Appendix K

Biodiversity Development Assessment Report (updated)

Moss Vale Plastics Recycling and Reprocessing Facility

Technical Report 1 – Biodiversity Development Assessment Report

Plasrefine Recycling Pty Ltd

2 March 2023

Certification under Section 6.15 of the Biodiversity Conservation Act 2016

I, Kath Chesnut (BAAS17031) certify that this Biodiversity Development Assessment Report and the accompanying finalised credit report dated 2 March 2023 has been prepared in accordance with the requirements of (and information provided under) the Biodiversity Assessment Method.

_____

Kath Chesnut – BAAS17031
2 March 2023

This BDAR: has been prepared by GHD for Plasrefine Recycling Pty Ltd and may only be used and relied on by Plasrefine Recycling Pty Ltd for the purpose agreed between GHD and the Plasrefine Recycling Pty Ltd as set out in Section 1 of this BDAR.

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Investigations undertaken in respect of this BDAR are constrained by the particular site conditions, such as the location of buildings, services and vegetation. As a result, not all relevant site features and conditions may have been identified in this BDAR.

Site conditions (including the presence of threatened biota and their habitats) may change after the date of this BDAR. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD is also not responsible for updating this report if the site conditions change.

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Executive summary

The proposal

Plasrefine Recycling Pty Ltd (Plasrefine Recycling) ('the proponent') is seeking approval to construct and operate a plastics recycling and reprocessing facility in Moss Vale, NSW ('the proposal').

The proposal involves constructing and operating a plastics recycling and reprocessing facility with capacity to receive up to 120,000 tonnes per year of mixed plastics. The proposal also includes ancillary infrastructure to support the proposal.

The proposal would sort the plastics into different types and convert the various plastics to flakes and pellets (in the first stage) and produce more advanced products (in the second stage). The combined outputs of both stages of the proposal would help fill the gap in local processing capacity for mixed plastics.

The proposal is State significant development and is subject to approval by the NSW Minister for Planning and Public Spaces under the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act).

This report

This Biodiversity Development Assessment Report (BDAR) has been prepared on behalf of Plasrefine Recycling for the proposal to support the environmental impact assessment (EIS) for the proposal and responds to the Secretary's Environmental Assessment Requirements (SEARs) for biodiversity.

This BDAR has been prepared by GHD Pty Ltd to identify the potential impacts of the proposal on biodiversity values within the proposal site. This assessment has been completed in accordance with the Biodiversity Assessment Method (BAM) and includes:

– Desktop assessment to describe the existing environment and landscape features of the proposal site and to identify the suite of threatened biota potentially affected by the proposal.
– Field survey to describe the biodiversity values of the proposal site and surrounding study area and determine the likelihood of threatened biota and their habitats occurring in the proposal site, including targeted seasonal surveys for species credit entities.
– Discussion of measures to avoid and minimise impacts to biodiversity values.
– BAM calculations using the credit calculator version 1.4.0.00 to quantify the biodiversity impacts of the proposal following implementation of measures to avoid and minimise impacts and to determine the biodiversity credits that would be required to be retired to offset the residual impacts of the proposal.

Existing environment

The proposal is located in cleared agricultural land and has been purposefully designed to minimise impacts on biodiversity values as far as is practicable.

Impacts from the proposal during construction

The proposal would result in impacts to two plant community types (PCT) comprising removal of 0.32 ha of native vegetation:

– 0.28 hectares of PCT 1256 Tableland swamp meadow on impeded drainage sites of the western Sydney Basin Bioregion and South Eastern Highlands Bioregion (HN602)
– 0.04 hectares of PCT 944 Mountain Grey Gum - Narrow-leaved Peppermint grassy woodland on shales of the Southern Highlands, southern Sydney Basin Bioregion (HN544).

A possible call from the Southern Myotis (*Myotis macropus*) was recorded on the proposal site. The Southern Myotis is listed as a vulnerable species under the BC Act and is a candidate species credit species under the BAM. A conservative approach was taken and the species was assumed present on site. As such, the proposal would remove 0.32 hectares of potential foraging habitat for the Southern Myotis (*Myotis macropus)*.

A possible call from the Large Bent-winged bat (*Miniopterus orianae oceanensis*) was also recorded on the proposal site. The Large Bent-winged Bat is listed as a vulnerable species under the BC Act and is a dual credit species meaning species credits are only calculated if suitable breeding habitat is located on the proposal site or within 2 km or the proposal site. As no breeding habitat was located on the proposal site, or within 2 km of the site, offsets for removal of foraging habitat for the Large Bent-winged Bat are calculated via the ecosystem credits for the native vegetation on the proposal site and no species credits are required.

The proposal would result in the removal of up to nine planted Camden Woollybutt (*Eucalyptus macarthurii*) trees along the new north-south road alignment. This species is listed as endangered under the BC Act and EPBC Act.

The proposal would not impact any threatened biota listed under the *Fisheries Management Act 1994* (FM Act).

A biodiversity assessment and credit calculations have been performed in accordance with the BAM (OEH 2020) and using credit calculator version 1.4.0.00. The following credits are required to be retired to offset the impacts of the proposal:

– 6 ecosystem credits to offset impacts to 0.28 ha of PCT 1256 Tableland swamp meadow on impeded drainage sites of the western Sydney Basin Bioregion and South Eastern Highlands Bioregion
– 6 Southern Myotis species credits to offset the removal of habitat within a 0.28 hectare species polygon
– 18 *Eucalyptus macarthurii* species credits to offset the removal of nine planted individuals.

Other threatened species identified as potentially being impacted by the proposal are ecosystem credit species which would be offset through the retirement of the ecosystem credits listed above.

No ecosystem credits are required for impacts to PCT 944, as the VI score was only 2.1, which is less than the threshold (15) for PCTs that are EECs or CEECs.

Impacts to 10.15 hectares of land in the proposal site would not require offsetting as this area is not native vegetation as defined in the BAM and comprises exotic vegetation.

Impacts from the proposal during operation

Impacts on biodiversity values would be largely restricted to the construction phase of the proposal. Some beneficial impacts would occur as a result of the riparian vegetation management plan and the revegetation associated with the realignment of the eastern watercourse. However, during operation there is potential for the proposal to impact surrounding vegetation and habitat values through:

– Generation of additional light and noise.
– Erosion and sedimentation as a result of runoff from hard stand areas.
– Introduction of weed propagules by vehicle and/or residents/businesses.
– Fauna mortality as a result of collision with vehicles.
– Increased risk of fire.
– Rubbish dumping.

Given current land uses at the proposal site and in adjacent areas the proposal would not result in a substantial increase in the operation of any of these potential impacts. Mitigation measures are also proposed to minimise the potential for these impacts.

Recommended mitigation measures

To avoid and minimise potential impacts of the proposal on biodiversity values, a series of mitigation and management measures have been identified, which would be implemented as part of the construction environmental management plan and riparian vegetation management plan for the proposal site. These include measures relating to:

– Standard construction environmental management plan protocols – including site inductions and dust suppression measures.
– Planting of native vegetation along the riparian corridors or the western and eastern watercourses.

– Vegetation protection – including protective fencing to prevent impacts to surrounding vegetation, vehicle washing to avoid spread of pathogens/weeds, appropriate locations of stockpiles during construction and installation of sediment fences.
– Weeds – including weed management actions/planning, weed propagule spread control measures and sediment control.
– Fauna habitat – including hygiene protocol implementation, presence of an ecologist during clearing, staged vegetation clearing and protocols for the removal of habitat features.
– Water quality and aquatic habitats – including erosion and sediment control measures, plans and surface stabilisation, dust control, spill kits and protocols.

The preferred approach to offset the residual impacts of the proposal is to secure and retire appropriate credits from stewardship sites that fit within the trading rules of the NSW Biodiversity Offsets Scheme (BOS) in accordance with the 'like for like' report generated by the BAM calculator. If such credits are unavailable, credits would be sourced in accordance with the 'variation report' generated by the BAM calculator (Appendix F).

A payment to the Biodiversity Conservation Trust would be considered if a suitable number and type of biodiversity credits cannot be secured.

Mitigation measures that would be implemented to minimise potential operational impacts include:

– Ongoing management of priority weeds according to statutory requirements.
– Ongoing water quality management.
– Prescribed fencing requirements.
– Ecologically sensitive street lighting design.

This report is subject to, and must be read in conjunction with, the limitations set out earlier in this document and the assumptions and qualifications contained throughout.

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1. Introduction

1.1 Overview

1.1.1 Plasrefine Recycling and the proposal

For many years, recyclable plastics have been recovered from kerbside collections and it has been profitable to export mixed plastics to China and other countries. With the advent of the China National Sword policy (a policy in China which banned the importation of certain types of waste and set strict contamination limits on recyclable materials), as well as issues with contaminated loads of recyclables being sent to China and other countries, opportunities to send mixed plastics overseas for processing have diminished. Recently, the Council of Australian Governments (COAG) decided to ban exports of recyclable waste from Australia from July 2021.

Despite these difficulties, export markets still exist for clean, separated, pelletised plastics and resins. However, there is very little local capacity in NSW and within Australia to sort recovered plastics into different types and convert them into valuable products.

To help address this issue, Plasrefine Recycling Pty Ltd (Plasrefine Recycling) ('the proponent') proposes to construct and operate a plastics recycling and reprocessing facility in Moss Vale ('the proposal').

The proposal would extract mixed plastics from waste, sort the plastics into different types, and convert the various plastics to plastic flakes and pellets (in the first stage) and produce more advanced products (in the second stage). The combined outputs of both stages of the proposal would help fill the gap in local processing capacity for mixed plastics.

The proposal would have an ultimate capacity to receive up to 120,000 tonnes per year of mixed waste plastics.

1.1.2 Approval and assessment requirements

The proposal is State significant development and is subject to approval by the NSW Minister for Planning and Public Spaces under the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act).

This Biodiversity Development Assessment Report (BDAR) has been prepared by GHD Pty Ltd (GHD) as part of the environmental impact statement (EIS) for the proposal. The EIS has been prepared to support the application for approval of the proposal and address the environmental assessment requirements of the Secretary of the NSW Department of Planning, Industry and Environment (now Department of Planning and Environment) (SSD-9409987) dated 15 October 2020 (the SEARs).

1.2 The proposal

1.2.1 Location

The proposal would be located about 140 kilometres south west of the Sydney central business district and approximately 2.8 kilometres north west of the Moss Vale town centre within the Wingecarribee local government area.

The proposed plastics recycling and reprocessing facility and ancillary infrastructure would be located on the northern parcel of land in Lot 11 DP 1084421, with a current street address of 74-76 Beaconsfield Road, Moss Vale. This parcel of land is referred to as 'the plastics recycling and reprocessing facility site' for the purpose of the EIS. It has a total site area of about 7.7 hectares. The proposal would occupy a portion of the plastics recycling and reprocessing facility site.

An access road will be constructed to enable public access to the proposal via a new north-south road, connecting with an existing gravel road off Collins Road, which is part of Council's proposed future Enterprise Zone Road (as defined in the *Moss Vale Enterprise Corridor Development Control Plan 2008* (Connell Wagner 2008)). Several other road options have been considered; however the north-south road is the current preferred option, and replaces the initial east-west preferred option that was presented in the original BDAR. There is still some uncertainty over which road option will be selected, and this BDAR presents only the biodiversity impacts and credit calculations associated with the north-south option.

The area that would be occupied by the proposal's permanent operational infrastructure, and/or directly disturbed during construction, is referred to as 'the proposal site' for the purposes of the EIS. The proposal site considered in this BDAR therefore comprises:

– The plastics recycling and reprocessing facility site
– The preferred new public access road corridor.

It is noted that the areas that would be disturbed for construction of buildings, roads and water management would comprise about six hectares of the total 7.7 hectare plastics recycling and reprocessing facility site. Disturbance of the remaining 1.7 hectares would be limited to plantings as part of riparian vegetation management and landscaping.

The proposal would be located within the Moss Vale Enterprise Corridor (MVEC) catchment. The MVEC is a significant area of land between Moss Vale and New Berrima set aside for employment generating development under the Wingecarribee Shire Local Environmental Plan 2010.

The location of the proposal site is shown in Figure 1.1.

1.2.2 Key features

The proposal is defined as the construction and operation of a plastics recycling and reprocessing facility with capacity to receive up to 120,000 tonnes per year of mixed plastics, comprising:

– Two main buildings for waste receival, recycling and reprocessing and finished product storage
– Wastewater treatment plant
– Truck parking
– Ancillary infrastructure including an office building, workshop, truck parking, staff and visitor parking, internal roadways, weighbridges, water management, fire management, landscaping, fencing, signage and utility connection
– The preferred access road will be constructed to enable public access to the proposal via a new north-south road, connecting with an existing gravel road off Collins Road, which is part of Council's proposed future Enterprise Zone Road (Connell Wagner 2008).

The proposal would sort the plastics into different types and convert the various plastics to flakes and pellets (in the first stage) and produce more advanced products such as resins and other plastic products (in the second stage). The combined outputs of both stages of the proposal would help fill the gap in local processing capacity for mixed plastics.

Further information on the proposal is provided in the EIS, with a detailed description of the access road and recent changes provided in the Response to Submissions Report (GHD 2023).

The key features of the proposal are shown in Figure 1.2

1.2.3 Construction overview

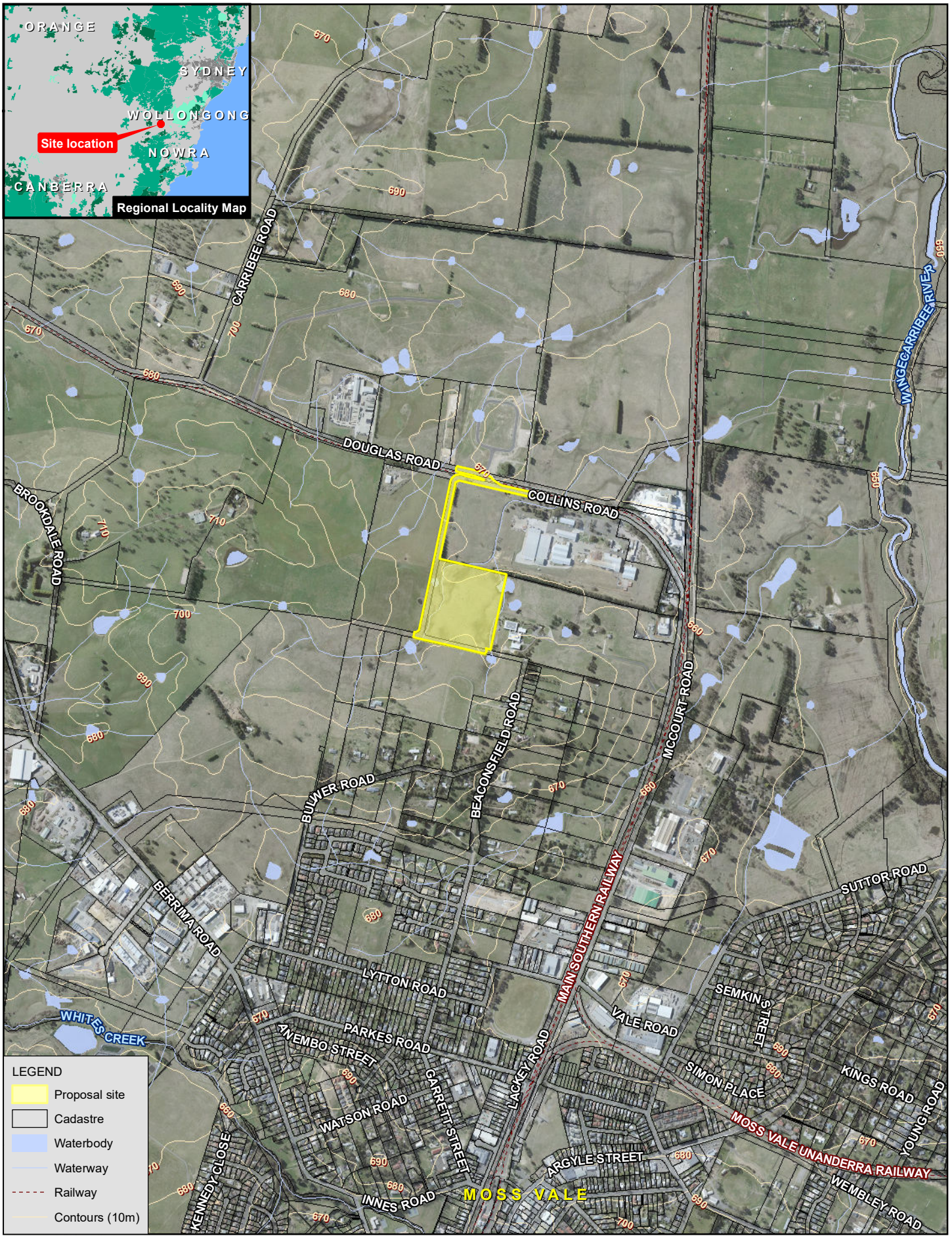
An indicative construction strategy has been developed, based on the current design, to be used as a basis for the environmental assessment process. Detailed construction planning, including programming, work methodologies and work sequencing would be undertaken once construction contractor(s) have been engaged and during detailed design.

