy the Development footprint on occasion as an extension of their use of habitat in adjoining areas of native vegetation but would not be limited to, or reliant on, the habitat at the site for their continued persistence in the locality.

The reduction in extent of habitat would be very minor, when considered in the context of the surrounding landscape and mobile nature of the species in question. The surrounding locality and region contain many thousands of hectares of similar vegetation and equivalent habitat resources. Given this minor quantum of impact and the presence of alternative habitat resources the Development footprint would not interfere substantially with the recovery of these species.

Conclusion of assessment of significance

Based on consideration of the above criteria, the Development footprint is considered unlikely to have a significant impact on an important population of Malleefowl, as:

- Only a minor proportion of the extensive available habitat for these mobile species within the broader landscape would be removed or modified.
- No important populations are identified for these species
- The Development footprint is unlikely to have an adverse effect on the size or breeding cycle of an important population of these species
- The Development footprint will only result in a minor increase in the degree of fragmentation between retained areas of habitat for these species and will not result in any isolation of habitat
- The Development footprint is unlikely to interfere substantially with the recovery of the species

Blue-winged Parrot

Distribution

Blue-winged Parrots breed on mainland Australia south of the Great Dividing Range in southern Victoria, far south-east of South Australia, and parts of Tasmania (Emison et al. 1987; Higgins 1999). A partial migrant, variable numbers of birds migrate across Bass Strait in winter, during the non-breeding period, birds are recorded throughout eastern Australia, including western New South Wales (Higgins 1999).

Habitat requirements

Blue-winged parrots inhabit a wide range of habitats from coastal, sub-coastal and inland areas, through to semi-arid zones. They tend to favour grasslands and grassy woodlands and are often found near wetlands both near the coast and in semi-arid zones (Higgins 1999; Holdsworth et al. 2021). The species can also be seen in altered environments such as airfields, golf-courses and paddocks. Pairs or small parties of blue-winged parrots forage mainly near or on the ground for seeds of a wide range of native and introduced grasses, herbs and shrubs (Higgins 1999).

Habitat in the Study area

There is potential habitat for the Blue-winged Parrot throughout the Development footprint, in PCT 58 and 170 and 171, where this species may forage on the seeds of chenopods and native grasses. There are no records of the species within the locality (NSW DCCEEW 2025a), but there are numerous observations from the broader area.

The species consists of a single population with a total size estimated to be 10,000 mature birds occurring at low densities across its range (DCCEEW 2023). As such, any individuals that occurred in the Development footprint would form part of an important population.

EPBC Act Assessment of Significance

Vulnerable bird species of Mallee woodland: Southern Whiteface (*Aphelocephala leucopsis*) and Blue-winged Parrot (*Neophema chrysostoma*)

According to the DotE (2013) 'significant impact criteria', an action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

Lead to a long-term decrease in the size of an important population

There are no important populations identified in the listing/conservation advice for these species. As described above, each of the populations of these vulnerable bird species of semi-arid shrubland and woodland that could occur at the Development footprint would comprise an important population as defined in the MNES significant impact guidelines 1.1 (DotE 2013).

The factors that could potentially lead to a long-term decrease in the size of an important population of these vulnerable bird species include direct harm, loss of foraging habitat affecting an ecologically significant proportion of local populations or loss of important breeding habitat.

The Development footprint would result in direct impacts to native vegetation and associated threatened species habitat through the clearing of up to 50.41 ha of native vegetation for construction of the Modification 6 and its associated access tracks. Of this vegetation 40.54 ha would provide habitat for the Blue-winged Parrot and 50.41 ha is habitat for the Southern Whiteface.

The proposed impact mitigation and environmental management measures are likely to mitigate against erosion, sedimentation or any other indirect effects on adjacent habitat during the proposed works.

Only the Southern Whiteface was recorded in the Development footprint, whilst the Blue-winged Parrot are known to occur in adjacent habitats in the locality and may occur in the Development footprint on occasion.

The Development footprint would remove or modify 50.41 ha of native vegetation in varying condition, all of which provides foraging habitat and potential nesting habitat for the Southern Whiteface. Of this 40.45 ha would also provide foraging habitat for the Blue-winged Parrot. The Southern Whiteface may build nests in a variety of locations, including trees and shrubs or stumps, and could therefore also nest in the Development footprint. It is assumed that a breeding population of these species is present in the wider locality given the large tracts of vegetation nearby.

Clearing of vegetation may, in general, directly harm resident fauna. The Development footprint would remove 50.41 ha of vegetation, which could comprise shelter for these bird species. Most resident birds could easily evade harm once construction activity begins at the Development footprint. The Development footprint would include fauna management protocols including pre-clearing surveys and salvage and treatment of any resident fauna as specified section 8. This would partially mitigate impacts on the local populations of these species and avoid any less mobile nesting individuals or their young, in the Development footprint during vegetation clearing works. The Development footprint would not directly harm a significant proportion of the populations of these bird species, if any.

Noise and vibration, light, vehicle movement and other human activities during the operation of the Development footprint has the potential to disturb individuals, if nesting in areas adjacent to the Development footprint and may result in individuals foraging elsewhere. These indirect impacts resulting from the Development footprint would be temporary in nature and would only last about 6 months during construction, and vehicle movement would reduce to less than 4 movements per day for the life of the Project (Until 2034). Generation of additional noise and light would occur intensively during the construction phase, for a relatively small portion of the 8-year life of the Development footprint. Vegetation management measures recommended for the Development footprint would help to avoid direct impacts and minimise indirect impacts on habitat adjoining the Development footprint. Extensive areas of comparable foraging and nesting habitat are present in surrounding areas and so the temporary displacement of fauna over short distances would have a minor consequence. The likely magnitude of edge effects or other indirect effects would not be sufficient to tangibly affect the life cycle of these threatened species. The Development footprint is therefore unlikely to adversely affect the lifecycle of these vulnerable bird species such that an important population would decline in size.

Reduce the area of occupancy of an important population

The Development footprint would remove or modify up to 50.41 hectares of native vegetation that is habitat for the Southern Whiteface and of which 40.45 ha of habitat for the Blue-winged Parrot. Noise and human activity may affect the quality or occupation of habitat adjoining the Development footprint during construction and for short periods of maintenance. The Development footprint would create a small-scale gap in habitat that could be easily passed over or through by these bird species particularly during the majority of the 8-year life of the Development footprint when the services corridor is

EPBC Act Assessment of Significance

Vulnerable bird species of Mallee woodland: Southern Whiteface (*Aphelocephala leucopsis*) and Blue-winged Parrot (*Neophema chrysostoma*)

operational. Given the mobility of these bird species and the very large extent of habitat in the locality, important populations of these species would persist in the local area and region. Therefore, despite removing or modifying a small area of habitat the Development footprint would not reduce the overall area of occupancy of these species.

EPBC Act Assessment of Significance**Vulnerable bird species of Mallee woodland: Southern Whiteface (*Aphelocephala leucopsis*) and Blue-winged Parrot (*Neophema chrysostoma*)****Fragment an existing important population into two or more populations**

These species may travel through the site on occasion as an extension of their use of habitat in adjoining areas of native vegetation but would not be limited to, or reliant on, the vegetation or connectivity provided by the site to support their continued use of the local area. The Development footprint would include clearing of native vegetation up to 50.41 ha of land and the construction of an access track. Construction would reduce connectivity through the Development footprint by decreasing shelter and creating open areas that may present physical barriers to some species. Removal of native vegetation cover and operation of the Development footprint would create a gap in habitat connectivity of about 30m across, a relatively small open area within this variable landscape.