It is estimated that the proposal would take about 15 months to construct and commission and consist of the following key stages:

– Construction of new north-south public access road (2-3 months)
    - Mobilisation of plant
    - Site establishment
    - Bulk earthworks
    - Retaining walls and stormwater drainage structures
    - Road paving
    - Dewatering and reshaping of the northern bio-retention basin

    - Demobilisation of road construction plant
    - Decommissioning of construction laydown areas
- Early works and site establishment (1 month):
    - Utilities connection
    - Establishment of construction compound including construction staff amenities
    - Installation of temporary fencing
- Main site works (11 months):
    - Clearance of vegetation within the construction footprint, stripping and stockpiling of topsoil for reuse
    - Bulk earthworks for site shaping and surface water drainage and the bioretention pond
    - Pouring concrete foundation slab, footings, hardstand and slabs for the buildings
    - Construction of pavement areas for the truck and car park, internal roads and the site entrance/egress points
    - Installation of steel truss framework for structures
    - Erection of pre-cast concrete panels for external and internal partition walls and metal roof sheets for site buildings
    - Installation of processing equipment
    - Building finishing works including fit out
    - Installation of firewater and other tanks
    - Installation of weighbridges
    - Installation of permanent fencing and signage
    - Restoration works including removal of temporary construction compound, general site clean up and landscaping following construction
- Testing and commissioning (3 months).

Further information on how the proposal would be constructed is provided in the EIS and the response to submissions report.



Paper Size ISO A4

0 400 800

Metres

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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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Plasrefine Pty Ltd
Moss Vale Plastics Recycling Facility
Biodiversity Development Assessment Report

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Revision No. **B**
Date **02 Mar 2023**

Site map

FIGURE 1.1

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Data source: Aerial imagery - MetroMaps 2023 ; General topo - NSW LPI DTDB 2020, 2015; Inset map - Geoscience Australia. Created by: fmackay

Paper Size ISO A4

0 20 40

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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Revision No.
Date **02 Mar 2023**

Proposal footprint

FIGURE 1.2

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Data source: Aerial imagery - nearmap 2023 (image date 24/04/2021, image extracted 30/06/2021); General topo - NSW LPI DTDB 2020, 2015. Created by: fmackay

1.3 Secretary's Environmental Assessment Requirements and agency requirements

The specific SEARs and agency requirements addressed in this report are summarised in Table 1.1.

Table 1.1 SEARs and agency requirements relevant to this assessment

Requirement	Where addressed in this report
Biodiversity	
Biodiversity – including an assessment of the project's biodiversity impacts in accordance with the *Biodiversity Conservation Act 2016*, including the preparation of a Biodiversity Development Assessment Report (BDAR) where required under the Act, except where a waiver for preparation of a BDAR has been granted.	This Biodiversity Development Assessment Report has been prepared to satisfy the requirements of the *Biodiversity Conservation Act 2016*.
1. Biodiversity impacts related to the proposed project are to be assessed in accordance with the Biodiversity Assessment Method and documented in a Biodiversity Development Assessment Report (BDAR). The BDAR must include information in the form detailed in the *Biodiversity Conservation Act 2016* (s6.12), Biodiversity Conservation Regulation 2017 (s6.8) and Biodiversity Assessment Method.	Addressed in this BDAR
2. The BDAR must document the application of the avoid, minimise and offset framework including assessing all direct, indirect and prescribed impacts in accordance with the Biodiversity Assessment Method.	Section 5 and 6
3. The BDAR must include details of the measures proposed to address the offset obligation as follows; – The total number and classes of biodiversity credits required to be retired for the development/project; – The number and classes of like-for-like biodiversity credits proposed to be retired; – The number and classes of biodiversity credits proposed to be retired in accordance with the variation rules; – Any project to fund a biodiversity conservation action; – Any project to conduct ecological rehabilitation (if a mining project); – Any project to make a payment to the Biodiversity Conservation Fund. If seeking approval to use the variation rules, the BDAR must contain details of the reasonable steps that have been taken to obtain requisite like-for-like biodiversity credits.	Section 6
4. The BDAR must be prepared by a person accredited in accordance with the Accreditation Scheme for the Application of the Biodiversity Assessment Method Order 2017 under s6.10 of the *Biodiversity Conservation Act 2016*.	Section 2.6
Water and soils	
5. The EIS must map the following features relevant to water and soils including: b. Rivers, streams, wetlands, estuaries (as described in s4.2 of the Biodiversity Assessment Method). c. Wetlands as described in s4.2 of the Biodiversity Assessment Method. e. Groundwater dependent ecosystems.	Section 3.1.6, Section 3.1.7 and Section 3.2.4

1.4 Purpose of this report

The purpose of this report is to assess the potential biodiversity impacts and determine the potential for offset requirements for impacts associated with constructing and operating the proposal. Specifically, the objectives of this assessment are to:

- Address the SEARs and agency requirements listed in Table 1.1 and respond to the Biodiversity, Conservation and Science Directorate of the Department of Planning and Environment (BCS) comments on the BDAR that accompanied the EIS Exhibition – Moss Vale Plastics Recycling Facility (SSD-9409987)
- Outline the methods used in the biodiversity assessment
- Describe the existing environment of the proposal site in terms of its biodiversity values, including type and condition of PCTs, flora and fauna species and terrestrial and aquatic habitats
- Describe the conservation significance of the proposal site in terms of threatened biota and their habitats that are known or predicted to occur
- Provide a description of the proposal, including potential impacts on biodiversity values
- Identify measures undertaken to avoid and minimise impact to biodiversity values
- Present the data used to perform the BAM assessment and credit calculations for the proposal
- Calculate the number and type of biodiversity credits using the BAM that would be required to offset impacts of the proposal
- Outline measures proposed to offset the residual impact of the proposal.

1.5 Biodiversity offset scheme and biodiversity assessment methodology

The BC Act, together with the *Biodiversity Conservation Regulations 2017***,** provides a mechanism to address impacts on biodiversity from land clearing associated with development. Under this legislation, there are provisions for a Biodiversity Offsets Scheme (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. It 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 aim of the BOS is to ensure that the impacts of development, clearing or biodiversity certification will result in no net loss of biodiversity in NSW.

The Biodiversity Assessment Method (BAM) was established by the NSW Office of Environment and Heritage (OEH) as a standard method to implement the aims of the BOS and to address the loss of biodiversity and threatened species. The scheme creates a market framework for the conservation of biodiversity values and the offsetting of development impacts. It also provides the mechanisms to offset impacts of development, clearing or biodiversity certification such that there is no loss of biodiversity values.

The BAM sets out how biodiversity values will be assessed, prescribes requirements to avoid and minimise impacts, establishes rules for calculating the number and class of biodiversity credits required for unavoidable impacts, and determines the credit trading rules that will apply. The methodology includes a software package known as the Biodiversity Assessment Method Calculator (the credit calculator) 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.

1.6 Approach

This BDAR has been prepared in accordance with the BAM to assess the impacts of the proposal on threatened biota and their habitats. The main components of the methodology include:

– Desktop assessment to describe the existing environment and landscape features of the study area and to identify the suite of threatened biota potentially affected by the proposal
– Field survey in accordance with the BAM to describe the biodiversity values of the proposal site and surrounding study area and determine the likelihood of threatened biota and their habitats occurring in the proposal site or being affected by the proposal
– Determining reasonable actions to avoid and minimise impacts to biodiversity values
– Completing calculations using the credit calculator to quantify the residual biodiversity impacts of the proposal and to determine the ecosystem and species credits that would be required to offset these impacts.

The initial biodiversity assessment and credit calculations were completed by Madeline Young (accredited assessor number BAAS19071) in accordance with the BAM, based on field surveys completed by Madeline Young and Kath Chesnut (accredited assessor number BAAS17031). A technical review of the report was undertaken by Jayne Tipping and Ben Harrington (accredited assessor number BAAS17023). This revised BDAR and associated credit calculations have been completed by Kath Chesnut (accredited assessor number BAAS17031), with a review undertaken by Kirsten Crosby (accredited assessor number BAAS17011).

1.7 Information sources

Information sources used in the preparation of this BDAR include:

– The NSW BioNet Vegetation Classification database to help identify PCTs that occur in the proposal site as required by the BAM (OEH, 2021c)
– OEH threatened biota profiles for descriptions of the ecology, distribution and habitat requirements of threatened biota (OEH, 2021b). This resource was used to identify the suite of threatened biota that could potentially be affected by the proposal and to inform habitat assessments.
– Department of Agriculture, Water and the Environment (DAWE) *Protected Matters Online Search Tool* for MNES listed under the EPBC Act and predicted to occur in the locality (DAWE 2021a)
– DAWE online *Species profiles and threats database* (SPRAT) (DAWE 2021b)
– The NSW *BioNet Vegetation Classification* database to help identify Plant Community Types (PCTs) that occur in the proposal site as required by the BAM (OEH, 2021c)
– Threatened Biodiversity Data Collection (TBDC) for information relating to species credit and ecosystem credit threatened species and thresholds for Serious and Irreversible Impact (SAII) assessments (DPIE 2021b)
– Department of Primary Industries (DPI) freshwater threatened species distribution maps. For distribution of threatened aquatic species that may occur in the locality (DPI, 2021a).
– Groundwater Dependent Ecosystem Atlas (BOM 2021a)
– The list of species credit-type species identified by the BAM Credit Calculator based on the initial credit calculations
– Existing vegetation mapping of the proposal site, including DECCW (2009), Tozer *et al.* (2010) and DPE (2022)
– Aerial photographs and satellite imagery of the proposal site and buffer area.
– Submission comments on the exhibited BDAR from DPE (dated 23 March 2022).

References used in the preparation of this BDAR are listed in Section 9.

1.8 Glossary of terms and acronyms

Table 1.2 Glossary of terms and acronyms

Term	Definition
AOBV	Areas of Outstanding Biodiversity Value
BAM	Biodiversity Assessment Method 2020 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	*Biodiversity Conservation Act 2016*
BCS	Biodiversity, Conservation and Science Directorate of the Department of Planning and Environment
BCT	Biodiversity Conservation Trust
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.
Biosecurity Act	Biosecurity *Act 2015*
BOM	Bureau of Meteorology
BOS	NSW Biodiversity Offset Scheme
CEEC	Critically endangered ecological community
CEMP	Construction Environmental Management Plan
DAWE	Department of Agriculture, Water and the Environment (Commonwealth) (former, now DCCEEW)
DBH	Diameter at breast height
DCCEEW	Department of Climate Change, Energy, the Environment and Water (Commonwealth)
DEE	Department of the Environment and Energy (Commonwealth), (former, now DCCEEW)
DEWHA	Department of Environment, Water, Heritage and the Arts (Commonwealth) (former, now DCCEEW)
DPE	Department of Planning and Environment (NSW)
DPI	Department of Primary Industries (NSW), now DPIE
DPIE	Department of Planning, Industry and Environment
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
EIS	Environmental Impact Statement
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
FFMP	Flora and Fauna Management Plan
FM Act	*Fisheries Management Act 1994* (NSW)
GDE	Groundwater Dependent Ecosystem
GIS	geographic information system

Term	Definition
GPS	global positioning system
ha	hectare
HTE	High threat exotic (weed)
IBRA	Interim Biogeographic Regionalisation for Australia
km	kilometre
LEP	Local Environment Plan
LGA	Local Government Area
Locality	The area within a 10 km radius of the proposal site
Migratory species	Species listed under listed under international agreements (i.e. Ramsar, JAMBA and CAMBA conventions) to which Australia is a party
MNES	Matters of National Environmental Significance
NSW	New South Wales
OEH	Office of Environment and Heritage (former, now BCS)
PCT	Plant community type
PMST	Protected Matters Search Tool
Proposal site	The area that would be directly impacted by construction and operation of the proposal. Comprises the 'development site' as referenced in the BAM
SAII	Serious and irreversible impact
SAII entity	Species and ecological communities that are likely to be the subject of serious and irreversible impacts (SAIIs)
SEARs	Secretary Environmental Assessment Requirements
SEED	Sharing and Enabling Environmental Data (online portal)
SEPP	State Environment Planning Policy
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.
SPRAT	Species Profile and Threats Database
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.
TBDC	Threatened Biodiversity Data Collection
TEC	Threatened ecological community
Threatened biota	Threatened species, populations or ecological communities listed under the BC Act and/or the EPBC Act
VI	Vegetation integrity
VIS	Vegetation information system

1.9 Definitions

The following terms are used in this report:

- The 'proposal' refers to the construction and operation of a plastics recycling and reprocessing facility.
- The 'proposal site' refers to the area that would be directly impacted by the proposal.
- The 'study area' refers to the area that was subject to field survey and assessed for direct or indirect impacts that may arise from the proposal.
- The 'locality' refers to the area within a 10 km radius of the proposal site.

1.10 Assumptions and accredited assessor judgments

This report has been prepared based on the proposal description and maps and plans provided by the proponent. A 'proposal footprint' polygon (i.e. disturbance footprint) was prepared for the biodiversity assessment based on these inputs and confirmed in consultation with the proponent. 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 GIS.

These calculations have in turn been relied upon in the BAM 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 proposal design and/or spatial data.

The accredited assessor has assumed that all impacts associated with the development, including construction and operational impacts, are included within the footprint provided.

2. Methods

2.1 Desktop assessment

2.1.1 Literature and database review

A desktop literature and database review was undertaken to identify threatened flora and fauna species, populations and ecological communities (threatened biota) listed under the BC Act, FM Act, and EPBC Act, that could be expected to occur in the locality, based on previous records, known distribution ranges, and habitats present. Desktop information was also used to obtain the necessary site data to perform BAM calculations. Biodiversity resources pertaining to the proposal site and locality (i.e. within a 10 km radius of the proposal site) that were reviewed prior to conducting field investigations are outlined in Section 1.7.

The threatened biota and migratory species identified in the desktop assessment are presented in Appendix A. Following collation of database records and threatened species and community profiles, a 'likelihood of occurrence' assessment was prepared for threatened biota and migratory species with reference to the broad vegetation types and habitats contained within the study area. This was further refined following field surveys and verification of vegetation types and identification and assessment of habitat present within the proposal site. A likelihood of occurrence ranking was attributed to these biota based on this information.

2.1.2 Groundwater dependent ecosystems

The NSW Groundwater Dependent Ecosystem (GDE) Policy defines GDEs as ecosystems, which have their species composition, and their natural ecological processes determined by groundwater (DLWC 2002). The Policy defines groundwater as the water beneath the earth's surface that has filtered down to the zone where the earth or rocks are fully saturated (DLWC 2002). Ecosystems vary dramatically in the degree of dependency on groundwater, from having no apparent dependence through to being entirely dependent on groundwater (DLWC 2002).

The Australian Government Atlas of Groundwater Dependent Ecosystems (Australian Government 2012) was used to identify any previously mapped GDEs that occur in or near the proposal site. The atlas identifies GDEs reliant on surface groundwater (rivers, springs and wetlands) and subsurface groundwater (vegetation). Results are discussed in section 3.2.4.

2.2 Site survey

2.2.1 Survey effort and timing

Surveys of the proposal site were conducted in accordance with the BAM and with reference to 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.

Table 2.1 Survey effort associated with proposal impacts

Stage	Date	Survey Technique
BAM assessment survey	2-3 March 2021	Mapping of vegetation zones Vegetation integrity plots Targeted threatened flora surveys Opportunistic fauna observations Fauna habitat assessment Targeted fauna survey, including: Spotlighting Call Playback Ultrasonic call recording using Anabats Active searches for nests, roosts, scats and other signs of fauna occupancy

Stage	Date	Survey Technique
Supplementary BAM assessment surveys	8 June 2021	Mapping of vegetation zones Vegetation integrity plots Targeted threatened flora surveys Opportunistic fauna observations Fauna habitat assessment
Supplementary BAM assessment surveys	29 July 2021	Mapping of vegetation zones Vegetation integrity plots Targeted threatened flora surveys Opportunistic fauna observations Fauna habitat assessment
Supplementary BAM assessment surveys of proposed north/south access road	9 November 2022	Mapping of vegetation zones Vegetation integrity plots Targeted threatened flora surveys Opportunistic fauna observations Fauna habitat assessment

2.2.2 Vegetation mapping

Existing vegetation mapping of the proposal site (DECCW 2009 and Tozer *et al*., 2010; along with the more recent NSW State Vegetation Type Map (DPE 2022)) was ground-truthed in the field via systematic walked transects across the proposal site and by walking the boundary of vegetation units. Necessary adjustments were made by hand on aerial photographs of the proposal site with reference to a handheld Global Positioning System (GPS) unit. Native vegetation communities in the study area were assigned to the closest equivalent Plant Community Type (PCT). The closest equivalent PCT for each vegetation community was determined through a comparison of the floristic descriptions of PCTs in the database with the vegetation integrity plot data collected from the proposal site. In addition to floristic and structural similarity, the landscape position, soil type and other diagnostic features of the vegetation communities on the proposal site were also compared to the descriptions in the database to determine the most suitable PCT. Threatened ecological communities (TECs) as defined in NSW and Commonwealth legislation were also identified.

The native vegetation in the proposal site was then stratified into vegetation zones in accordance with Section 4.3 of the BAM (DPIE 2020). 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. Each vegetation zone was assigned a patch size in accordance with Subsection 4.3.2 of the BAM (DPIE 2020).

2.2.3 Vegetation integrity survey plots

Following the stratification of the proposal site into vegetation zones, plot surveys were conducted on site in accordance with the BAM to obtain vegetation integrity data for the calculation of biodiversity credits. The site value was determined by assessing ten attributes used to assess function, composition and structure of vegetation within a 50 metre X 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.

All flora species within a 20 metre x 20 metre quadrat nestled within the 50 m x 20 m transect were identified according to the nomenclature of the Royal Botanic Gardens and Domain Trust (2018). Each species identified was allocated a growth form group and designated as either native, exotic or high threat exotic in accordance with lists provided by OEH.

Plots were sampled within the native vegetation zone at the proposal site according to the minimum number of plots required by Table 4 in the BAM (OEH 2020) (refer to Table 2.2 below). Additional plots were sampled within exotic grassland vegetation to confirm this area does not comprise native vegetation or require further assessment (as per Section 5.2.1.5 of the BAM).

A total of six plots were completed across the proposal site, including three within exotic grassland. Data from only three plots, located in the aquatic vegetation within the dams and the small patch of woodland trees on the new north-south road alignment were entered into the BAM credit calculator, as exotic vegetation does not require further assessment under the BAM (OEH 2020). The locations of all plots are shown on Figure 2.1.

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, weed invasion and canopy health. The new benchmarks for PCTs (introduced in January 2023) have been used in all BAM-C calculations.

Table 2.2 Minimum plot survey requirements

Vegetation zone	Likely PCT	Area (ha) in proposal site	Minimum number of plots required	Number of plots sampled
Vegetation associated with farm dams	PCT 1256 Tableland swamp meadow on impeded drainage sites of the western Sydney Basin Bioregion and South Eastern Highlands Bioregion - Poor Condition	0.28	1	2 (Plots 3 and 4)
Planted stand of *Eucalyptus macarthurii* along new north-south road alignment	PCT 944 Mountain Grey Gum - Narrow-leaved Peppermint grassy woodland on shales of the Southern Highlands, southern Sydney Basin Bioregion	0.04	1	1 (Plot 7_22)
Exotic grassland	N/A	10.15	0	3 (Plots 1, 2 and 8_22)
	Total	**10.47**	**2**	**6**

2.2.4 Targeted threatened flora surveys

Targeted surveys were undertaken for threatened flora species that were either predicted to occur at the proposal site by the BAM calculator or 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 (refer to Appendix A). A number of species were considered unlikely to occur on site due to an absence of suitable habitat and these species were not included in the targeted searches (Appendix A). Targeted flora searches were completed by walking parallel transects spaced 10 m apart in areas of suitable habitat across the study area, with reference to threatened plant survey guidelines (DPIE 2020a). Given that much of the study area is dominated by exotic grasslands that does not comprise suitable habitat for the suite of threatened flora species predicted to occur, survey effort was focussed around dams, and the planted line of *Eucalyptus macarthurii* along the north-south road alignment.

Targeted threatened flora surveys were undertaken in early autumn (March 2021), winter (June and July 2021) and late spring (November 2022) which, according to the BAM calculator, is a suitable time of the year to identify the candidate threatened flora species identified as having the potential to occur. Given the existing environment within the proposal site, with much of the land covered by exotic grassland and blackberry infestations, much of the proposal site was considered unsuitable for the predicted candidate threatened flora species to occur, as the specific microhabitats required by the various species were not present.

Candidate threatened flora species that were targeted during these surveys and the appropriate survey period specified in the BAM calculator are listed in Table 2.3.

The site survey confirmed that there is no suitable habitat for threatened flora species in most of the proposal site. The highly modified nature of the proposal site, the history of disturbance, the lack of any intact native vegetation, the continued presence of grazing and use of the proposal site for agricultural purposes and the lack of connectivity with any areas of intact native vegetation mean the proposal site does not comprise suitable habitat for any of the predicted threatened flora species. The exception is the small linear strip of planted trees along the eastern boundary of the north-south road alignment, which comprises a stand of *Eucalyptus macarthurii* over exotic grassland.

Further detail regarding candidate threatened flora species targeted during surveys are provided in Section 4.1.

Table 2.3 Threatened flora species targeted during surveys

Scientific name	Common Name	Appropriate survey period	Month (s) surveyed
Eucalyptus macarthurii	Paddys River Box, Camden Woollybutt	All year	March, June, July and November
Eucalyptus aggregata	Black Gum	All year	March, June, July and November
Lysimachia vulgaris var. *davurica*	Yellow Loosestrife	December - March	March

2.2.5 Terrestrial fauna survey

Under the BAM, targeted surveys are not required for threatened fauna species known or predicted to occur within the proposal site (ecosystem credit species). These species are assumed to be present within certain PCTs, given a certain patch size and condition.

Targeted, seasonal surveys are required for species credit entities that could potentially occur at the proposal site based on the habitat resources present (referred to as 'candidate threatened species' under the BAM). Candidate threatened fauna species that were targeted during these surveys and the appropriate survey period as specified in the credit calculator are listed in Table 2.4.

As noted elsewhere in this report, the proposal site is dominated by exotic pasture, and there is no intact native woodland or forest vegetation present within the proposal site. The only canopy species are a single line of nine planted *Eucalyptus macarthurii* individuals along the north-south road alignment. It is estimated that these trees are about 25 years old (G. Leonard, *pers comm* via email, 1/2/2023). There was no evidence of any hollows in these trees at the time of the field survey. There are limited habitat features present within the proposal site, and the survey effort completed reflects the lack of habitat for arboreal mammals, large forest owls, threatened reptiles, and woodland birds.

Fauna survey techniques and effort are summarised in Table 2.5. All fauna observations were recorded using the 'sightings' app on a mobile phone.

Further detail regarding candidate fauna species targeted during surveys is provided in Section 4.1.

Table 2.4 Threatened fauna species targeted during surveys

Species name	Common Name	Appropriate survey period	Survey Method/s utilised	Month(s) surveyed
Litoria aurea	Green and Golden Bell Frog	November - March	Diurnal surveys for basking frogs, nocturnal spotlight surveys, call detection, call playback and tadpole survey in accordance with DEWHA (2009). Habitat assessments conducted with reference to DPE (2020).	March
Myotis macropus	Southern Myotis	October to March	Performed as per DEC (2004) Threatened Species Survey and Assessment Guidelines: two sound activated recording devices utilised for the entire night (a minimum of eight hours), starting at dusk, for two nights.	March

Table 2.5 Fauna survey techniques and effort

Survey technique	Survey effort
Spotlighting	One night of spotlighting on the evening of 2 March, 2021. Included four person hours, conducted between 8 – 10 PM. Survey effort included visually scanning all vegetation around the proposal site, the farm dams for frogs (in particular the Green and Golden Bell Frog), as well as publicly accessible planted roadside vegetation along the northern end of Beaconsfield Road. Total effort = four person hours.
Daytime traverses Active reptile/ amphibian searches Active searches for scats and signs	Targeted active searches of potential habitat throughout the study area targeting shelter dependent fauna such as small reptiles and frogs. Woody debris and other shelter substrate was lifted and inspected. Farm dams were surveyed for basking frogs. Dedicated searches for any signs of fauna occupation, including searching for evidence of feeding, foraging and signs of bird presence (such as pellets, whitewash, nests etc.) and signs of other biota (eg scats, scratches, diggings, tracks etc.).
Frog surveys	Call playback for the Green and Golden Bell Frog on the evening of 2 March 2021. Limited survey was completed given the lack of local source population, small size of farm dams, and general lack of suitable breeding habitat.
Ultrasonic call recording	Two Anabat units positioned at two locations within the proposal site over one night. The units were set to continuous recording and were placed on site at about 4:00 PM and collected the next morning at about 9:00 AM. Total effort = 16 recording hours, of which about 11 were in darkness.

Fauna habitat assessment

Fauna habitat assessments were undertaken throughout the proposal site, including active searches for potential shelter, basking, roosting, nesting and/or foraging sites. Specific habitat features and resources such as water bodies, food trees, hollow-bearing trees, rock outcrops or overhangs, the density of understorey vegetation, the composition of ground cover, leaf litter and ground debris and soil type were noted.

Indicative habitat criteria for targeted threatened species (i.e. those determined as having the potential to occur within the proposal site following the desktop review) were identified prior to fieldwork. Habitat criteria were based on information provided in DPIE and DAWE threatened species profiles, field guides, and the knowledge and experience of GHD field ecologists.

Habitat assessments included searches for signs of fauna activity or occupancy including:

– Trees with bird nests or other potential fauna roosts
– Burrows, dens and warrens
– Distinctive scats or latrine sites, owl white wash 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.

Active searches

Active searches of woody debris and other ground litter were conducted throughout the proposal site targeting threatened frogs and reptiles. Potential shelter sites such as old fence posts found lying on the ground were carefully turned and inspected. Diurnal searches were undertaken to look for basking frogs, (including identification of frog calls), waterbirds and reptiles including snakes, dragons and lizards.

Diurnal bird surveys

Bird surveys were completed in the morning and afternoon of March 2, and on the morning of March 3. Surveys focussed on the blackberry infestations and farm dams which provide foraging and shelter habitat for birds on the proposal site, as well as waterbodies for birds. Planted windbreaks and roadside vegetation adjacent to the proposal site were also surveyed for birds.

Aquatic habitat survey

Aquatic habitat within the proposal site is limited to four small farm dams, with water levels that vary depending on the amount of rainfall received. These dams contained water at the time of the field survey. Each of these dams appeared to be associated with small, unnamed, first order ephemeral drainage lines within and around the study area. The dams were surveyed for aquatic biota on 2 March 2021.

Opportunistic observations

Opportunistic and incidental observations of fauna species were recorded at all times during field surveys. This included a conscious focus on suitable areas of habitat during flora surveys, for instance blackberry infestations were scanned for foraging birds, and any ground-dwelling birds that were disturbed during traverses across the proposal site were recorded.

Spotlighting

Nocturnal spotlighting surveys were undertaken in areas of potential habitat value including the farm dams and row of planted trees along the northern end of Beaconsfield Road. Survey effort included visually scanning all vegetation around the proposal site with a particular focus on the farm dams for frogs (in particular the Green and Golden Bell Frog).

Ultrasonic call recording

Two Anabat units positioned at two locations within the proposal site over one night. The units were set to continuous recording and were placed on site at about 4:00 PM and collected the next morning at about 9:00 AM. The Anabats were placed near open water to target the foraging habitat of the Southern Myotis.

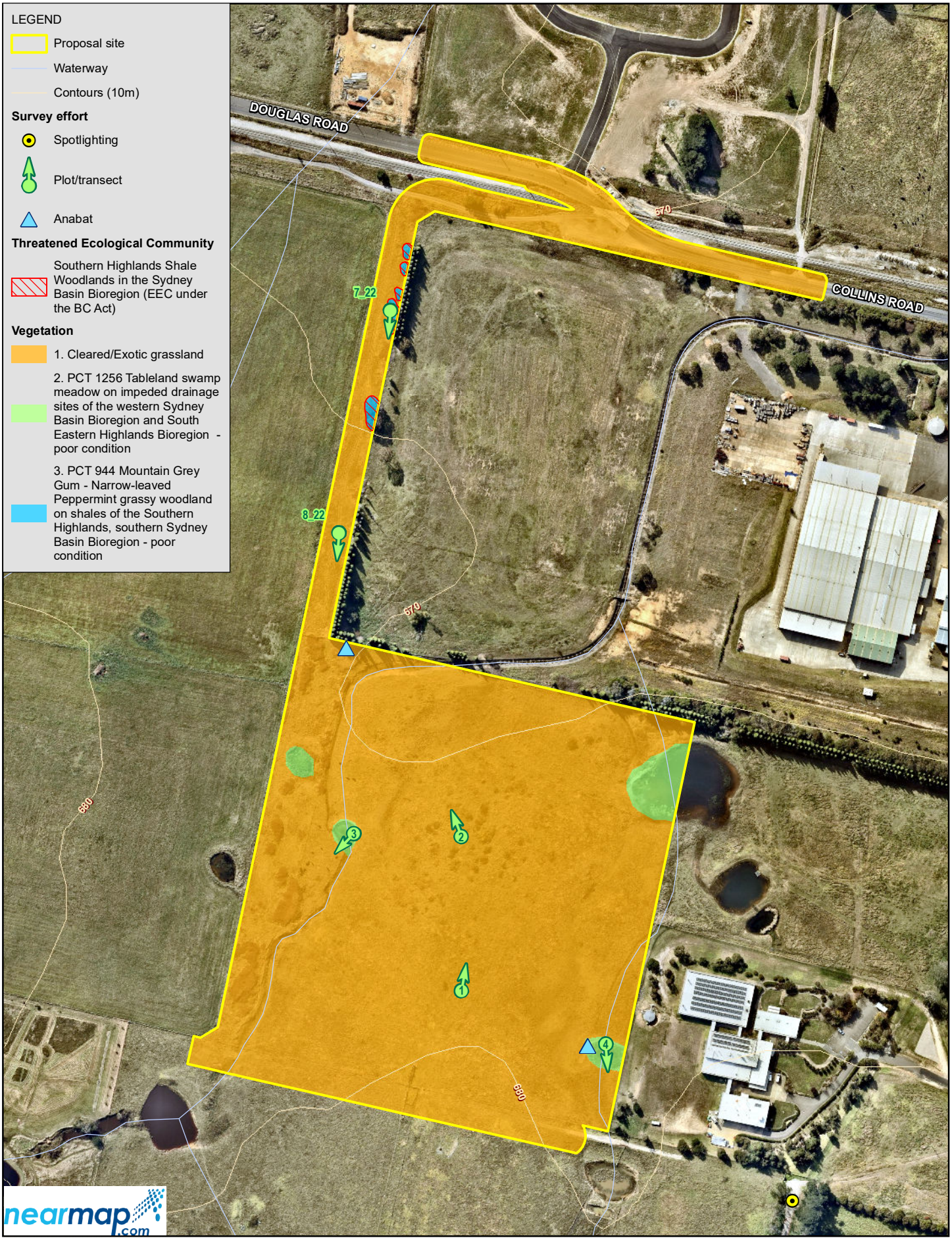
2.2.6 Survey conditions

Conditions during the March 2021 survey were sunny, cool and calm. A small amount (11 mm) of rain had fallen in the week preceding the survey. Wind during opportunistic fauna surveys and nocturnal surveys was low to none and so would not have hampered the detection of bird species. Frogs were abundant and actively calling in dams in the study area. Conditions during the June 2021 surveys were sunny and cold. A small amount (17 mm) of rain had fallen in the week preceding the survey. The November 2022 survey conditions were mild and dry at the time of the survey, however the proposal site and surrounding region had experienced relatively high rainfall in the month preceding the survey.