Human occupation may also deter these bird species from moving through the local area during construction and then during use as a services corridor. The construction and commissioning of the services corridor will take approximately 6 months and is expected to be utilised for the life of the Campaspe mine.

Habitat connectivity would be maintained around the Development footprint through extensive areas of similar semi-arid woodland. The Development footprint does not include the erection of any large or hazardous structures that would increase the risk or energy cost of movement of any threatened or migratory fauna. Removal of vegetation and construction of the services corridor and its associated infrastructure would only result in a minor increase in the degree of fragmentation between retained areas of habitat for these species and would not result in the isolation of any habitat. The Development footprint would create a small-scale gap in habitat that could be easily passed over or through by these bird species particularly during the majority of the 8-year life of the Development footprint. Given the extent of habitat in the locality, important populations of these species would persist in the local area and region. Therefore, despite removing or modifying a small area of habitat the Development footprint would not fragment an important population of these bird species into two or more populations.

Adversely affect habitat critical to the survival of a species

Habitat critical to the survival of the Southern Whiteface includes areas of:

- Relatively undisturbed open woodlands and shrublands with an understorey of grasses or shrubs, or both
- Habitat with low tree densities and an herbaceous understorey litter cover which provides essential foraging habitat
- Living and dead trees with hollows and crevices which are essential for roosting and nesting (DCCEEW 2023b)

No Critical Habitat for the species as defined under section 207A of the EPBC Act has been identified or included in the Register of Critical Habitat (DCCEEW 2023b). The Development footprint would remove or modify up to 50.41 hectares of native vegetation that may be habitat critical to the survival of the Southern Whiteface. This is a very small proportion of the extent of similar critical habitat in the locality and region, which includes close to 100 % cover of similar semi-arid woodland and shrubland. The Development footprint would not remove or otherwise affect any trees with hollows and crevices, essential for roosting and nesting.

Habitat critical to the survival of the Blue-winged Parrot includes grassy woodlands where they may forage for seeds of a wide range of native and introduced grasses, herbs and shrubs. This species does not breed in western NSW, and would only occur within this locality during the non-breeding season when they may disperse in small numbers throughout the locality and forage on the seeds of native grasses and chenopods.

No Critical Habitat for the Blue-winged Parrot has defined under section 207A of the EPBC Act, or included in the Register of Critical Habitat (DCCEEW 2023b). The Proposal would remove or modify up to 40.45 hectares of native vegetation that may very occasionally provide foraging and roosting habitat for this species. This is a very small proportion of the extent of similar habitat in the locality and region, which includes close to 100 % cover of similar semi-arid woodland and shrubland. The Development footprint would not remove or otherwise affect any areas essential for nesting.

EPBC Act Assessment of Significance**Vulnerable bird species of Mallee woodland: Southern Whiteface (*Aphelocephala leucopsis*) and Blue-winged Parrot (*Neophema chrysostoma*)****Disrupt the breeding cycle of an important population**

The Development footprint would remove or modify 50.41 ha of native vegetation, all of which provides potential breeding habitat for the Southern Whiteface. The Blue-winged Parrot does not breed in western NSW, and would only occur within this locality during the non-breeding season when they may disperse in small numbers throughout the region to forage.

Removal of vegetation may disrupt the breeding cycle of Southern Whiteface by reducing foraging resources available, displacing or harming nesting birds and/or by affecting the ability of birds to move between breeding and foraging habitat. The Southern Whiteface may build nests in a variety of locations, including trees and shrubs or stumps and could also nest in the Development footprint. It is assumed that a breeding population of these species is present in the wider locality given the large tracts of vegetation nearby.

Clearing of 50.41 ha of native vegetation may, in general, directly harm resident fauna. The Development footprint would include fauna management protocols including pre-clearing surveys and salvage and treatment of any resident fauna, and clearing completed outside of the breeding period for these species, following the existing Tronox preclearance protocol, as specified section 8. This would partially mitigate impacts on the local populations of these species and avoid any less mobile nesting individuals or their young, in the Development footprint during vegetation clearing works, with clearing restricted to seasons outside of the typical breeding period for Southern Whiteface.

Indirect impacts such as generation of additional noise and light would occur for a small portion of the 8-year life of the Development footprint. Extensive areas of comparable foraging and nesting habitat are present in surrounding areas and so the temporary displacement of fauna over short distances would have a minor consequence.

The Development footprint is therefore unlikely to substantially disrupt the breeding cycle of an important population of any of these vulnerable bird species.

Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The Development footprint would remove or modify up to 50.41 ha of native vegetation. There would be no impact to any large trees, water bodies or any other habitat features that would comprise an important connecting link between any other areas of habitat that may be used by the species considered in this assessment. These species may travel through the Development footprint on occasion as an extension of their use of habitat in adjoining areas of native vegetation but would not be limited to, or reliant on, the vegetation or connectivity provided by the Development footprint to support their continued use of the local area. Habitat connectivity would be maintained around the Development footprint through extensive areas of similar semi-arid woodland in comparable condition states. The Development footprint does not include the erection of any large or hazardous structures that would substantially increase the risk or energy cost of movement of these bird species. Removal of vegetation and construction of the services corridor would only result in a very minor increase in the degree of fragmentation between retained areas of habitat for these species and would not result in the isolation of any habitat for these mobile species.

The reduction in extent of habitat would be minor. The Development footprint would create a gap in habitat connectivity about 100m across which would not be sufficient to interrupt any ecological process such as migration or pollination. The surrounding locality and region contain many thousands of hectares of similar vegetation and equivalent habitat resources. Given this minor quantum of impact and the presence of alternative habitat resources the Development footprint is unlikely to have an adverse effect on habitat for these species to the extent that they would be likely to decline.

Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

Disturbance associated with vegetation clearing and vehicle traffic during construction or ongoing maintenance of the area may, in general, increase the potential for the spread, introduction and establishment of weed and pest species. The Development footprint site adjoins important areas of native vegetation, especially the offset area for the Atlas-Campaspe Mine.

Construction and environmental management plans will specify measures for restricting access to native vegetation and minimising the risk of transmitting weed propagules. Environmental inductions, visual barriers and/or exclusion fencing will be used to exclude personnel and vehicles from habitat outside the Development footprint.

To further mitigate the risk of pathogens being brought onto and/or spread through the site all vehicles, plant and equipment will be cleaned down (wash/blow down) and certified weed free prior to initial entry to site; all vehicles, plant and equipment will strictly adhere to the approved roads, tracks, easements and work areas to minimise contact with vegetation.

Altered environmental conditions along new edges and clearings can allow invasion by pest animals specialising in edge habitats and/or change the behaviour of resident animals. Edge zones can be subject to higher levels of predation by introduced mammalian predators, such as foxes and feral cats. Pest mammal control measures will be completed around the Study area as part of the broader mine pest management, to limit the expansion of pest predators into this area.