Bureau of Meteorology (BOM) records for the survey dates are outlined in Table 2.6. These records were taken at Moss Vale AWS weather station (068239) located approximately 5 km from the proposal site (BOM 2021b).

Table 2.6 Daily weather observations during the survey period

Date	Minimum temp (Deg Celsius)	Max temp (Deg Celsius)	Rainfall (24 hours to 9am) (mm)
02/03/2021	11.3	20.7	0
03/03/2021	10.3	19.4	0
08/06/2021	6.3	15.4	0
29/07/2021	4.1	10.6	0.2
09/11/2022	10.7	20.0	0



Paper Size ISO A4

0 70 140

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

Plasrefine Pty Ltd
Moss Vale Plastics Recycling Facility
Biodiversity Development Assessment Report

Project No. **12524108**
Revision No. **B**
Date **02 Mar 2023**

Survey effort and vegetation

FIGURE 2.1

N:\AU\Sydney\Projects\21\12524108\GIS\Maps\Deliverables\BDAR\12524108_BDAR004_SurveyEffortAndVegetation.mxd

Data source: Aerial imagery - nearmap 2023 (image date 24/04/2021, image extracted 30/06/2021); General topo - NSW LPI DTDB 2020, 2015. Created by: fmackay

2.3 Geographical Information System (GIS) analysis

GIS analysis is an integral part of the BAM. GIS was used to:

– Plot the proposal site on a high-resolution aerial photo base and to map vegetation zones, survey effort, habitat resources and biodiversity values across the site.
– Calculate the extent of native vegetation to be impacted.
– Confirm the relevant IBRA bioregion, IBRA subregion and NSW (Mitchell) Landscape for the proposal site.

Additional GIS analysis was used to plot a 1,500 m buffer area surrounding the proposal site in which site context components were calculated. Native vegetation cover, extent and connectivity were assessed using aerial photography. Air photo interpretation was used to identify and record distinct vegetation patches, determine the broad condition state of vegetation types and the location and extent of vegetated habitat corridors. The buffer area and GIS area calculations were used to enter information about landscape value and to determine the change in Landscape Value score by assessing the impact of the proposal on native vegetation cover and connectivity as well as the patch size.

2.4 BAM calculations

The proposal was assessed according to the methodology presented in the BAM (OEH, 2020), and the *Biodiversity Assessment Methods Calculator Users Guide* (OEH 2017b). The credit calculator is a software application that is used to apply the BAM. Data is entered into the credit calculator based on information collected in the desktop assessment, site surveys and from using GIS mapping software.

Initial BAM credit calculations were undertaken using credit calculator version 1.3.0.00. Revised BAM calculations, completed after receipt of comments from BCD were completed using calculator version 1.4.0.00, and updated again following adjustments to the project footprint and layout. The biodiversity credit report is included as Appendix F and the data and assumptions used to perform the BAM credit calculations are presented in Section 5. Calculations were completed in BAM-C case 00024641/BAAS17031/21/00024642.Staff qualifications

The initial biodiversity development assessment report (BDAR) and credit calculations were completed by Madeline Young (accredited assessor number BAAS19071) in accordance with the BAM, based on field surveys completed by Madeline Young, Fanny Stricher and Kath Chesnut (accredited assessor number BAAS17031), with a technical review of the report undertaken by Ben Harrington (accredited assessor number BAAS17023) and Jayne Tipping. A subsequent BDAR was completed by Madeline Young with updates made in response to comments received from BCD and in response to a minor change in the footprint, with a review completed by Kath Chesnut. This revised BDAR has been updated by Kath Chesnut (accredited assessor number BAAS17031) in response to a change in project footprint, based on field surveys completed by Kath Chesnut and Cindy Murphy, with a review completed by Kirsten Crosby (accredited assessor number BAAS17011). Staff qualifications are presented in Table 2.7.

Table 2.7 GHD ecology staff and qualifications

Name	Position / Project Role	Qualifications	Relevant Experience
Maddy Young	Ecologist / lead assessor Field surveys, desktop assessment and reporting, BAM-C calculations	BEnvSc (Hons) Accredited BAM Assessor	6+ years
Jayne Tipping	Technical Director – Biodiversity / BDAR review	BSc Masters Environmental Law	27+ years
Kirsten Crosby	Technical Director – Biodiversity / BDAR review	BSc (Hons), PhD (Zoology) Accredited BAM Assessor	17+ years
Ben Harrington	Technical Director – Biodiversity / BDAR and BAM-C review	BSc, MSc (Physical Geography) Accredited BAM Assessor	17+ years

Name	Position / Project Role	Qualifications	Relevant Experience
Kath Chesnut	Senior Ecologist / lead assessor Field survey, desktop assessment, report contributor, BDAR review and BAM-C calculations	BEnvSc (Hons) Accredited BAM Assessor	11+ years
Fanny Stricher	Ecologist / field survey, desktop assessment and report contributor	BSc, MEcol	4+ years
Cindy Murphy	Ecologist / field survey, desktop assessment and report contributor	BSc	2+ years

3. Existing environment

3.1 Landscape features

The BAM requires the assessment of landscape features to help describe the biodiversity values of the proposal site and assess the impacts of the proposal. Landscape features relevant to the BAM calculations are shown on Figure 3.1, discussed below and summarised in Table 3.1.

3.1.1 Location and land uses

The proposal site is about 2.8 km northwest of the Moss Vale town centre, within the Wingecarribee LGA. The proposal site is also included within the Moss Vale Enterprise Corridor (MVEC) catchment. The MVEC is an area of land between Moss Vale and New Berrima set aside for employment generating development under the Wingecarribee Shire LEP 2010. The MVEC is about 1,100 ha of industrial zoned land (Cardno, 2020).

There are several existing industrial businesses located to the north and east of the proposal site, including timber recycling facilities, industrial manufacturing and packaging facilities, a medical research facility, and a chemical (adhesives) plant. To the west and south of the proposal site, land is used for agricultural activities, with grazing of livestock the primary focus.

Much of the proposal site has been cleared of all native vegetation and is dominated by exotic pasture. One small vegetated windbreak exists along the eastern boundary of the north-south road alignment and there are several planted windbreaks nearby or adjacent to the proposal site which support the only midstorey or overstorey vegetation close to the proposal site. These windbreaks support a mixture of mature exotic species, as well as sub-mature, generally native species, however, do contain species that are not locally indigenous. The potential north-south road alignment runs through a ‘paper road’ owned by Council, which has also been largely cleared of all native vegetation, except for a row of canopy trees along the eastern boundary. A planted row of exotic pines is present to the east of the southern portion of this potential road alignment.

The proposal site does not contain any buildings, and the only structure on site is an old, decrepit cattle loader. This was inspected for any signs of use by microbats and other fauna species, and there was no evidence of use. Recent land uses have included grazing, and historical land uses appear to have included timber-getting and agriculture.

The Main Southern Railway line and the adjacent Collins Road and McCourt Road run in a north/south direction about 700 m to the east of the proposal site, and the Berrima Branch Railway line and the adjacent Douglas Road run in an east/west direction along the north of the proposal site.

3.1.2 Bioregion and IBRA subregion

The proposal site occurs within the Moss Vale IBRA (Interim Biogeographic Regionalisation for Australia) subregion of the Sydney Basin IBRA bioregion (refer to Figure 3.1). The Sydney Basin IBRA bioregion lies on the central east coast of NSW and covers an area of about 3,624,008 ha which includes about 4.53 per cent of NSW. The region extends north from Batemans Bay to Nelson Bay and west to Mudgee and includes a significant proportion of the catchments of the Hawkesbury-Nepean, Hunter and Shoalhaven River systems.

3.1.3 NSW landscape region (Mitchell Landscapes)

The proposal site is mapped entirely within the ‘Moss Vale Highlands’ Mitchell Landscape (refer to Figure 3.1) (DECC, 2008a).

The Moss Vale Highlands is described as occurring on rolling hills and rounded peaks with deep channel incision on horizontal Triassic alternating quartz sandstone and shale, general elevation 700 to 850mm, local relief 80m. Widespread yellow and grey texture-contrast soils, deep yellow earth on friable sandstone often with concretionary ironstone and accumulations of clan quartz sand in valleys.

The vegetation is described as woodland of Silvertop ash (*Eucalyptus sieberi*), Sydney peppermint (*Eucalyptus piperita*), Smooth-barked apple (*Angophora costata*), Blue-leaved stringybark (*Eucalyptus agglomerata*) and Scribbly gum (*Eucalyptus haemastoma*) on sheltered sites. Open forest in gullies at the head of rivers below the plateau; Gully gum (*Eucalyptus smithii*), River peppermint (*Eucalyptus elata*), Mountain grey gum (*Eucalyptus cypellocarpa*). Woodland of mountain grey gum, Coastal white box (*Eucalyptus quadrangulata*), White stringybark (*Eucalyptus globoidea*), Swamp gum (*Eucalyptus ovata*), and Cabbage gum (*Eucalyptus amplifolia*) on shale and poorly drained sites. Large areas of wet heath with; prickly Broom heath (*Monotoca scoparia*), Coral heath (*Epacris microphylla*), Christmas bells (*Blandfordia nobilis*) and Button grass (*Gymnoschoenus sphaerocephalus*) with patches of stunted Silvertop ash, Red bloodwood (*Corymbia gummifera*), and Scrub she-oak (*Allocasuarina paludosa*)

Based on the vegetation, landforms and soils observed during the field survey, the Moss Vale Highlands Mitchell landscape is a good fit for the biophysical environment at the proposal site.

3.1.4 Climate

The site has a temperate climate. Based on data from the Moss Vale AWS (068239) weather station, the proposal site has a mean annual rainfall of 713 mm. The proposal site can reach mean daily maximum temperatures of 23.6 degrees and mean daily minimum temperature of 13.2 degrees Celsius (BOM 2021b).

3.1.5 Soils and geology

Soil landscapes

The majority of the proposal site is mapped as occurring on the Moss Vale soil landscape which comprises rises on Wianamatta Group Shale in the Moss Vale Tablelands and Woronora Plateau (OEH 2021d). This soil landscape has a local relief of 5-30 m with slopes between 0-5%. Soils in this landscape comprise Yellow Kurosols (Yellow Podzolic Soils), Red Kurosols (Red Podzolic Soils), Brown Kurosols (Yellow Podzolic Soils) and Yellow Kandosols (Yellow Earths).

The southeast corner of the proposal site and adjoining land is mapped as Lower Mittagong soil landscape. This landscape comprises rises and low hills on Wianamatta Group Shale (shale) in the Moss Vale Tablelands, Wanganderry Tablelands and Woronora Plateau. Local relief is 5–90 m with slopes generally 0-25%. Soils in this landscape comprise Brown Kurosols (Yellow and Brown Podzolic Soils), Red Kurosols (red Podzolic Soils), Brown Dermosols (Yellow Earths) and Red and Brown Kandosols (Red Earths and Brown Earths), with Yellow Natric Kurosols (Soloths) in drainage lines.

Soil hazards

Soil landscapes for the proposal site and surrounding buffer area indicate that soils associated with the Moss Vale soil landscape have a minor to moderate risk of gully erosion in cleared drainage plains. Due to intensive farming potassium (K) deficiency commonly occurs in the soils of this landscape.

Soils associated with the Lower Mittagong soil landscape have a minor to moderate risk of gully erosion in cleared drainage plains. Minor sheet erosion is common.

There is minimal risk of acid sulfate soils as the proposal site is not in a coastal location and has an elevation ranging from about 670-680 m AHD. Acid sulfate soil risk mapping indicates that there are no known occurrences at the proposal site (OEH 2021d).

Areas of geological significance

There are no karst, caves, crevices, cliffs or other areas of geological significance located within the proposal site or buffer area surrounding the proposal site.

3.1.6 Hydrology

Two watercourses are present in the proposal site. A small, unnamed ephemeral second order drainage line occurs in the western portion of the proposal site and eventually flows into Wingecarribee River. Part of this drainage line has been modified substantially and now flows along a concrete drainage channel. A first order unnamed ephemeral drainage line runs along the eastern boundary of the proposal site and also eventually flows into Wingecarribee River (see Figure 3.1). Each of these drainage lines area heavily infested with exotic vegetation, including dense thickets of Blackberry (*Rubus fruticosus* sp. agg.).

3.1.7 Wetlands

There are four farm dams in the study area (refer to Figure 1.1). The dams are associated with the two ephemeral drainage lines on the proposal site and appear to have been excavated to capture local surface flow. All dams contained water at the time of field surveys.

The dams are clearly artificial waterbodies, however, contain some native and exotic fringing and aquatic vegetation. These water bodies do not comprise an occurrence of the Threatened Ecological Community (TEC) Freshwater Wetlands on Coastal Floodplains as they are artificial waterbodies created on previously dry land for purposes such as farm production. Such artificial water bodies do not comprise part of the TEC according to the identification guidelines for the community (NSW Scientific Committee 2010).

3.1.8 Patch size and connectivity features

There is no intact native woodland or forest vegetation within the proposal site. There are scattered, isolated dams on site that support a highly modified form of the PCT Tableland swamp meadow on impeded drainage sites of the western Sydney Basin Bioregion and South Eastern Highlands Bioregion. The total size of this patch is about 0.28 ha within the 1,500 m buffer of the proposal site. The small patch of planted *Eucalyptus macarthurii* along the new north-south road alignment have a patch size of 0.04 ha within the 1,500 m buffer of the proposal site.

The nearest patches of intact native vegetation to the proposal site appear to be about 3.5 km to the northwest (riparian vegetation associated with the Wingecarribee River), about 10 km to the west (Belanglo Stage Forest), 7.5 km to the south (Meryla State Forest), and about 13 km to the east (Upper Nepean State Conservation Area). These patches are all separated from the proposal site by large areas of cleared agricultural land, industrial land, residential areas and existing infrastructure such as rail lines and major roads. Highly mobile fauna species could traverse these distances, however given the lack of habitat resources within the proposal site, many fauna species are unlikely to occur within the proposal site. This distance would constitute a hostile gap for less mobile species (DECC 2008e).