EPBC Act Assessment of Significance**Vulnerable bird species of Mallee woodland: Southern Whiteface (*Aphelocephala leucopsis*) and Blue-winged Parrot (*Neophema chrysostoma*)****Introduce disease that may cause the species to decline, or**

As described for invasive species above, the Development footprint may, in general, increase the potential for the spread, introduction and establishment of diseases and pathogens. The Development footprint does not include any higher risk activities such as transport of biological material.

Construction and environmental management plans will specify measures for restricting access to native vegetation and minimising the risk of transmitting disease. To further mitigate the risk of pathogens being brought onto and/or spread through the site all vehicles, plant and equipment will be cleaned and inspected. Personnel, vehicles and equipment will be restricted to work areas to minimise contact with sensitive habitat.

Interfere substantially with the recovery of the species

The Development footprint would interfere with the recovery of these species by removing or modifying habitat, which is noted as a key threat for each species (DCCEEW 2023b). As described above, the Development footprint would remove or modify a maximum of 50.41 ha of potential habitat for these species at the Development footprint. The site does not contain any confirmed breeding habitat, large trees, water bodies or any habitat features that would comprise an important connecting link between any other areas of habitat. These species may occupy the Development footprint on occasion as an extension of their use of habitat in adjoining areas of native vegetation but would not be limited to, or reliant on, the habitat at the site for their continued persistence in the locality.

The reduction in extent of habitat would be very minor, when considered in the context of the surrounding landscape and mobile nature of the species in question. The surrounding locality and region contain many thousands of hectares of similar vegetation and equivalent habitat resources. Given this minor quantum of impact and the presence of alternative habitat resources the Development footprint would not interfere substantially with the recovery of these species.

Conclusion of assessment of significance

Based on consideration of the above criteria, the Development footprint does not provide critical habitat for these species and is considered unlikely to have a significant effect on an important population of these vulnerable bird species, as:

- Only a minor proportion of the available habitat for these mobile species within the locality would be removed or modified.
- No important populations are identified for these species
- The Development footprint is unlikely to have an adverse effect on the size or breeding cycle of an important population of these species
- The Development footprint will only result in a minor increase in the degree of fragmentation between retained areas of habitat for these species and will not result in any isolation of habitat
- The Development footprint is unlikely to interfere substantially with the recovery of the species

Endangered bird species of Mallee woodland: Hooded Robin (south-eastern) (*Melanodryas cucullata cucullata*) and Pink Cockatoo (*Lophochroa leadbeateri*)

Hooded Robin (south-eastern)

Distribution

The Hooded Robin is widespread and found across Australia except for the driest deserts and the wetter coastal areas of coastal Queensland, and Tasmania. However, it is common in few places and rarely found on the coast. It is considered a sedentary species, but local seasonal movements are possible. The south-eastern form (subspecies *cucullata*) is found from Brisbane to Adelaide and throughout much of inland NSW with the exception of the extreme north-west, where it is replaced by subspecies *picata*.

Habitat requirements

The species prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas. The Hooded Robin requires structurally diverse habitats featuring mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses. Often perches on low dead stumps and fallen timber or on low-hanging branches, using a perch-and-pounce method of hunting insect prey (NSW DCCEEW 2025e).

Habitat in the Study area

This species was observed in the Study area, with a pair recorded feeding on the ground in an open area within the centre of the Study area. There are 10 records of the species within the locality on BioNet (NSW DCCEEW 2025a) and the Development footprint is well within the known distribution of the species and this species would be expected to occur at least on occasion. There is potential habitat for the Hooded Robin throughout the Development footprint. The species was observed on one occasion within the Study area, with two individuals (a pair) seen. The species has been regularly observed across the Atlas-Campaspe Mine area over several years of survey in this area (GHD 2022). This species may also nest in trees and shrubs within the Development footprint. No evidence of breeding was noted despite diurnal bird surveys and nest tree censuses conducted over two weeks.

No important populations of the Hooded Robin (south-eastern) are noted in the conservation advice for the species. According to the MNES significant impact guidelines 1.1 (DotE 2013) an 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are: key source populations either for breeding or dispersal; populations that are necessary for maintaining genetic diversity; and/or populations that are near the limit of the species range.

Given the frequency that the species has been observed across the locality over several years, it is likely that this population comprises a key source either for breeding or dispersal and is necessary for maintaining genetic diversity and as such is an important population.

Within the Development footprint there is foraging and potential nesting habitat for the Hooded Robin within PCTs 58, 143, 170 and 171

Pink Cockatoo

Distribution

The Pink Cockatoo occurs in arid and semi-arid NSW, regularly as far east as Bourke and Griffith and occasionally further east as vagrants.

Habitat requirements

The species inhabits a range of treed and treeless inland habitats within easy reach of water. Nests in tree hollows. Feeds mostly on the ground, especially on the seeds of native and exotic melons and on the seeds of species of saltbush, wattles and cypress pines (NSW DCCEEW 2025e).

Habitat in the Study area

This species was observed in the Study area, with a group of four recorded feeding on the ground in an open area within the north of the Study area. There are five records of the species within the locality on BioNet (NSW DCCEEW 2025a) and the Development footprint is well within the known distribution of the species and this species would be expected to occur at least on occasion. There is potential foraging habitat for the Pink Cockatoo throughout the Study area associated with all PCTs (58, 143, 170 and 171), however no potential breeding habitat for the species occurs within the Development footprint, which lacks any candidate nest trees with suitable hollows. No evidence of breeding was noted anywhere in the Study area or Assessment Area despite diurnal bird surveys and nest tree censuses conducted over multiple seasons including dedicated survey effort within the breeding season for the species nominated in the TBDC (NSW DCCEEW 2025e).

EPBC Act Assessment of Significance

Endangered bird species of Mallee woodland: Hooded Robin (south-eastern) (*Melanodryas cucullata cucullata*) and Pink Cockatoo (*Lophochroa leadbeateri*)

**According to the DoE (2013) 'significant impact criteria', an action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:
Lead to a long-term decrease in the size of a population**

The factors that could potentially lead to a long-term decrease in the size of a population of these endangered bird species include direct harm, loss of foraging habitat affecting an ecologically significant proportion of local populations or loss of important breeding habitat.

The Proposal would result in direct impacts to native vegetation and associated threatened species habitat through clearing of up to 50.41 ha of native vegetation for construction of the Modification 6 and its associated access tracks.

The proposed impact mitigation and environmental management measures are likely to mitigate against erosion, sedimentation or any other indirect effects on adjacent habitat during the proposed works.

Both species were recorded within the Development footprint and are known from the broader Study area and similar habitats in the locality and can be expected to occur in the Development footprint and surrounds in response to favourable foraging conditions.

The Development footprint would remove or modify 50.41 ha of native vegetation, all of which provides potential foraging habitat for these species. The Development footprint would not affect any candidate trees with hollows of a suitable size or location for nesting of the Pink Cockatoo, and therefore the species is unlikely to breed in the Development footprint or rely on any habitat resources that are present to maintain populations. Some trees and shrubs have the potential to provide breeding habitat for the Hooded Robin, but alternative habitat exists in the surrounding area.