The BAM provides guidance on assessing the patch size for a vegetation zone and notes that patch size should be assigned to a class. The patch size for the vegetation zone that occurs within the proposal site is ≥ 5 ha, with 0.28 ha occurring within the 1,500 m buffer of the proposal site. This has been rounded up to 1 ha for the purposes of the BAM-C calculations, which require a whole number be input in the calculator.

Within the 1,500 m buffer area surrounding the proposal site native vegetation comprises approximately 1.77 percent of the area. This has been rounded up to 2 percent in the BAM-C.

Two ephemeral watercourses occur on the proposal site as described in section 3.1.6 above. There is no native riparian vegetation along the watercourses on the proposal site and no existing connectivity for terrestrial biota. There is almost no riparian vegetation remaining along the smaller tributaries of Wingecarribee River or along the main watercourse itself, and therefore very limited potential to act as a vegetated link to the aquatic and riparian habitats elsewhere along Wingecarribee River. As such, the proposal is unlikely to further fragment the vegetation associated with this drainage line. The watercourses on the proposal site flow into a concrete channel to the north which would inhibit connectivity for aquatic biota.

Table 3.1 Summary of landscape features present within the proposal site

Landscape feature	Project site
Method applied for site context components	Site-based
Interim Biogeographic regionalisation of Australia (IBRA) bioregion	Sydney Basin
IBRA subregion	Moss Vale
Mitchell landscapes	Moss Vale Highlands
Rivers, streams and estuaries	There are two ephemeral watercourses on the proposal site; one first order watercourse and one second order watercourse.
Wetlands	None present, however there are four small farm dams on site with varying covers of emergent aquatic vegetation
Connectivity features	There is no intact native woodland or forest vegetation within the proposal site and the site is not connected to any patches of intact native vegetation. The two watercourses onsite provide limited aquatic habitat connectivity to the Wingecarribee River as the streams flow into a concrete channel and there is no riparian vegetation on the banks of the watercourses.
Areas of geological significance or soil hazard features	Soil landscapes for the proposal site and surrounding buffer area indicate that soils associated with the Moss Vale soil landscape have a minor to moderate risk of gully erosion in cleared drainage plains Soils associated with the Lower Mittagong soil landscape have a minor to moderate risk of gully erosion in cleared drainage plains. Acid sulfate soil risk mapping indicates that there are no known occurrences at the proposal site (OEH 2021d). There are no karst, caves, crevices, cliffs or other areas of geological significance located within the proposal site or buffer area surrounding the site.
Other landscape features	Nil
Current percent native vegetation cover buffer area	1.77 percent (entered as 2 percent
The future percent native vegetation cover buffer area	1.73 percent

3.1.9 Other site features

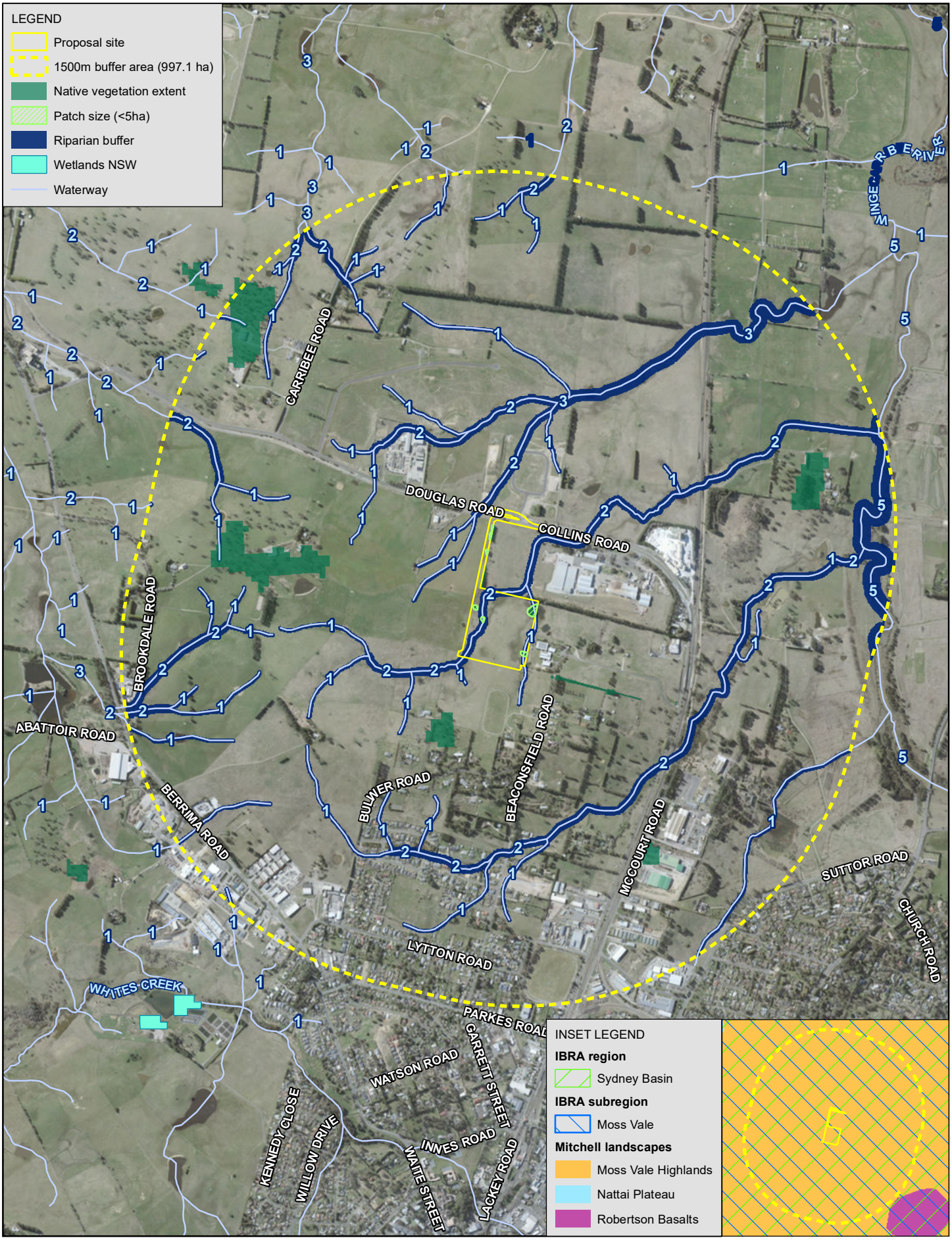
Other site features include artificial water bodies (farm dams), livestock management infrastructure (including both intact and decaying fences), native tree plantings, and exotic grassland. Infrastructure and exotic grassland were not included in BAM calculations, however, have been considered with regard to potential prescribed biodiversity impacts on threatened species.

3.1.10 Non-native vegetation

Non-native vegetation occurs as exotic grassland within the proposal site. Exotic grassland occupies 10.15 ha of the proposal site and extends over the whole site and surrounds the farm dams. Exotic grassland in the proposal site has been subject to grazing by livestock (by at least approximately 9 cows for the past 5 years on the development site and new north-south road alignment). Three floristic plots (Plots 1, 2 and 8_22) were sampled in exotic grassland (refer to Figure 2.1) to confirm the vegetation did not conform to a native PCT.

There was no native overstorey or midstorey species within these plots. Native species richness was very low in the understorey and was restricted to very sparse occurrences of *Rytidosperma, Lachnagrostis filiformis* and Weeping grass (*Microlaena stipoides* var. *stipoides*). Exotic species dominated the understorey and included Paspalum (*Paspalum dilatatum*), Blackberry (*Rubus fruticosus* sp. agg.*),* Serrated tussock (*Nassella trichotoma*), *Setaria parviflora* and African lovegrass (*Eragrostis curvula*).

An offset is not needed for impacts on native vegetation if the vegetation integrity score is below 17 if the vegetation zone is associated with potential threatened species habitat in accordance with section 9.2.1 of the BAM (OEH 2020). Plots 1, 2 and 8_22 had an integrity score of 1.5, as such ecosystem credit offsets are not required for impacts to this vegetation zone.



Paper Size ISO A4

0 400 800

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

Plasrefine Pty Ltd
Moss Vale Plastics Recycling Facility
Biodiversity Development Assessment Report

Project No. **12524108**
Revision No. **B**
Date **02 Mar 2023**

Proposal site location

FIGURE 3.1

N:\AU\Sydney\Projects\21\12524108\GIS\Maps\Deliverables\BDAR\12524108_BDAR002_LocationMap.mxd

Data source: Aerial imagery - Sixmaps 2023 ; General topo - NSW LPI DTDB 2020, 2015; Vegetation, IBRA regions and subregions, Mitchell Landscapes, wetlands - OEH. Created by: fmackay

3.2 Native vegetation

3.2.1 Native vegetation extent

There is 0.28 ha of native vegetation in the proposal site associated with PCT 1256 Tableland swamp meadow on impeded drainage sites of the western Sydney Basin Bioregion and South Eastern Highlands Bioregion. There is also about 0.04 ha of planted native trees comprising a single line of Eucalyptus macarthurii, that has been assigned to the PCT 944 Mountain Grey Gum - Narrow-leaved Peppermint grassy woodland on shales of the Southern Highlands, southern Sydney Basin Bioregion. PCT 1256 occurs as farm dams, associated with ephemeral drainage lines within the footprint, while PCT 944 is associated with a narrow, linear windbreak along the new north-south road alignment.

3.2.2 Flora species

Common species recorded are discussed below in relation to the vegetation zones occurring within the proposal site.

3.2.3 Plant community types

Overview

Field surveys confirmed the presence of some native vegetation present within the proposal site, which was assigned to the closest possible PCTs, as shown on Figure 2.1 and described in Table 3.2, Table 3.3 and Table 3.4. These vegetation zones are modified and/or planted forms of native vegetation but were assigned to the 'most likely' PCT in accordance with Section 4.2.2. of the BAM (OEH 2020). Vegetation within each zone was considered relatively homogenous, however was not considered homogenous across the entire site.

Mature trees are absent within much of the proposal site with the exception of several small windbreaks, comprising a row of planted *Cupressus torulosa* along the south eastern boundary of the new north-south road alignment. There is also a row of planted *Eucalyptus macarthurii* along the eastern boundary of the new north-south road alignment that are estimated to be about 25 years old (G. Leonard, *pers comm* via email, 1/2/2023) and in good condition. There are no hollow-bearing trees on the proposal site, and no natural regeneration of any canopy species within the proposal site.

The native vegetation within the proposal site is in poor condition with many weeds present. There are dense patches of weedy grasses including Serrated Tussock (*Nassella trichotoma*) and *Setaria parviflora,* as well as infestations of the woody weed Blackberry (*Rubus fruticosus* spp*.* agg), throughout the proposal site.

Table 3.2 Vegetation within the proposal site

Vegetation zone	Old PCT ID and name	Revised east coast PCT ID and name	Condition	Area (ha)	Patch size (ha)	Vegetation integrity score	BC Act	EPBC Act
Farm dams	PCT 1256 Tableland swamp meadow on impeded drainage sites of the western Sydney Basin Bioregion and South Eastern Highlands Bioregion	PCT 3932 Central and Southern Tableland Swamp Meadow Complex	Poor	0.28	0.32 (< 5 ha)	46.4	Not a TEC	Not a TEC
Planted stand of *Eucalyptus macarthurii* along new north-south road alignment	PCT 944 Mountain Grey Gum - Narrow-leaved Peppermint grassy woodland on shales of the Southern Highlands, southern Sydney Basin Bioregion	PCT 3302 Southern Highlands Shale-Basalt Dry Forest	Poor	0.04	0.32 (< 5 ha)	2.1	Southern Highlands Shale Woodlands in the Sydney Basin Bioregion EEC	Does not meet the minimum condition thresholds or key diagnostic criteria for listing.
Exotic grassland	N/A	N/A	N/A	10.15	N/A	1.5	Not a TEC	Not a TEC
Total area of native vegetation				**0.32**				
Total area				**10.47**				

Notes: TEC = Threatened ecological community

Native vegetation zones

The structure, species composition and condition of the vegetation zones within the proposal site are described below. Plot data is provided in Appendix D, along with benchmark values for the PCTs.

Table 3.3 ***Zone 1 – Tableland swamp meadow on impeded drainage sites of the western Sydney Basin Bioregion and South Eastern Highlands Bioregion_poor condition***

Tableland swamp meadow on impeded drainage sites_poor condition	
PCT	Assigned to the PCT 1256 Tableland swamp meadow on impeded drainage sites of the western Sydney Basin Bioregion and South Eastern Highlands Bioregion. This PCT has been decommissioned, and amalgamated into PCT 3932 Central and Southern Tableland Swamp Meadow Complex as part of the Eastern NSW PCT Classification version 1.1. This vegetation type that is associated with farm dams in the proposal site does not strictly meet the definition of the nominated PCT, as per the BioNet Vegetation Classification, but was allocated to this PCT to which it most closely aligns, based on floristic composition, landscape position and geology.
PCT ID	1256 / 3932. Entered into BAM-C as PCT 1256
Photo	
Survey effort	Plots 3 and 4
Conservation significance	Not a threatened ecological community, habitat for native fauna and flora. These water bodies do not comprise an occurrence of the Threatened Ecological Community (TEC) Freshwater Wetlands on Coastal Floodplains as they are artificial waterbodies created on previously dry land for purposes such as farm production. Such artificial water bodies do not comprise part of the TEC according to the identification guidelines for the community (NSW Scientific Committee 2010).
Patch size class	< 5 ha (0.28 ha within the 1500 m buffer of the proposal site)
Condition	The Plot data confirms that this vegetation is in poor condition, with values well below benchmark for all native plant species richness and most vegetation cover attributes although percentage of forb cover was higher than benchmark. No canopy trees were recorded in this vegetation zone. No fallen logs or leaf litter are present. The banks of the dams were colonised by exotic species. The larger two of these dams are in close proximity to adjacent properties, that support industrial activities, and there is a constant level of background noise associated with the adjacent land uses. This noise may deter some species from occurring, should they be present in the local area.
Current vegetation integrity score	46.4
Landscape position	Occurs within the four farm dams on the proposal site.
Structure	Freshwater wetland species colonising a farm dam.
Over storey	Absent
Mid storey	Absent

Tableland swamp meadow on impeded drainage sites_poor condition	
Groundcover	The dams were colonised by native aquatic species, including Water couch (*Paspalum distichum*), Floating pondweed (*Potamogeton tricarinatus*), Tall spike rush (*Eleocharis sphacelate), Juncus usitatus,* Water primrose (*Ludwigia peploides* subsp*. montevidensis), Juncus continuus, Juncus prismatocarpus* and *Schoenoplectus* spp*.*
Exotic species	Exotic aquatic species within the dam included *Cyperus congestus,* Phalaris (*Phalaris aquatica*) and *Cyperus brevifolius.* Exotic species that have colonised the banks of the dam included *Paspalum dilatatum,* Kikuyu grass (*Cenchrus clandestinus*), Tall fleabane (*Conyza sumatrensis*), Catsear (*Hypochaeris radicata*), and African lovegrass (*Eragrostis curvula*). Four high threat weeds were recorded in this vegetation zone (*Paspalum dilatatum,* Kikuyu grass (*Cenchrus clandestinus*), Phalaris (*Phalaris aquatica*) and African lovegrass (*Eragrostis curvula*)).