Clearing of vegetation may, in general, directly harm any resident fauna, if individuals are present during clearing works. The Proposal would remove vegetation in under 50.41 ha of land; this area would not comprise important shelter or breeding for these species, given the lack of suitable hollows and/or extensive areas of alternative habitat in the surrounding area. Any resident birds could easily evade harm once construction activity begins at the Development footprint, by flying into adjacent or nearby tracts of comparable vegetation. The Proposal would also include fauna management protocols including pre-clearing surveys and salvage and treatment of any resident fauna, should they occur. The Proposal is unlikely to directly harm a significant proportion of the populations of these bird species, if any.

Vegetation management measures recommended for the Development footprint would help to avoid direct impacts and minimise indirect impacts on habitat adjoining the Development footprint. The likely magnitude of edge effects or other indirect effects would not be sufficient to tangibly affect the life cycle of these species.

Noise and vibration, light, vehicle movement and other human activities during the operation of the Development footprint has the potential to displace individuals from foraging habitat. These indirect impacts resulting from the Development footprint would be mostly temporary in nature and would only last about 6 months during construction of the access tracks, with greatly reduced vehicle traffic and associated light and noise impacts anticipated in the following 10 years of operation, when maintenance activities would occur. Extensive areas of comparable and superior habitat are present in surrounding areas and so the temporary displacement of fauna over short distances would represent only a minor consequence.

The Development footprint is therefore unlikely to adversely affect the lifecycle of these species such that a population would decline in size.

EPBC Act Assessment of Significance
Endangered bird species of Mallee woodland: Hooded Robin (south-eastern) (*Melanodryas cucullata cucullata*) and Pink Cockatoo (*Lophochroa leadbeateri*)

Reduce the area of occupancy of the species

Construction and operation of the Proposal would remove or modify up to 50.41 hectares of native vegetation that represents suitable habitat for these species. Noise and human activity may affect the quality or occupation of habitat adjoining the Development footprint during construction and periods when the site is accessed and occupied for maintenance. The Development footprint would create a small-scale gap in habitat that could be easily passed over or through by these highly mobile bird species during the 20-year life of the Development footprint. Given the extent of habitat in the locality, populations of these species would persist in the local area and region. There would be no impact to any breeding habitat for the Pink Cockatoo with no loss of any hollow-bearing trees of a suitable size or location within the Development footprint. Some areas of suitably dense tree and shrub cover have the potential to provide breeding habitat for the Hooded Robin, but these resources would not be limiting in the context of extensive areas of alternative habitat in the surrounding area. Therefore, despite removing or modifying a small area of habitat the Proposal would not reduce the overall area of occupancy of these species.

Fragment an existing population into two or more populations

The Hooded Robin and Pink Cockatoo occupy the Development footprint on occasion as an extension of their use of habitat in adjoining areas of native vegetation but would not be limited to, or reliant on, the vegetation or connectivity provided by the site to support their continued use of the local area. The Proposal would include clearing of native vegetation and erection of small structures over around 50.41 ha of land. Construction of the access tracks and associated infrastructure would not be expected to significantly reduce connectivity through the Development footprint for these mobile species. Removal of native vegetation cover and operation of the Proposal would create a gap in habitat connectivity about 100 m across, which would not comprise a significant gap in habitat for these highly mobile species.

Human occupation may also deter these species from moving through the local area during construction and then periods when the haul road is being used. The construction of the access tracks will take approximately 6 months and the operation of the optimised services corridor will extend to 10 years over the life of the Proposal. Impacts of human activity would occur intensively for six months, and then with much less frequency and intensity for the following 8 years.

Habitat connectivity would be maintained around the Development footprint through extensive areas of similar semi-arid woodland. The Proposal does not include the erection of any large or hazardous structures that would increase the risk or energy cost of movement of these highly mobile species. Removal of vegetation and construction of the optimised services corridor would only result in a minor increase in the degree of fragmentation between retained areas of habitat for the species and would not result in the isolation of any habitat. The Development footprint would create a small-scale gap in habitat that could be easily passed over or through by these bird species, and outside of the Development footprint, large areas of intact native vegetation would remain, providing corridors for movement for these species, which is noted as a key consideration in impact assessment for these species (DCCEEW, 2023a). Given the extent of habitat in the locality, populations of Hooded Robin and Pink Cockatoo would persist in the local area and region. Therefore, despite removing or modifying a small area of habitat the Development footprint would not fragment the population of Hooded Robin or Pink Cockatoo into two or more populations.

Adversely affect habitat critical to the survival of a species

Habitat critical to the survival of the Hooded Robin and eastern Pink Cockatoo consist of:

- Lightly wooded open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas, with structurally diverse habitats featuring mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses.
- Arid and semi-arid woodlands dominated by mulga (*Acacia aneura*), mallee and box eucalypts, slender cypress pine (*Callitris gracilis*) or belah (*Casuarina cristata*)
- Known habitat containing suitable attributes such as large mature trees with suitable hollows for Pink Cockatoo
- Surrounding matrix of these areas for the role of providing movement corridors for dispersal across the landscape

No Critical Habitat for the species as defined under section 207A of the EPBC Act has been identified or included in the Register of Critical Habitat (DCCEEW 2023b). The Development footprint would remove or modify up to 50.41 hectares of native vegetation that represents suitable habitat for these species, which unlikely to comprise habitat critical to the survival of the Hooded Robin and Pink Cockatoo. The Proposal would not remove or otherwise affect any large mature trees with suitable hollows for Pink Cockatoo nesting. Some areas of suitably dense tree and shrub cover have the potential to provide breeding habitat for the Hooded Robin, but these resources would not be limiting in the context of extensive areas of alternative habitat in the surrounding area. This is a very small proportion of the extent of similar habitat for either species in the locality and region, which includes close to 100 % cover of similar semi-arid woodland and shrubland.

Taking the above into account, the Proposal is unlikely to substantially affect habitat critical to the survival of the species, given there would be no impact to Pink Cockatoo breeding habitat, no loss of movement corridors, and noting the large expanses of alternative habitat throughout the locality.

EPBC Act Assessment of Significance**Endangered bird species of Mallee woodland: Hooded Robin (south-eastern) (*Melanodryas cucullata cucullata*) and Pink Cockatoo (*Lophochroa leadbeateri*)****Disrupt the breeding cycle of a population**

The Proposal would remove or modify 50.41 ha of native vegetation, which comprises potential foraging habitat or movement corridors for these species. Removal of vegetation may result in temporary disruption the breeding cycle of these species by reducing foraging resources available or displacing or otherwise affecting the movement of breeding birds. The Development footprint would not affect any candidate trees of a suitable size or location for nesting of the Pink Cockatoo. Some areas of suitably dense tree and shrub cover have the potential to provide breeding habitat for the Hooded Robin, but these resources would not be limiting in the context of extensive areas of alternative habitat in the surrounding area.

The Development footprint would not directly harm or otherwise interrupt the breeding cycle of a significant proportion of populations of these bird species, if any.

Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The Development footprint would remove or modify a maximum of 50.41 ha of native vegetation. There would be no impact to any large trees, water bodies or known breeding habitat. The removal of vegetation and construction of the corridor, access tracks and associated infrastructure will result in a minor increase in the degree of fragmentation between retained areas of habitat for these species and would result in the temporary isolation of an area of offset habitat to the east of the alignment. The reduction in extent of habitat would be minor. The Development footprint would create a gap in habitat connectivity about 100 m across, which would not be sufficient to interrupt the movement of these mobile species, or ecological processes such as migration or pollination.