Table 3.4 Zone 2 – Mountain Grey Gum - Narrow-leaved Peppermint grassy woodland on shales of the Southern Highlands, southern Sydney Basin Bioregion_poor condition

Mountain Grey Gum - Narrow-leaved Peppermint grassy woodland on shales of the Southern Highlands, southern Sydney Basin Bioregion_poor condition	
PCT	Mountain Grey Gum - Narrow-leaved Peppermint grassy woodland on shales of the Southern Highlands, southern Sydney Basin Bioregion. This PCT has been split into new PCTs as part of the Eastern NSW PCT Classification version 1.1, and aligns with PCT 3302 Southern Highlands Shale-Basalt Dry Forest. The vegetation in the proposal site does not strictly meet the definition of this PCT, as per the BioNet Vegetation Classification but was allocated to this PCT to which it most closely aligns, conservatively based on floristic composition (presence of *Eucalyptus macarthurii*), landscape position, nearby vegetation mapping and geology.
PCT ID	944 / 3302. Entered into BAM-C as PCT 944.
Photo	
Survey effort	Plot 7_22
Conservation significance	Planted native trees that provide some habitat for native fauna. PCT 944 is broadly commensurate with *Southern Highlands Shale Woodlands of the Sydney Basin Bioregion* which is listed as an endangered ecological community (EEC) under the BC Act. The patch of planted vegetation in the proposal site does not meet the minimum condition thresholds or key diagnostic criteria for inclusion as the critically endangered ecological community listed under the EPBC Act (detail provided in section 4.2.3).
Patch size class	< 5 ha (0.28 ha within the 1500 m buffer of the proposal site)
Condition	The plot data confirms that this vegetation is in poor condition, with values well below benchmark for all vegetation integrity attributes. The groundcover layer is colonised by exotic species.

Mountain Grey Gum - Narrow-leaved Peppermint grassy woodland on shales of the Southern Highlands, southern Sydney Basin Bioregion_poor condition	
Current vegetation integrity score	2.1 (ie, ecosystem credits are not required for impacts to this vegetation zone.
Landscape position	This PCT occurs on the Southern Highlands plateau from Mittagong to Bundanoon. The patch of vegetation on the proposal site occurs as a thin strip of planted trees along the proposed north-south road alignment.
Structure	Single line of planted trees that form a windbreak along the property boundary. Trees are evenly aged, and appear to have been planted at the same time.
Over storey	Planted specimens of *Eucalyptus macarthurii* of unknown provenance. Specimens are estimated to be about 25 years old (G. Leonard, *pers comm* via email, 1/2/2023).
Mid storey	Absent
Groundcover	Exotic grassland, subject to grazing by cattle. The only native species present was *Juncus continuus*.
Exotic species	Exotic herbaceous and grass species, including Hypochaeris radicata, Paspalum dilatatum, Holcus *lanatus*, *Plantago lanceolata*, *Taraxacum officinale*, *Pennisetum clandestinum*, *Eragrostis leptostachya*, *Lolium perenne*, *Phalaris aquatica*, *Bromus diandrus*, *Cirsium vulgare*, *Sonchus oleraceus*, *Hypericum perforatum* and the woody weed *Rubus fruticosus* agg.

3.2.4 Groundwater dependent ecosystems

No native vegetation within the proposal site is mapped as a GDE in the Atlas of GDEs. The vegetation recorded in the proposal site would not be dependent on groundwater.

3.3 Habitat resources

The proposal site contains limited habitat resources for native fauna, and a low diversity of native fauna species were recorded in the study area (refer to Appendix B). Species recorded were those capable of persisting in disturbed, rural environments and in fragmented patches of vegetation that lack structural and floristic diversity.

The study area contains the following broad habitat types for fauna:

– Exotic grassland
– Planted trees
– Ephemeral streams and farm dams

The various habitats and their biodiversity values are discussed in the following tables:

Table 3.5 Habitat resources on the proposal site

Exotic grassland	
Description	Exotic grassland is the most common fauna habitat type within the study area, covering the majority of the proposal site. The proposal site has been historically cleared for agriculture and is currently grazed by livestock. Exotic grassland contains few habitat resources of relevance to most native fauna species due to its limited structural complexity and floristic diversity. The exotic grassland provides foraging habitat for some species (eg macropods, raptors and ground-foraging birds and snakes). There is limited refuge for most fauna, apart from dense thickets of Blackberry that provide refuge, nesting and foraging habitat for small birds including Grey Fantail (*Rhipidura albiscapa*), Yellow Thornbill (*Acanthiza nana*), and Fairy-wren (*Malurus* sp.).
Typical fauna species recorded or likely to occur	Fauna recorded in this habitat were largely ground-foraging birds capable of utilising open grassland areas. Commonly recorded birds included insectivorous species such as the Magpie-lark (*Grallina cyanoleuca*), Grey Fantail (*Rhipidura albiscapa*), Welcome Swallow (*Hirundo neoxema*), Australian Pipit (*Anthus novaeseelandiae*) and Australian Magpie; granivorous species such as the Eastern Rosella (*Platycercus eximius*). Australian Wood Ducks (*Chenonetta jubata*) were recorded in grassland areas adjacent to farm dams on the proposal site.

Exotic grassland	
	Grassland areas provide foraging habitat for larger herbivores, including the Eastern Grey Kangaroo (*Macropus giganteus*). Bats typical of open areas such as the White-striped Freetail Bat (*Austronomus australis*) and Gould's Wattled Bat (*Chalinolobus gouldii*) may forage over this habitat type. Common frogs such as the Common Eastern Froglet (*Crinia signifera*), Eastern Dwarf Tree Frog (*Litoria fallax*) and Brown-striped Frog (*Limnodynastes peronii*) may occur in small soaks within exotic grassland following rain. Grassland areas also provides habitat for a range of reptile species, including small lizards and common snakes such as the Red-bellied Black Snake (*Pseudechis porphyriacus*)
Threatened and migratory fauna species recorded or likely to occur	No threatened fauna or migratory species were recorded in this habitat type during the field survey. Threatened microbats may forage on occasion over grassland areas. Exotic grassland does not provide roosting habitat for threatened microbats.
Introduced species recorded	Species recorded included the Common Starling (*Sturnus vulgaris*), the House Mouse (*Mus musculus*) and Rabbit (*Oryctolagus cuniculus*).
Photo	

Planted woodland trees	
Description	Narrow strip of native trees, with an understorey dominated by exotic grass species that is subject to grazing and irrigation from a bore. This vegetation type is located along the fence line of the proposed north-south road alignment. It is along the border of the council-owned paper-road, and adjacent to a stand of mature planted Himalayan cypress (*Cupressus torulosa*) that act as a windbreak. It contains similar exotic groundcover species as the adjacent exotic grassland which provides limited habitat resources for most native fauna species. There is no midstorey vegetation. No hollow-bearing trees were recorded in this vegetation type.
Typical fauna species recorded or likely to occur	A number of birds species were recorded using trees for refuge and foraging during field surveys. Species included insectivorous species such as the Grey Fantail (*Rhipidura albiscapa*); and omnivorous species such as the Eastern Rosella (*Platycercus eximius*).
Threatened and migratory fauna species recorded or likely to occur	No threatened fauna or migratory species were recorded in this habitat type during the field survey. Threatened birds may forage or find refuge on occasion within the tree layer as part of a larger home range, however none would rely on the habitats present for their continued persistence in the locality. This vegetation zone does not provide roosting habitat for threatened bird and microbat species.
Introduced species recorded	No introduced species were record during the field survey. Due to the proximity to the exotic grassland, the Common Starling (*Sturnus vulgaris*) the House Mouse (*Mus musculus*) and Rabbit (*Oryctolagus cuniculus*) are likely to occur in this area.

Planted woodland trees	
Photo	

Dams	
Description	Four dams with some sparse emergent aquatic vegetation are located on the proposal site. No canopy trees or shrubs are present near the dams. Two degraded ephemeral drainage lines occur on the proposal site. The drainage lines do not comprise key fish habitat and are highly modified with the northern section consisting of a concrete channel.
Typical fauna species recorded or likely to occur	Frogs including the Brown-striped frog (*Limnodynastes peronii*), Spotted grass frog (*Limnodynastes tasmaniensis*), Eastern dwarf tree frog (*Litoria fallax*), Verreaux's frog (*Litoria verreauxii*), and Common eastern froglet (*Crinia signifera*) were recorded in the dams. The dams are also likely to provide habitat for common waterbirds typical of rural areas and dams and flooded grassland such as the Australian Wood Duck (*Chenonetta jubata*) and the White-faced Heron (*Egretta novaehollandiae*). Microbats including Little Forest Bat (*Vespadelus vulturnus*) and Large Forest Bat (*Vespadelus darlingtonia*) may forage for insects that are often abundant around dams. The dams may also provide water source for a wide range of common birds and mammals as well as habitat for reptiles such as snakes, water skinks and dragons.
Threatened and migratory fauna species recorded or likely to occur	The dams may provide foraging habitat for the Southern Myotis (*Myotis 32acropus)* which was recorded via anabat call recording near to a dam during the March 2021 survey. This species forages over streams and pools catching insects and small fish by raking their feet across the water surface. The Green and Golden Bell Frog (*Litoria aurea*) is unlikely to occur on the proposal site. The species is known to inhabit marshes, dams and stream-sides that contain dense stands of bullrushes (*Typha* spp.) or spikerushes (*Eleocharis* spp.). No dense emergent aquatic vegetation occurs in the farm dams present on the proposal site, with only a sparse cover of *Eleocharis* present. There are no records of Green and Golden Bell Frog in the locality, nor are there any source populations from which the species may travel through the proposal site. Degraded farm dams are unlikely to provide suitable breeding habitat for the species. The species was not recorded during surveys in March 2021, nor would the species be considered likely to occur. The nearest known records of the species are more than 45km to the south east, near Nowra. The dams do not contain tall dense emergent vegetation and are not suitable habitat for the Australasian Bittern, which favours permanent freshwater wetlands with tall dense reedbeds, particularly *Typha* spp. and *Eleocharis* spp., with adjacent shallow, open water for foraging. The watercourses and dams are unlikely to provide habitat for threatened fish listed under the FM Act.

Dams	
Photo	

The BAM assessment of habitat resources at the proposal site was completed with reference to the above observations. The BAM-C generates specific geographic and habitat features that can be used to indicate the potential presence of threatened species. The following features were considered present at the proposal site:

- Waterbodies
- Semi-permanent/ephemeral wet areas
- Land within 1 kilometre of wet areas/swamps
- Land within 1 kilometre of waterbodies/swamps
- Land within 200 m of riparian zone
- Land within 1 km of waterbody
- Land within 1 km of a rivers, lakes, large dams or creeks, wetlands and coastlines
- Riparian areas and drainage lines or within 100 m
- Waterbodies with permanent pools/stretches 3 m or wider, including rivers, large creeks, billabongs, lagoons, estuaries, dams and other, on or within 200 m of the site.

Several habitat constraints were considered to be absent from the proposal site, including:

- Swamps
- Margins of swamps or within 100 m
- Hollow-bearing trees
- Living or dead trees with hollows greater than 15 cm diameter and greater than 8 m above ground
- Land containing peat swamps and their margins or tributaries
- Land containing peat bogs and margins on either Sphagnum Moss humps or sedge communities
- Living or dead mature trees within suitable vegetation within 1 km of a rivers, lakes, large dams or creeks, wetlands and coastlines
- Land containing peat swamps and wetland margins or within 20 m
- Caves
- Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding including species records with microhabitat code "IC - in cave, " observation type code "E nest-roost, " with numbers of individuals >500
- Presence of Koala use trees
- Grey-headed Flying-fox breeding camps
- Land within 200 m of a swamp

The farm dams present were excluded as being swamps for the purposes of this assessment. The dams lacked surrounding native vegetation, were man-made, and lacked the various ecological functions and components that are implied in the use of ‘swamp’ as a habitat constraint for the relevant species.

4. Threatened biota

4.1 Identification of threatened species under the BAM

4.1.1 Predicted threatened species

Based on the vegetation types and habitat resources present within the proposal site, the BAM calculator generates a list of threatened fauna species that are predicted to utilise the proposal site. The suite of threatened species associated with ecosystem credits required for the proposal site are listed in Table 4.1. For each predicted threatened species a sensitivity class rating is also provided. Targeted surveys are not required for these species. Species can be excluded as potential predicted species if specific habitat constraints or geographic limitations required by the species are not present on the proposal site. Appendix A and Table 4.1 indicate whether predicted species were excluded from BAM-C calculations, with Appendix A providing justification for their exclusion, where relevant.

A 'possible' call of the Large Bent-winged Bat (*Miniopterus orianae oceanensis*) was recorded via anabat within the proposal site during field surveys. The proposal site represents potential foraging habitat for this species, but does not provide roosting habitat for the species. No other predicted threatened fauna species were recorded within the proposal site during field surveys.

Table 4.1 Predicted threatened species (ecosystem species)

Common name	Scientific name	Sensitivity class[1]	Confirmed predicted species
Dusky Woodswallow	*Artamus cyanopterus*	Moderate	Yes
Australasian Bittern	*Botaurus poiciloptilus*	Moderate	Yes
Glossy Black-Cockatoo (foraging)	*Calyptorhynchus lathami*	High	No (habitat constraint '*Presence of Allocasuarina and casuarina species*' not present on site)
Spotted-tailed Quoll	*Dasyurus maculatus*	High	Yes
White-bellied Sea-Eagle (foraging)	*Haliaeetus leucogaster*	High	Yes
White-throated Needletail	*Hirundapus caudacutus*	High	Yes
Eastern Coastal Free-tailed Bat	*Micronomus norfolkensis*	High	Yes
Large Bentwing-bat (foraging)	*Miniopterus schreibersii oceanensis*	High	Yes.
Scarlet Robin	*Petroica boodang*	Moderate	Yes
Flame Robin	*Petroica phoenicea*	Moderate	Yes
Grey-headed Flying-fox (foraging)	*Pteropus poliocephalus*	High	Yes
Australian Painted Snipe	*Rostratula australis*	Moderate	Yes

Note: 1. Sensitivity to gain class – High = high sensitivity to potential gain, Moderate = moderate sensitivity to potential gain.

4.1.2 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 Threatened Biodiversity Data Collection as 'species credit species'. 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 proposal site to generate a list of the species credit-type threatened species predicted to occur and requiring targeted survey.

Searches of threatened species databases were also completed to determine any additional species to those generated by the credit calculator that are known or predicted to occur in the locality (refer to likelihood of occurrence table in Appendix A). These results were reviewed giving consideration to the habitats available on site, to determine the candidate species credit species that have potential to occur at the proposal site. Table 4.2 and Appendix A provide details of the predicted candidate species relevant to this assessment. Species can be excluded as candidate species when specific habitat constraints or geographic limitations relevant to the species are not present, or when the specific microhabitats required by the species are not present on site (indicated by checking the 'habitat degraded' button in the BAM-C. Appendix A and Table 4.2 provide a summary of the candidate species considered in this assessment, along with whether the species was a confirmed candidate species, or was excluded from the BAM-C. Targeted surveys are not required for those species excluded as candidate species.

The following species were excluded as candidate species, with Appendix A providing justification for their exclusion:

- Deane's Boronia (*Boronia deanei*)
- Glossy Black-Cockatoo (*Calyptorhynchus lathami*)
- Broad-leaved Sally (*Eucalyptus aquatica*)
- Wingecarribee Gentian (*Gentiana wingecarribiensis)*
- White-bellied Sea-eagle (*Haliaeetus leucogaster*)
- Large Bent-winged Bat (*Miniopterus orianae oceanensis*)
- Koala (*Phascolarctos cinereus)*
- Giant Dragonfly (*Petalura gigantea*)
- Slaty Leek Orchid (*Prasophyllum fuscum*)
- Grey-headed Flying-fox (*Pteropus poliocephalus)*
- Waterfall Greenhood (*Pterostylis pulchella*)
- Elusive Bush-pea (*Pultenaea elusa*); and
- Kangaloon Sun Orchid (*Thelymitra kangaloonica*).

Targeted surveys were undertaken for the species considered to have the potential to occur on site, given the presence of broadly suitable habitat, as identified in Table 4.2. The following species were identified as confirmed candidate species:

- Paddys River Box (*Eucalyptus macarthurii*)
- Black Gum (*Eucalyptus aggregata*)
- Green and Golden Bell Frog (*Litoria aurea*)
- Yellow Loosestrife (*Lysimachia vulgaris* var*. davurica*); and
- Southern Myotis (*Myotis macropus*).