The species' may travel through the site on occasion as an extension of their use of habitat in adjoining areas of native vegetation but would not be limited to, or reliant on, the connectivity provided by the site to support their continued use of the local area. Habitat connectivity would be maintained around the Development footprint through extensive areas of similar semi-arid woodland. The Proposal does not include the erection of any large or hazardous structures that would substantially increase the risk or energy cost of movement of these highly mobile bird species. Removal of vegetation and construction of the access tracks and associated infrastructure would only result in a very minor increase in the degree of fragmentation between retained areas of habitat for these species and would not result in the isolation of any habitat.

The reduction in extent of habitat would be minor in the context of the surrounding locality and region which contain many thousands of hectares of similar vegetation and equivalent habitat resources. Given this minor quantum of impact and the presence of alternative habitat resources the Proposal is unlikely to have an adverse effect on habitat for the species to the extent that they would be likely to decline.

Result in invasive species that are harmful to a vulnerable species becoming established in the species' habitat

Disturbance associated with vegetation clearing and vehicle traffic during construction or ongoing maintenance of the access tracks may, in general, increase the potential for the spread, introduction and establishment of weed and pest species. The Development footprint adjoins important areas of native vegetation, especially the offset area for the Atlas-Campaspe Mine.

Construction and environmental management plans will specify measures for restricting access to native vegetation and minimising the risk of transmitting weed propagules. Environmental inductions, visual barriers and/or exclusion fencing will be used to exclude personnel and vehicles from habitat outside the Development footprint.

To further mitigate the risk of pathogens being brought onto and/or spread through the site all vehicles, plant and equipment will be cleaned down (wash/blow down) prior to initial entry to site; all vehicles, plant and equipment will strictly adhere to the approved roads, tracks, easements and work areas to minimise contact with vegetation.

Introduce disease that may cause the species to decline, or

As described for invasive species above, the Proposal may, in general, increase the potential for the spread, introduction and establishment of diseases and pathogens. The Proposal does not include any higher risk activities such as transport of biological material.

To minimise the risk of transmitting diseases through the site:

- Soil disturbance would be avoided as much as possible to minimise the potential for spreading weeds
- Machinery hygiene protocols will be implemented for all machinery working in/around the Campaspe optimized services corridor construction site
- Erosion and sediment controls measures would be followed as outlined in the Water Management Plan to control nutrient/weed migration
- High-risk areas will be monitored in and around Atlas-Campaspe such as access roads, stockpiles and bare ground

EPBC Act Assessment of Significance**Endangered bird species of Mallee woodland: Hooded Robin (south-eastern) (*Melanodryas cucullata cucullata*) and Pink Cockatoo (*Lophochroa leadbeateri*)****Interfere with the recovery of the species**

The Proposal would interfere with the recovery of these species by removing or modifying habitat, which is noted as a key threat for the species (DCCEEW 2023b). As described above, the Development footprint would remove or modify a maximum of 50.41 ha of foraging habitat for the species at the Development footprint. The site does not contain breeding habitat, large trees, water bodies or any habitat features that would comprise an important connecting link between any other areas of habitat. These species would use the Development footprint on occasion as an extension of their use of habitat in adjoining areas of native vegetation but would not be limited to, or reliant on, the habitat at the site.

The reduction in extent of habitat would be minor in the context of the surrounding locality and region which contain many thousands of hectares of similar vegetation and equivalent habitat resources. Given this minor quantum of impact, the lack of impact to breeding habitat, and the presence of alternative habitat resources in adjacent areas, the Development footprint would not interfere with the recovery of these species.

Conclusion of assessment of significance

The project is not likely to have a significant impact on Hooded Robin or Pink Cockatoo or other species of threatened woodland birds given:

- The limited extent of native vegetation to be removed in comparison to the extensive areas of alternative habitat in the locality
- The limited quality of habitat to be removed, noting that the Development footprint does not contain any candidate nest trees for the Pink Cockatoo
- The Development footprint is unlikely to have an adverse effect on the size or breeding cycle of a population of these species
- The Development footprint will only result in a minor increase in the degree of fragmentation between retained areas of habitat for the species and will not result in any isolation of habitat
- The Development footprint is unlikely to be important to the recovery of the species

Vulnerable bat species of Mallee woodland: 'Corben's Long-eared Bat (*Nyctophilus corbeni*)

Corben's Long-eared Bat (*Nyctophilus corbeni*)

Distribution

Overall, the distribution of Corben's Long-eared Bat coincides approximately with the Murray Darling Basin with the Pilliga Scrub region being the distinct stronghold for this species. The South-eastern Long-eared Bat is known from this locality – with individuals trapped and monitored regularly over the last five years from the Atlas-Campaspe Mine Offset area immediately to the north of the Development footprint.

Habitat requirements

The species inhabits a variety of vegetation types, including mallee, Buloke and box eucalypt dominated communities, but it is distinctly more common in box/ironbark/cypress-pine vegetation that occurs in a north-south belt along the western slopes and plains of NSW and southern Queensland. These bats roost in tree hollows, crevices, and under loose bark. Studies of the species in the Pilliga region have highlighted the importance of dead trees and dead spouts for roosting (Law et al, 2016; Law et al 2018).

Habitat in the Study area

There is potential foraging, roosting and breeding habitat for Corben's Long-eared Bat throughout the Development footprint associated with PCTs (58, 170 and 171).

There are 23 records of the species within the locality on BioNet (NSW DCCEE 2025a). The Development footprint is well within the known distribution of the species and it would be expected to occur at least on occasion.

EPBC Act Assessment of Significance

Vulnerable bat species of Mallee woodland: South-eastern Long-eared Bat (*Nyctophilus corbeni*)

According to the DotE (2013) 'significant impact criteria', an action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

Lead to a long-term decrease in the size of an important population

As described above, populations of this vulnerable bat species of mallee woodland could occur at the Development footprint, and would comprise an important population as defined in the MNES significant impact guidelines 1.1 (DotE 2013).

The factors that could potentially lead to a long-term decrease in the size of an important population of this vulnerable bat species include direct harm, loss of foraging habitat affecting an ecologically significant proportion of local populations or loss of important breeding habitat.

The Development footprint would result in direct impacts to native vegetation and associated threatened species habitat through the clearing of up to 50.41 ha of native vegetation for construction of the modification 6 and its associated access tracks of this vegetation 44.87 ha would provide foraging, roosting and breeding habitat for Corben's Long-eared Bat.

The proposed impact mitigation and environmental management measures are likely to mitigate against erosion, sedimentation or any other indirect effects on adjacent habitat during the proposed works.

This species was not recorded in the Development footprint but is known to occur in adjacent habitats in the locality (GHD 2023) and may occur in the Development footprint on occasion. The Development footprint would remove or modify 44.87 ha of native vegetation which provides potential foraging, roosting and breeding habitat for this species. The species is known from numerous parks within the NSW reserve network, including Goulburn River National Park, Monabalai Nature Reserve, Yathong Nature Reserve, Buddigower Nature Reserve, Woggon Nature Reserve, Mungo National Park, Cocoparra National Park, Ben Halls Gap National Park, Pilliga Nature Reserve, Goobang National Park, Warrumbungle National Park and the Rocks Nature Reserve (TSSC 2015). The Pilliga is considered a stronghold of the species (TSSC, 2015). The project would not impact the Pilliga or any of these reserves.