Surveys were conducted in the appropriate season for all of the confirmed candidate species credit-type species (see Table 4.2).

Table 4.2 Candidate species credit species with potential to occur within proposal site

Common name	Scientific name	Confirmed candidate species	SAII entity	Survey period	Targeted survey undertaken	Recorded within proposal site	Reason for exclusion from candidate species list or assessed for species credits
Deane's Boronia	*Boronia deanei*	No	No	October-November	No	No	This species is excluded as a candidate species on the basis that: – habitat is degraded to the point that the species is unlikely to inhabit the subject land; and – the microhabitats required by a species as described in the TBDC are absent from the subject land: 'Grows in wet heath, often at the margins of open forest adjoining swamps or along streams' No native shrubs were recorded anywhere within the proposal footprint, during any survey round. No further assessment required for species credits.
Glossy Black-cockatoo (Breeding)	*Calyptorhynchus lathami*	No	No	January – September	Although not a candidate species, habitat assessment and bird surveys undertaken in March 2021	No	This species is excluded as a candidate species on the basis of lack of suitable breeding habitat within the study area. The habitat constraints listed for this species in the Threatened Biodiversity Data Collection include 'Hollow bearing trees' and 'Living or dead tree with hollows greater than 15 cm diameter and greater than 8 m above ground'. The proposal site does not contain hollow bearing trees. The study area does not contain suitable foraging habitat (ie *Casuarina* or *Allocasuarina* species) for the Glossy Black-cockatoo which is usually located close to breeding sites. No further assessment required for species credits.
Black Gum	*Eucalyptus aggregata*	Yes	No	All year	Yes	No	Species not recorded in targeted surveys undertaken within a suitable survey time. No further assessment required for species credits.

Common name	Scientific name	Confirmed candidate species	SAII entity	Survey period	Targeted survey undertaken	Recorded within proposal site	Reason for exclusion from candidate species list or assessed for species credits
Broad-leaved Sally	*Eucalyptus aquatica*	No	Yes	All year	No	No	This species is excluded as a candidate species on the basis of lack of suitable habitat within the study area. The habitat constraints listed for this species in the Threatened Biodiversity Data Collection include 'swamps' or 'land containing peat swamps and their margins or tributaries'. The proposal site does not contain suitable habitat. No further assessment required for species credits.
Paddys River Box, Camden Woollybutt	*Eucalyptus macarthurii*	Yes	No	All year	Yes	Yes	Species recorded as a planted line of nine trees along the new north-south road alignment. *Eucalyptus macarthurii* was assessed as a species credit species and is discussed in more detail in Sections 5.4.1, 6.1 and 6.5. This species is a 'count' type species credit. The number of individuals (9) recorded on site were entered into the BAM-C, and are shown on Figure 6.3.
Wingecarribee Gentian	*Gentiana wingecarribiensis*	No	Yes	October-December	No	No	This species is excluded as a candidate species on the basis of lack of suitable habitat within the study area. The habitat constraints listed for this species in the Threatened Biodiversity Data Collection include 'swamps' or 'land containing peat bogs and margins on either Sphagnum Moss humps or sedge communities. The proposal footprint does not contain land that meets the above habitat constraint. No further assessment required for species credits.

Common name	Scientific name	Confirmed candidate species	SAII entity	Survey period	Targeted survey undertaken	Recorded within proposal site	Reason for exclusion from candidate species list or assessed for species credits
White-bellied Sea-Eagle (Breeding)	*Haliaeetus leucogaster*	No	No	July-December	No	No	This species is excluded as a candidate species on the basis of lack of suitable breeding habitat within the study area. The habitat constraints listed for this species in the Threatened Biodiversity Data Collection include 'living or dead mature trees within suitable vegetation within 1 km of a river, lakes, large dams or creeks, wetlands and coastlines. The proposal site contains no mature trees and does not meet the habitat constraint listed in the TBCD. No large stick nests were recorded in the study area. No further assessment required for species credits.
Green and Golden Bell Frog	*Litoria aurea*	Yes	No	November-March	Yes, a frog survey was undertaken at the dams in March 2021	No	This species is unlikely to occur on the proposal site. Surveys confirmed the lack of appropriate habitat for the species within the proposal site. There is a general lack of suitable breeding habitat, and no local source populations. The nearest records of the species are from Nowra, more than 40km to the south-east. There are no local records and the species was not recorded in targeted surveys undertaken at a suitable time of year. No further assessment required for species credits.
Yellow Loosestrife	*Lysimachia vulgaris* var. *davurica*	Yes	Yes	December-March	Yes, surveys of dams/ waterbodies were undertaken in March 2021	No	Species not recorded in targeted surveys undertaken within the suitable survey time. No further assessment required for species credits.

Common name	Scientific name	Confirmed candidate species	SAII entity	Survey period	Targeted survey undertaken	Recorded within proposal site	Reason for exclusion from candidate species list or assessed for species credits
Large Bent-winged Bat (Breeding)	*Miniopterus orianae oceanensis*	No	Yes	December – February	Although not a confirmed candidate species, anabat detectors were deployed in March 2021	No	This species is excluded as a candidate species on the basis of lack of suitable breeding habitat within the study area. The habitat constraints listed for this species in the Threatened Biodiversity Data Collection include 'caves' or 'Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding'. The proposal site contains no caves or suitable breeding habitat and does not meet the above habitat constraint. No further assessment required for species credits.
Southern Myotis	*Myotis macropus*	Yes	No	October – March	Anabat detectors were deployed in March 2021	Yes	A possible call was recorded on the Anabat detectors in March 2021. A conservative approach was taken, and the species was assumed to be present. The Southern Myotis was assessed as a species credit and discussed in more detail in Sections 5.4.1, 6.1 and 6.5. Species polygon prepared for this species.
Koala	*Phascolarctos cinereus*	No	No	All year	Yes, habitat assessment undertaken in March 2021	No	This species is excluded as a candidate species on the basis of lack of suitable habitat within the study area. The habitat constraints listed for this species in the Threatened Biodiversity Data Collection include 'Presence of Koala use trees'. A habitat assessment was completed that included surveys for Koala use trees within the proposal site. The proposal site does not contain Koala use trees as defined by DPE (2022a). No further assessment required for species credits.

Common name	Scientific name	Confirmed candidate species	SAII entity	Survey period	Targeted survey undertaken	Recorded within proposal site	Reason for exclusion from candidate species list or assessed for species credits
Giant Dragonfly	*Petalura gigantea*	No	Yes	December – January	No	No	This species is excluded as a candidate species on the basis of lack of suitable habitat within the study area. The habitat constraints listed for this species in the Threatened Biodiversity Data Collection include 'swamps or within 500 m of a swamp'. The species habitat comprises permanent peat swamps and bogs, and the proposal site does not contain this habitat feature. No further assessment required for species credits
Slaty Leek Orchid	*Prasophyllum fuscum*	No	Yes	November – December	No	No	This species is excluded as a candidate species on the basis that: – the habitat is degraded to the point that the species is unlikely to inhabit the subject land; and – the microhabitats required by a species are absent from the subject land as the TBDC described the habitat as being 'swamp''. Although there are farm dams on the proposal site, the areas are not considered swamps and are not suitable habitat for the Slaty Leek Orchid, which typically grows in moist heath. No further assessment required for species credits
Grey-headed Flying-fox (Breeding)	*Pteropus poliocephalus*	No	No	October - December	No	No	This species is excluded as a candidate species on the basis of lack of suitable breeding habitat within the study area. No breeding camps are located on or in the vicinity of the proposal site. No further assessment required for species credits

Common name	Scientific name	Confirmed candidate species	SAII entity	Survey period	Targeted survey undertaken	Recorded within proposal site	Reason for exclusion from candidate species list or assessed for species credits
Waterfall Greenhood	*Pterostylis pulchella*	No	Yes	February - April	No	No	This species is excluded as a candidate species on the basis of lack of suitable habitat within the study area. The habitat constraints listed for this species in the Threatened Biodiversity Data Collection include 'Within 1 km of sandstone escarpment'. The proposal site does not contain the above habitat constraint and the species is unlikely to occur in the exotic grassland in the study area. No further assessment required for species credits
Elusive Bush-pea	*Pultenaea elusa*	No	Yes	October - November	No	No	This species is excluded as a candidate species on the basis that: – habitat is degraded to the point that the species is unlikely to inhabit the subject land; and – the microhabitats required by a species are absent from the subject land as the TBDC described the habitat as being 'moist heath, often along seepage lines'. No further assessment required for species credits
Kangaloon Sun Orchid	*Thelymitra kangaloonica*	No	Yes	October - November	No	No	This species is excluded as a candidate species on the basis of lack of suitable habitat within the study area. The habitat constraints listed for this species in the Threatened Biodiversity Data Collection include 'swamps or within 200 m or a swamp'. Although there are farm dams on the proposal site, the areas are not considered swamps and are not suitable habitat for the Kangaloon Sun Orchid. No further assessment required for species credits

4.2 Threatened species survey results

4.2.1 Threatened flora

One threatened flora species was identified within the proposal site; *Eucalyptus macarthurii*, which is listed as endangered under the NSW BC Act as well as the Commonwealth EPBC Act. A total of nine individuals were recorded within the proposal site, as a planted line of trees about 25 years old (G. Leonard, *pers comm* via email, 1/2/2023), along the new north-south road alignment.

No other threatened flora species were recorded. Visibility and access across the proposal site was good, with minimal midstorey vegetation present, which allowed for easy sighting of all species in the understorey and midstorey. The proposal site was also easily traversed on foot, with no barriers to human movement encountered during the field survey. As such, field staff were able to traverse all areas of potential threatened flora habitat on foot, in a manner that reflected threatened species survey guidelines (DPIE 2020a; Cropper 1993). Given the lack of obstacles to accurate and definitive survey, candidate threatened flora species can be excluded from occurring within the proposal site, given they were not located by an experienced botanist familiar with each of the species. Habitat assessment surveys for some cryptic species were undertaken outside of the recommended survey period, however these surveys confirmed that there was no suitable habitat on the proposal site for the predicted species.

The desktop assessment and site survey confirmed that there is no suitable habitat for any other threatened flora species in the study area. The highly modified nature of the study area, the history of disturbance, the lack of any intact native vegetation, the continued presence of grazing and the lack of connectivity with any areas of intact native vegetation mean the proposal site does not comprise suitable habitat for any of the predicted threatened flora species, with the exception of the planted stand of *Eucalyptus macarthurii*.

4.2.2 Threatened fauna

Two threatened fauna species were possibly recorded within the proposal site during field surveys:

– Southern Myotis (*Myotis macropus*)
– Large Bent-winged Bat (*Miniopterus orianae oceanensis*).

A call from the Southern Myotis species group was recorded in the proposal site via anabat echolocation call recording. The Southern Myotis is listed as a vulnerable species under the BC Act. The call characteristics of *Nyctophilus* sp. and the Southern Myotis are very similar and can be easily confused particularly when call quality is less than optimal. It is likely that some calls attributed to the species group *Nyctophilus* sp./*Myotis macropus* are the Southern Myotis. A conservative approach was taken, and the species was assumed to be present. The Southern Myotis is a species credit candidate species and is discussed in more detail in Sections 6.1 and 6.4.

A call from the Large Bent-winged Bat was recorded in the proposal site via anabat echolocation call recording. The Large Bent-winged Bat is listed as a vulnerable species under the BC Act. The Large Bent-winged Bat is a dual credit species meaning species credits are only calculated if suitable breeding habitat is located on the proposal site or within 2 km or the proposal site. Breeding habitat for the Large Bent-winged Bat comprises caves, tunnels, mines, culverts or other structure known or suspected to be used for breeding. As no breeding habitat occurs on the proposal site or within 2 km of the proposal site, no species credits are required for this species. Offsets for removal of foraging habitat for the Large Bent-winged Bat are calculated via the ecosystem credits for the native vegetation on the proposal site.

4.2.3 Threatened ecological communities

PCT 944 on site is broadly aligned with a threatened ecological community as listed under the BC Act. The patch of planted *Eucalyptus macarthurii* trees in the new north-south road alignment was assigned to PCT 944 Mountain Grey Gum - Narrow-leaved Peppermint grassy woodland on shales of the Southern Highlands, southern Sydney Basin Bioregion. The vegetation does not strictly meet the definition of the PCT, as per the BioNet Vegetation Classification but was allocated to the PCT to which it most closely aligns, based on the results of the 'filter PCT' tool in the NSW VIS, using IBRA region, subregion and *Eucalyptus macarthurii* as the filtered options. The presence of *Eucalyptus macarthurii*, nearby existing regional vegetation mapping, landscape position and geology (fertile soils derived from Wianamatta Group shales) confirm that PCT 944 is an appropriate allocation.

PCT 944 can be commensurate with *Southern Highlands Shale Woodlands of the Sydney Basin Bioregion* which is listed as an endangered ecological community (EEC) under the BC Act, with high quality components also listed as a critically endangered ecological community (CEEC) under the EPBC Act. A conservative approach has been taken, and it has been assumed that the patch of planted trees meets the description of the community as defined in the final determination for *Southern Highlands Shale Woodlands of the Sydney Basin Bioregion* (NSW Scientific committee 2011), despite the poor condition of the vegetation present on site. The final determination does not exclude planted occurrences of the community, and specifically notes that "Disturbed Southern Highlands Shale Woodlands remnants are considered to form part of the community". While the only characteristic species present has been planted, it is possible that the community could once have occurred within the proposal site. As such, the planted stand of *Eucalyptus macarthurii* that has been assigned to PCT 944 has been assumed to meet the description provided in the final determination for the EEC (NSW Scientific committee 2011).

The patch of planted trees on the proposal site does not meet the minimum key diagnostic criteria or the condition thresholds outlined in the Commonwealth approved conservation listing for the EPBC Act-listed CEEC Southern Highlands Shale Forest and Woodland in the Sydney Basin Bioregion (DoE 2015) as the patch is smaller than 0.5 ha and less than 30% of the perennial understorey vegetation cover is made up of native species.

5. Impact assessment

5.1 Introduction

The proposal would result in direct impacts on native biota and their habitats within the proposal site. There is also the potential for indirect impacts on adjoining areas of planted native vegetation adjacent to the proposal site, both during construction and from the resulting operation of the plastic recycling facility.

Specific mitigation measures are recommended to minimise likely impacts on biodiversity values. These measures are presented according to the hierarchy of avoidance and mitigation of impacts, and the provision of offsets to counter residual impacts of the proposal that cannot be avoided or mitigated.

5.2 Avoidance of impacts

The proposal has aimed to avoid impacts on native vegetation and habitat values by focusing development in areas of exotic grassland where possible. Multiple iterations of the proposal site boundary have been considered and the boundary adjusted to limit impacts on native vegetation where possible. The proposal site is highly modified and contains mostly exotic vegetation. The proposal would result in impacts to 0.32 ha of highly modified vegetation and planted native trees.

Two options for the access road were considered with the aim of selecting an option with the least biodiversity values. The east-west access road alignment was initially selected and considered the preferred option over the north-south road alignment option, as it avoided impacts on the local occurrence of the BC Act-listed *Southern Highlands Shale Woodlands of the Sydney Basin Bioregion* EEC. The original BDAR included the east-west access road as part of the proposal footprint, as did the original BAM calculations, impact assessment and credit obligation calculations.

Unfortunately, despite attempted negotiations with landowners and Council, the proponent has been unsuccessful in obtaining agreement and support for the east-west access road, and so instead is pursuing the north-south option (refer to GHD 2023 for detailed information). The north-south road alignment would impact nine planted Paddys River Box (*Eucalyptus macarthurii*) which is listed as an endangered species under the BC Act and EPBC Act, and which has been mapped as an EEC under the BC Act. Comparatively, the east-west access road option would only require the removal of exotic grassland and a small patch of planted vegetation of low biodiversity value.