Clearing of vegetation may, in general, directly harm resident fauna. The current vegetation clearance protocol in place at the Atlas-Campaspe mine site was developed specifically to mitigate impacts to microbats, and would be implemented as part of the current Development footprint. The protocol limits vegetation clearing to autumn, when bats are active but not breeding, and requires potential roosting trees to be individually felled and checked for bats, which are salvaged and transferred to areas of remnant vegetation outside of the clearance area. Therefore, any resident bats should evade harm once construction activity begins at the Development footprint, should they occur. The Development footprint would not directly harm a significant proportion of the population of South-eastern Long-eared Bats, if any.

EPBC Act Assessment of Significance**Vulnerable bat species of Mallee woodland: South-eastern Long-eared Bat (*Nyctophilus corbeni*)**

Vegetation management measures recommended for the Development footprint would help to avoid direct impacts and minimise indirect impacts on habitat adjoining the Development footprint. The likely magnitude of edge effects or other indirect effects would not be sufficient to tangibly affect the life cycle of this species.

Noise and vibration, light, vehicle movement and other human activities during the operation of the Development footprint has the potential to displace individuals from roosting habitat. These indirect impacts resulting from the Development footprint would be mostly temporary in nature and would mainly occur in the 6 months during construction, with much reduced vehicle movements for bore maintenance over the 8 year life of the Development footprint. Extensive areas of comparable habitat are present in surrounding areas and so the temporary displacement of fauna over short distances would have a minor consequence.

The Development footprint is therefore unlikely to adversely affect the lifecycle of the South-eastern Long-eared Bat such that an important population would decline in size.

Reduce the area of occupancy of an important population

The Development footprint would remove or modify up to 44.87 hectares of native vegetation that is habitat for this vulnerable bat species. Noise and human activity may affect the quality or occupation of habitat adjoining the Development footprint site during construction and periods of maintenance. The Development footprint would create a small-scale (100 m wide) gap in habitat that could be easily passed over or through by this bat species. Given the extent of habitat in the locality, populations of this species would persist in the local area and region. Therefore, despite removing or modifying a small area of habitat the Development footprint would not reduce the overall area of occupancy of the species.

Fragment an existing important population into two or more populations

Corben's Long-eared Bat may travel through the site on occasion as an extension of their use of habitat in adjoining areas of native vegetation but would not be limited to, or reliant on, the connectivity provided by the site to support their continued use of the local area. The Development footprint would include clearing of native vegetation and erection of structures in around 50.41 ha of land. Construction would reduce connectivity through the Development footprint by decreasing shelter and creating physical barriers, removal of native vegetation cover and operation of the Development footprint would create a gap in habitat connectivity about 100 m across.

Human occupation may also deter the species from moving through the local area during construction. The construction of Modification 6 will take approximately 6 months and ongoing maintenance will occur intermittently for 10 years over the life of the Development footprint. Both construction and maintenance are unlikely to occur outside of daylight hours, reducing their potential impacts on microbats.

Habitat connectivity would be maintained around the Development footprint through extensive areas of similar semi-arid woodland. The Development footprint does not include the erection of any large or hazardous structures that would increase the risk or energy cost of movement of any threatened or migratory fauna. Removal of vegetation and construction of the access tracks would result in a negligible increase in the degree of fragmentation between retained areas of habitat for this highly mobile species and would not result in the isolation of any habitat. The Development footprint would create a small-scale gap in habitat that could be easily passed over or through by microbat species. Given the extent of habitat in the locality, populations of South-eastern Long-eared Bat would persist in the local area and region. Therefore, despite removing or modifying a small area of habitat the Development footprint would not fragment a population of this species into two or more populations.

Adversely affect habitat critical to the survival of a species

Habitat critical to the survival of Corben's Long-eared Bat consist of:

- Semi-arid woodlands of mallee, Buloke and box eucalypt dominated communities, and box/ironbark/cypress-pine vegetation
- Known habitat containing suitable attributes such as roosting tree hollows, crevices, and loose bark
- A surrounding matrix of suitable native vegetation providing movement corridors for dispersal across the landscape

No Critical Habitat for the species as defined under section 207A of the EPBC Act has been identified or included in the Register of Critical Habitat (DCCEEW 2023b). The Development footprint would remove or modify up to 44.87 hectares of native vegetation that may be foraging, roosting or breeding habitat for the South-eastern Long-eared Bat. This is a very small proportion of the extent of similar habitat in the locality and region, which includes close to 100 % cover of similar semi-arid woodland and shrubland. The Development footprint would not remove or otherwise affect any mature trees with suitable hollows for breeding, during the breeding season of this species.

Disrupt the breeding cycle of an important population

The Development footprint would remove or modify 50.41 ha of native vegetation, which comprises potential foraging, roosting and breeding habitat or a movement corridor for the South-eastern Long-eared Bat. Removal of vegetation would not disrupt the breeding cycle of the species if completed outside of the known breeding season, which is a requirement of the Tronox vegetation clearance protocol.

The Development footprint would not directly harm or otherwise interrupt the breeding cycle of an important population of the South-eastern Long-eared Bat.

EPBC Act Assessment of Significance**Vulnerable bat species of Mallee woodland: South-eastern Long-eared Bat (*Nyctophilus corbeni*)****Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline**

The Development footprint would remove or modify a maximum of 44.87 ha of native vegetation, which comprises potential foraging, roosting and breeding habitat or a movement corridor for Corben's Long-eared Bat. The species would not be limited to, or reliant on, the connectivity provided by the site to support their continued use of the local area. Habitat connectivity would be maintained around the Development footprint through extensive areas of similar semi-arid woodland. The Development footprint does not include the erection of any large or hazardous structures that would substantially increase the risk or energy cost of movement of this highly mobile bat species. Removal of vegetation and construction of the Development and associated infrastructure would only result in a very minor increase in the degree of fragmentation between retained areas of habitat for the species and would not result in the isolation of any habitat.

The reduction in extent of habitat would be minor. The Development footprint would create a gap in habitat connectivity about 100 m across which would not be sufficient to interrupt any ecological process such as migration or pollination. The surrounding locality and region contain many thousands of hectares of similar vegetation and equivalent habitat resources. Given this minor quantum of impact and the presence of alternative habitat resources the Development footprint is unlikely to have an adverse effect on habitat for the species to the extent that they would be likely to decline.

Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

Disturbance associated with vegetation clearing and vehicle traffic during construction or ongoing maintenance of the bores may, in general, increase the potential for the spread, introduction and establishment of weed and pest species. The Development footprint adjoins important areas of native vegetation, especially the offset area for the Atlas-Campaspe Mine.

To minimise the risk of transmitting diseases through the site:

- Soil disturbance would be avoided as much as possible to minimise the potential for spreading weeds
- Machinery hygiene protocols will be implemented for all machinery working in/around the Modification 6 construction site
- Erosion and sediment controls measures would be followed as outlined in the Water Management Plan to control nutrient/weed migration
- High-risk areas will be monitored in and around Atlas-Campaspe such as access roads, stockpiles and bare ground

Other mitigation to prevent invasive species becoming established within the site will include environmental inductions, visual barriers and/or exclusion fencing will be used to exclude personnel and vehicles from habitat outside the Development footprint.

Introduce disease that may cause the species to decline, or

As described for invasive species above, the Development footprint may, in general, increase the potential for the spread, introduction and establishment of diseases and pathogens. The Development footprint does not include any higher risk activities such as transport of biological material.

Construction and environmental management plans will specify measures for restricting access to native vegetation and minimising the risk of transmitting disease. To further mitigate the risk of pathogens being brought onto and/or spread through the site all vehicles, plant and equipment will be cleaned and inspected. Personnel, vehicles and equipment will be restricted to work areas to minimise contact with sensitive habitat.

Interfere substantially with the recovery of the species

The Development footprint could interfere with the recovery of the species by removing or modifying habitat, which is noted as a key threat for the species. As described above, the Development footprint would remove or modify a maximum of 44.87 ha of habitat for the species at the Development footprint. The vegetation would not be cleared during the breeding season, and the site does not contain any habitat features that would comprise an important connecting link between any other areas of habitat. This species occupies the Development footprint on occasion as an extension of their use of habitat in adjoining areas of native vegetation but would not be limited to, or reliant on, the habitat at the site.

The reduction in extent of habitat available for the species would be very minor. The surrounding locality and region contain many thousands of hectares of similar vegetation and equivalent habitat resources. Given this minor quantum of impact and the presence of alternative habitat resources the Development footprint would not interfere substantially with the recovery of these species.

EPBC Act Assessment of Significance

Vulnerable bat species of Mallee woodland: South-eastern Long-eared Bat (*Nyctophilus corbeni*)

Conclusion of assessment of significance

The project is not likely to have a significant impact on Corben's-eared Bat given:

- The limited extent of native vegetation to be removed in comparison to the extensive areas of alternative habitat in the locality, and noting that the vegetation would be cleared outside of the accepted breeding season for the South-eastern Long-eared Bat
- The Tronox vegetation preclearance protocol will be implemented, which avoids all vegetation clearing during microbat breeding season, preclears habitat trees with potential for microbats resident, and translocates microbats to areas of remnant vegetation
- The Development footprint is unlikely to have an adverse effect on the size or breeding cycle of a population of the species
- Would not impact on habitat identified as critical to the species
- The Development footprint will only result in a minor increase in the degree of fragmentation between retained areas of habitat for the species and will not result in any isolation of habitat
- The Development footprint site is unlikely to be important to the recovery of the species

Endangered Ecological Community - Mallee Bird Community of the Murray Darling Depression Bioregion

The Mallee Bird Community of the Murray Darling Depression (MDD) Bioregion (Mallee Bird Community) is listed in the endangered category of the threatened ecological communities list under the EPBC Act. The main factors that make the threatened ecological community eligible for listing in the endangered category are: severe loss of a functionally important species over much of the landscape; severe loss of ecological integrity from the combined actions of several threats; and a severe rate of continuing detrimental change shown by many members of the ecological community.

Distribution

Extensive areas of mallee occur in the drier parts of the mainland south-eastern Australian states (SA, NSW, Victoria) mostly in the Murray Darling Depression, Eyre Yorke Block, Gawler and Great Victoria Desert bioregions. These ecosystems face severe summer water deficits, nutritional poverty, and fire regimes that govern their responses and traits.

Habitat requirements

The Mallee Bird Community is an assemblage of bird species that are dependent on the mallee vegetation that characterises the MDD bioregion. The Mallee Bird Community is an assemblage of 20 bird species that rely on mallee habitats to varying degrees for their continued persistence within the MDD bioregion, with some species considered *mallee specialists*; bird species found almost exclusively in mallee habitats, especially within the MDD bioregion, and which the loss of suitable mallee habitats can potentially lead to their extinction at a local or regional scale. *Mallee dependent* species are a suite of bird species dependent on mallee where it is present, but have a wider range extending into non-mallee woodland and shrubland habitats, and loss of suitable mallee habitats for these species may not lead to extinction but result in substantial declines in abundance in the MDD, as well as loss of ecological diversity.

Habitat in the Study area and threats

The Development footprint is located within the geographic boundary of the Mallee Birds Ecological Community and contains mallee habitat (PCT 171 Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion (4.42 ha) and PCT 170 Sandplain mallee of central NSW (16.26 ha) that will be impacted by the project. Surveys across the broader Atlas-Campaspe mine and offset areas over a number of years, including targeted fauna surveys for this MOD6 BDAR, have recorded at least two of the eight mallee specialist species (Chestnut Quail-thrush *Cinclosoma castanotum* and Malleefowl *Leipoa ocellata* in nearby area), and at least seven of the 12 mallee dependent species. These findings are considered sufficient to consider the Mallee Birds Ecological Community of the Murray Darling Depression Bioregion EEC as being present at this site, and of condition category A – high number of MBEC species. The habitats within and surrounding the proposed Development footprint provides foraging, breeding and roosting habitat for many of the species which make up the Mallee Birds Ecological Community EEC.

The Mallee Birds Ecological Community is threatened primarily by the clearing of mallee habitats and their fragmentation into smaller, degraded remnants that are more susceptible to invasive species, fire impacts and climate change and hence less suitable to sustain a diverse assemblage of birds and the other flora and fauna on which they depend. The conservation advice for this EEC lists the key threats as altered fire regimes, fragmentation legacies, clearing, climate change and severe weather, pest animals and grazing, and weeds as the most significant threats to this bird community.

EPBC Act Assessment of Significance**Endangered Ecological Community - Mallee Birds Ecological Community of the Murray Darling Depression Bioregion.**

According to the DotE (2013) 'significant impact criteria', an action is likely to have a significant impact on an endangered ecological community if there is a real chance or possibility that it will:

Reduce the extent of an ecological community

The Development footprint would remove or modify at least 20.68 hectares of native vegetation that is habitat for this EEC. Noise and human activity may affect the quality or occupation of habitat adjoining the Development footprint during construction and for short periods of maintenance. The Development footprint would create a very small-scale gap in habitat that could be easily passed over or through by these bird species particularly during the majority of the 10-year life of the Development footprint when the haul road is operational. Given the very large extent of habitat in the locality, populations of these species would persist in the local area and region. Therefore, despite removing or modifying a small area of habitat the Development footprint would not reduce the extent of these species, or the EEC.

Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines

The species which make up this EEC are likely to travel through the site on occasion as an extension of their use of habitat in adjoining areas of native vegetation but would not be limited to, or reliant on, the vegetation or connectivity provided by the site to support their continued use of the local area. The Development footprint would include clearing of native vegetation around 50.41 ha of land. Construction of the haul road and associated access tracks and power and pipeline corridor would reduce connectivity through the Development footprint by decreasing shelter and creating open areas that may present physical barriers to some species. Removal of native vegetation cover and operation of the Development footprint would create a gap in habitat connectivity of about 100 across, a relatively small open area within this variable landscape, for such highly mobile and generally wide-ranging species.

Human occupation may also deter the species which make up this EEC from moving through the local area during construction. The construction and commissioning of the haul road will take approximately 6 months and will operate for the 10 year life of the Development footprint.

Habitat connectivity would be maintained around the Development footprint through very extensive areas of similar semi-arid woodland. The Development footprint does not include the erection of any large or hazardous structures that would increase the risk or energy cost of movement of any threatened or migratory fauna. Removal of vegetation and construction of the optimised services corridor and its associated infrastructure would only result in a minor increase in the degree of fragmentation between retained areas of habitat for this EEC and result in a minor increase in the degree of fragmentation between retained areas of habitat for these species and would result in the temporary isolation of an area of offset habitat to the east of the alignment. The reduction in extent of habitat would be minor. The Development footprint would create a gap in habitat connectivity about 100 m across which could be easily passed over or through by these bird species particularly during the majority of the 10-year life of the Development footprint, and not be sufficient to interrupt any ecological process such as species movements, migration or pollination.

Given the extent of habitat in the locality, populations of this EEC would persist in the local area and region. Therefore, despite removing or modifying a small area of habitat the Development footprint would not fragment an important population of these bird species into two or more populations.

EPBC Act Assessment of Significance**Endangered Ecological Community - Mallee Birds Ecological Community of the Murray Darling Depression Bioregion.****Adversely affect habitat critical to the survival of an ecological community**

Habitat critical to the survival of the Mallee Birds Ecological Community are quite varied but include areas of mallee vegetation that are larger and less disturbed, as these are likely to provide greater biodiversity value. Remnants that are spatially linked by their proximity to each other are also important for the viability of the ecological community. Mallee habitats that are most intact, larger and retain long unburnt mid to old growth mallee trees (particularly those with features such as tree hollows and bark ribbons) dense *Triodia* tussocks and accumulated leaf litter support a greater diversity of bird species and are more likely to support this EEC. Additionally, habitats that have surrounding, adjacent and/or buffering areas of native vegetation and are of a range of post-fire age vegetation classes, and with a reduced history of pest and grazing animals provide greater habitat value to species of the Mallee Birds Ecological Community EEC.

The Development footprint includes high quality habitat features, which support the MBEC, but no Critical Habitat for the species of this EEC as defined under section 207A of the EPBC Act has been identified or included in the Register of Critical Habitat (DCCEEW 2023b).

The Development footprint would remove or modify up to 20.68 hectares of native vegetation that may be foraging habitat for this community, but this is a very small proportion of the extent of similar habitat in the locality and broader region, which includes close to 100 % cover of similar mallee and non-eucalypt semi-arid woodland and shrublands across an area of many hundreds of thousands of hectares.

The Development footprint would remove or modify up to 20.68 ha of potential habitat for the Mallee Birds Ecological Community, a very small proportion (conservatively less than 0.0014% of the current estimate of 3.486 million ha of mallee woodlands and shrublands in the Murray Darling Depression northern IBRA subregion) of potential available habitat for this EEC within a highly intact landscape of many hundreds of thousands of hectares of this contiguous patch of remnant native vegetation, including mallee and non-eucalypt semi-arid woodland. The very size of this development area at a landscape scale is highly unlikely to cause a substantial change in the species composition of an occurrence of this EEC, or to cause a decline or loss of functionally important species.

Modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns

The proposed Development footprint will impact a small area of surface soil of up to 20.68 ha. The proposed Development footprint will not impact abiotic factors such as water, nutrients or soil that are likely to impact the survival of the EEC.

EPBC Act Assessment of Significance**Endangered Ecological Community - Mallee Birds Ecological Community of the Murray Darling Depression Bioregion.****Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting**

The Development footprint would remove or modify 20.68 ha of native vegetation, a very small proportion (conservatively less than 0.0014% of the current estimate of 3.486 million ha of mallee woodlands and shrublands in the MDD northern IBRA subregion) of available habitat for this EEC within a highly intact landscape of many hundreds of thousands of hectare contiguous patch of remnant native vegetation, including mallee and non-eucalypt semi-arid woodland.

The very small size of this development area at a landscape scale is highly unlikely to cause a substantial change in the species composition of an occurrence of this EEC, or to cause a decline or loss of functionally important species.

Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:

- assisting invasive species, that are harmful to the listed ecological community, to become established, or
- causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community, or
- interfere with the recovery of an ecological community

The proposed actions do not involve any use of fertilizers, herbicides or other chemicals or pollutants into the area.

As described, the Development footprint would remove or modify 20.68 ha of native vegetation, a very small proportion (conservatively less than 0.0014% of the current estimate of 3.486 million ha of mallee woodlands and shrublands in the MDD northern IBRA subregion) of available habitat for this EEC within a highly intact landscape of many hundreds of thousands of hectare contiguous patch of remnant native vegetation, including mallee and non-eucalypt semi-arid woodland.

Disturbance associated with vegetation clearing and vehicle traffic during construction or ongoing maintenance of the road may, in general, increase the potential for the spread, introduction and establishment of weed and pest species. The Development footprint site adjoins important areas of native vegetation, especially the offset area for the Atlas-Campaspe Mine. Construction and environmental management plans will specify measures for restricting access to native vegetation and minimising the risk of transmitting weed propagules. Environmental inductions, visual barriers and/or exclusion fencing will be used to exclude personnel and vehicles from habitat outside the Development footprint.

To further mitigate the risk of pathogens being brought onto and/or spread through the site all vehicles, plant and equipment will be cleaned down (wash/blow down) and certified weed free prior to initial entry to site; all vehicles, plant and equipment will strictly adhere to the approved roads, tracks, easements and work areas to minimise contact with vegetation.

Altered environmental conditions along new edges and clearings can allow invasion by pest animals specialising in edge habitats and/or change the behaviour of resident animals. Edge zones can be subject to higher levels of predation by introduced mammalian predators, such as foxes and feral cats. Pest mammal control measures will be completed around the haul road area as part of the broader mine pest management, to limit the expansion of pest predators into this area.

The very small size of this development area at a landscape scale is highly unlikely to cause a substantial reduction in the quality or integrity of an occurrence of the Mallee Birds Ecological Community EEC, nor assist with the establishment of invasive species, mobilise chemicals, or interfere with the recovery of this EEC.

Conclusion of assessment of significance

Based on consideration of the above criteria, the Development footprint is considered highly unlikely to have a significant effect on the Mallee Birds Ecological Community Endangered Ecological Community, as:

- Only a small area of native vegetation (20.68 ha) would be removed or modified, which represents a very small proportion of the available habitat for these mobile species within the locality
- The small size and narrow width of the Development footprint will only result in a minor increase in the degree of fragmentation between retained areas of habitat for these mobile species and will not result in any isolation of habitat
- No important populations are identified for the community
- The small Development footprint is unlikely to adversely affect habitat critical to the survival of this EEC
- The Proposal is unlikely to modify or destroy abiotic factors necessary for this EEC's survival, including reduction of groundwater levels, or alteration of surface water drainage patterns
- The Proposal is unlikely to cause a substantial change in the species composition of an occurrence of this EEC, including causing a decline or loss of functionally important species from the community.
- The Development footprint is not likely to cause a substantial reduction in the quality or integrity of an occurrence of this EEC, by assisting invasive species that are harmful to the community to become established, or mobilising chemicals or pollutants which may kill or inhibit the growth of species in the EEC
- The small size of the Development footprint within a largely intact landscape is unlikely to interfere substantially with the recovery of the Mallee Birds Ecological Community EEC



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