5.3 Minimisation of impacts

5.3.1 Construction phase

Construction Environmental Management Plan

A Construction Environmental Management Plan (CEMP) would be required for the construction phase of the proposal and would be prepared prior to issue of the Construction Certificate. The CEMP would include, as a minimum, industry-standard measures for the management of soil, surface water, weeds and pollutants, as well as site-specific measures, including the procedures outlined below. The proposed mitigation measures would include environmental safeguards for protection of neighbouring properties and waterways in accordance with relevant policy documentation and Government guidelines.

In order to address the potential impacts of the proposal on biodiversity as discussed in Section 5.4, the mitigation and management measures outlined in Table 5.1 would be implemented as part of the CEMP for the proposal site.

Riparian Vegetation Management Plan

The Riparian Vegetation Management Plan would meet the requirements of the *Water Management Act 2000* for controlled activities on waterfront land. The report will detail the vegetation restoration associated with the realignment of the eastern creekline and revegetation of the western creekline on the proposal site.

Table 5.1 Mitigation measures (construction)

Impact	Mitigation	Timing	Responsibility
General	All workers are to be provided with an environmental induction prior to starting work on site. This would include information on the ecological values of the proposal site, protection measures to be implemented to protect biodiversity and penalties for breaches.	Prior to clearing/construction works.	Construction contractor
	Prepare a dam dewatering plan as part of the CEMP, incorporating recommendations below, and expanding on specific details where necessary.	Prior to clearing/construction works.	Construction contractor
	Measures to suppress dust implemented during clearing and construction.	Throughout clearing and construction phases	Construction contractor
Vegetation clearing	Limit disturbance of vegetation to the minimum necessary to undertake the proposal.	Prior to works commencing	Construction contractor
	Prior to the commencement of any work near the retained planted trees adjoining the proposal site, a survey would be carried out to mark the construction impact boundary. The perimeter of this area will be fenced using high visibility fencing and clearly marked as the limits of clearing. All vegetation outside this fence line will be clearly delineated as an exclusion zone to avoid unnecessary vegetation and habitat removal. Fencing and signage must be maintained for the duration of the construction period. Fencing should be designed to allow fauna to exit the proposal site during clearing activities.	Prior to clearing / Daily inspections of exclusion zones during works in area.	Construction contractor and qualified ecologist
	Stockpiles of fill or vegetation should be placed within existing cleared areas (and not within areas of adjoining native vegetation).	Prior to clearing/ construction works	Construction contractor
	Sediment fences should be installed to prevent transfer of sediments into adjacent vegetation.	Prior to clearing/ construction works	Construction contractor
Introduction of Weeds and Pathogens	Develop a weed and pest species management sub-plan as part of the CEMP to manage weeds and pathogens during the construction and operational phase of the proposal.	Prior to clearing/ construction works	Construction contractor
	The location and extent of any priority and/or high threat environmental weeds within the proposal site will be identified by a suitably qualified ecologist during pre-clearance surveys. The introduction and spread of weed species will be minimised by restricting access to areas of native vegetation and communicating the responsibilities of all Proposal personnel at site inductions and during regular toolbox meetings. All priority weeds identified on the proposal site will be controlled and removed in accordance with the requirements of the Biosecurity Act 2016 and Council's relevant Weed Control Manuals: Appropriate pesticides will be applied if required and a record of such application made in the pesticide application register. All noxious and environmental weeds will be cleared and stockpiled separately to all other vegetation, removed from site and disposed of at an appropriately licenced disposal facility. When transporting weed waste from the proposal site to the waste facility, trucks must be covered to avoid the spread of weed-contaminated material. Disposal must be documented, and evidence of appropriate disposal must be kept.	Prior to clearing/ construction works	Construction contractor and qualified ecologist

Impact	Mitigation	Timing	Responsibility
	All machinery entering the proposal site must be appropriately washed down and disinfected prior to work on site to prevent the potential spread of weeds, Cinnamon Fungus (*Phytophthora cinnamomi*) and Myrtle Rust (*Pucciniales fungi*) in accordance with the national best practice guidelines for Phytophthora and the Myrtle Rust factsheet (DPI 2015b, DPIE 2020b, O'Gara *et al*., 2005) for hygiene control.	Prior to any plant or machinery being brought onto the proposal site	Construction contractor
	Incorporate control measures in the design of the proposal to limit the spread of weed propagules downstream of proposal site. Sediment control devices, such as silt fences, would assist in reducing the potential for spreading weeds.	Prior to clearing/ throughout construction works	Construction contractor
Removal of fauna habitat	Protocols to prevent introduction or spread of chytrid fungus should be implemented following Office of Environment and Heritage Hygiene protocol for the control of disease in frogs (DECC, 2008c) and the DPIE Hygiene guidelines (2020b).	Prior to clearing/ throughout construction works	Construction contractor
	A trained ecologist should be present during the clearing of native vegetation or removal of potential fauna habitat to avoid impacts on resident fauna and to salvage habitat resources as far as is practicable. Clearing surveys should include the following:	Prior to and during clearing works	Qualified ecologist
	The dewatering of the dam should be done in accordance with the dam dewatering plan to manage the environmental impacts that may arise from dewatering dams. The dewatering plan should include: – The quality and quantity of the water to be released; – The fate of the water; – Any impacts to native, threatened or protected species; – Relocation of displaced native fauna; and – The spread of exotic flora and fauna species.	Prior to and during clearing works	Qualified ecologist
	A suitably qualified and appropriately licenced ecologist will be present during the clearance of all native vegetation and/or fauna habitats. Animals that require handling must not be approached or handled until the ecologist is present, unless in an emergency (e.g. when there are both no authorised persons present and where the failure to immediately intervene would place the animal at significant risk). In such an emergency, the site manager may obtain over the phone instructions from the project ecologist to ameliorate the situation. A wildlife rescue organisation (e.g. WIRES or Sydney Wildlife) should be made aware of operations in case any injured fauna are found. All animals encountered will be treated humanely, ethically, and in accordance with relevant codes under the NSW *Prevention of Cruelty to Animals Act 1979*, including: – Australian code of practice for the care of animals for scientific purposes (NHMRC 2004). – Code of practice for the welfare of wildlife during rehabilitation (DPI 2001). – Animal ethics considerations and protocols outlined in this document.	During clearing	Qualified ecologist

Impact	Mitigation	Timing	Responsibility
	If the project ecologist considers an animal is at risk of injury or undue stress, it is to be gently directed into secure adjoining habitat. Where deemed necessary by the project ecologist, the animal may be required to be captured and released. Capture and release operations will proceed via the following protocols: All construction activities that are considered by the project ecologist be likely to increase the risk of injury, mortality or stress to the animal will be halted until the animal has been removed, which will be enforced with the co-operation of the Contractor. Construction activities that do not contribute to the risk of injury, mortality or stress to the animal can continue (as determined by the project ecologist). Only qualified ecologists or wildlife carers are authorised to handle animals. Animals will be captured (if required) by the project ecologist using a safe and ethical technique, as is appropriate for the particular species (see below). Native animals that are unable to depart of their own accord will be captured and held in a receptacle appropriate for that species until release. All captive-held animals will be provided with food, water and warmth as is appropriate for the species. Each receptacle will only hold one animal at a time and will be cleaned and disinfected between use to avoid the spread of disease. Details of any fauna relocated from trees, shrubs or other areas would be recorded on the register.		
	The construction contractor is to contact the project ecologist for advice if any unexpected fauna are found during the construction period (i.e. following clearing of native vegetation when the project ecologist is no longer on site).	During clearing	Construction contractor
	A post-clearing report will be prepared documenting all animals that are handled, or otherwise managed, within the proposal site. Data to be recorded includes: – Date and time of the sighting and details of the observer – Species – Number of individuals recorded – Adult/juvenile – Condition of the animal (living/dead/injured/sick) – Management action undertaken (e.g. captured, handled, taken to vet) – Results of any management actions (e.g. released, placed in a nest box, euthanised, placed with carer) – An inventory of hollows and fallen timber salvaged and relocated will be maintained.	Post clearing	Construction contractor/ Qualified ecologist

Impact	Mitigation	Timing	Responsibility
Water Quality and aquatic habitats	Erosion and sediment control plans should be prepared in accordance with Volume 2D of Managing Urban Stormwater: Soils and Construction (DECC 2008d). The erosion and sediment control plans would be established prior to the commencement of construction and be updated and managed throughout as relevant to the activities during the construction phase.	Prior to construction commencing	Construction contractor
	Erosion and sediment control controls would be regularly inspected, particularly following rainfall events, to ensure their ongoing functionality.	Weekly during construction phase or after any significant rainfall event	Construction contractor
	Stabilised surfaces should be reinstated as quickly as practicable after construction.	Immediately following clearing	Construction contractor
	All stockpiled material should be stored in bunded areas and kept away from waterways to avoid sediment or contaminants entering the waterway.	During construction	Construction contractor
	Spill kits would be made available to construction vehicles. A management protocol for accidental spills would be put in place.	During construction	Construction contractor

5.3.2 Operation phase

The following mitigation measures would be implemented during the operational phase of the proposal:

– Signposting and enforcement of appropriate speed limits along internal roads to reduce the likelihood of vehicle strike and mortality of native fauna
– Appropriate fencing to be erected at interface between the proposal site boundary
– Enforcement of legal obligations to control priority weeds within proposal site to prevent the spread of propagules
– Street lighting to be designed to direct light away from rows of adjacent trees and to limit the impacts of light spill on native fauna habitats.

5.4 Residual impacts

5.4.1 Construction phase

Direct impacts

Clearing of vegetation

The proposal would result in direct impacts on 0.32 ha of native vegetation comprising:

– 0.28 hectares of emergent aquatic vegetation that has been assigned to PCT 1256 Tableland swamp meadow on impeded drainage sites of the western Sydney Basin Bioregion and South Eastern Highlands Bioregion
– 0.04 hectares of planted *Eucalyptus macarthurii* specimens that have been assigned to PCT 944 Mountain Grey Gum - Narrow-leaved Peppermint grassy woodland on shales of the Southern Highlands, southern Sydney Basin Bioregion.

This vegetation is in poor condition with low species diversity. The impacts on this vegetation are associated with clearing for the plastics recycling and reprocessing facility and construction of associated infrastructure (roads, services etc.). The proposal would remove a very small proportion of individual plant species, PCTs and associated habitats comparative to that in the surrounding area.

In addition to the removal of this native vegetation, approximately 10.15 ha of exotic grassland would be removed that does not require offset.

Table 5.2 Direct impacts within the proposal site

Vegetation Community	PCT (OEH 2021c)	Area within the proposal site (ha)
Tableland swamp meadow on impeded drainage sites of the western Sydney Basin Bioregion and South Eastern Highlands Bioregion	1256	0.28
Mountain Grey Gum - Narrow-leaved Peppermint grassy woodland on shales of the Southern Highlands, southern Sydney Basin Bioregion	944	0.04
Exotic grassland	N/A	10.15
Total		**10.47**

The future values of the composition condition scores, structural condition score and function condition score would be 0 for the vegetation zone within the proposal site.

Removal of habitat and habitat resources

The farm dams that would be removed provide potential habitat resources for native fauna species, including the Southern Myotis. The proposal is therefore assumed to result in impacts on up to 0.28 ha of potential foraging habitat for this species credit entity (refer to Section 6.5), comprising all water bodies within the proposal site. The row of planted *Eucalyptus macarthurii* are more than 200m from the foraging resources (dams), and so have not been included in the species polygon for the species.

The clearing of 0.32 ha of vegetation within the proposal site would not include the removal of any mature trees or important habitat for any threatened species. A total of nine planted *Eucalyptus macarthurii* would be removed. It is estimated that these trees are about 25 years old. They did not contain any hollows, or evidence of roosting or use by native fauna species, however it is possible that some mobile species such as woodland birds and bats use them on occasion, in response to favourable conditions.

Fauna injury and mortality

As described above, the proposal site provides limited habitat resources for native fauna species. Groundcover vegetation, leaf litter and woody debris would provide shelter and foraging substrate for reptiles, frogs and invertebrates. Construction is likely to result in the injury or mortality of some individuals of these less mobile fauna species and other small terrestrial fauna that may be sheltering in the exotic grassland within the proposal site during clearing activities. More mobile native fauna such as native birds, bats, terrestrial and arboreal mammals that may be sheltering in vegetation in the proposal site are likely to evade injury during construction activities.

Recommendations have been made in Section 5.3 above to minimise the risk of vegetation clearing activities resulting in the injury or mortality of resident fauna.

Fragmentation or isolation of habitat

Habitat fragmentation through the clearing of vegetation can increase the isolation of remnant vegetation and create barriers to the movements of small and sedentary fauna such as ground dwelling mammals, reptiles and amphibians. Furthermore, habitat fragmentation can create barriers to the movement of pollinator vectors, such as insects, and consequently affect the life cycle of both common and threatened flora.

The proposal would require the removal of a small amount of vegetation and habitat from within an already highly modified and fragmented landscape. Impacts resulting from the proposal would increase gaps in habitat within the landscape. Given the existing degree of fragmentation in the locality it is unlikely that the proposal would create any new barriers to the movement of pollinator and seed dispersal vectors, such as insects and birds.

The existing degree of fragmentation and isolation from large tracts of remnant, intact vegetation means the potential for connectivity improvement (even without the proposed development) is limited.

Aquatic habitats

Aquatic habitats in the proposal site are limited to small farm dams and drainage depressions. Aquatic habitats may provide limited breeding and shelter resources for common frog and reptile species as discussed above.

The drainage lines on the proposal site are highly modified, ephemeral drainage lines that are overrun with weeds and exotic grasses. None of the aquatic habitats in the proposal site or study area are classified as Key Fish Habitat and would not provide potential habitat for threatened fish. Currently the aquatic habitats provide little habitat connectivity as there is no native riparian vegetation corridor and limited connectivity in an aquatic sense due to dams and concrete channel in the north of the proposal site

Habitat values are likely to be improved given proposed realignment and restoration of the eastern creek and revegetation of the riparian corridor along the western creek line.

Indirect impacts

Weed invasion

Vegetation within and adjoining the proposal site is in a highly modified condition with numerous weed species present. Surrounding land uses include industrial, agricultural, transport and infrastructure, and weed species within the proposal site reflect these uses, along with the proposal site's own disturbance history. As such there is a low to moderate risk that construction activities would introduce and/or spread any new weeds into adjoining

vegetation. Management measures including the development of a weed management sub-plan as part of the CEMP would be implemented to mitigate these potential impacts (refer to Section 5-3).

Introduction and spread of weeds, pests and pathogens

Disturbance associated with vegetation clearing, vehicle traffic and general day to day operations of the proposal during construction can increase the potential for the spread, introduction and establishment of weed and pest species, and diseases and pathogens. Weed species are effective competitors for food and habitat resources and have the potential to exclude native species and modify the composition and structure of vegetation communities.

The risk of any such introductions is more likely on a greenfield site, where there is intact native vegetation either on the proposal site or in surrounding areas. There is a very low risk of any such introductions within the proposal site, given the existing landscape context and current condition of the proposal site.

Construction activities within the proposal site have the potential to introduce or spread pathogens such as Chytrid fungus (*Batrachochytrium dendrobatidis*) into adjacent native vegetation should it occur, through vegetation disturbance and increased visitation. There is little available information about the distribution of these pathogens within the locality, and no evidence of these pathogens was observed during surveys. Similarly, there is no intact native vegetation adjacent to the proposal site. Chytrid fungus affects both tadpoles and adult frogs and can wipe out entire populations once introduced into an area.

The potential for impacts associated with these pathogens is relatively low, given the fairly disturbed and modified nature of the proposal site. Diseases and pathogens can be introduced or spread to the proposal site via dirt or organic material attached to machinery, vehicles, equipment and employees. To help mitigate the risk of pathogens being brought onto and/or spread through the proposal site all machinery brought to site will be washed down and inspected to be free of soils, seeds and other organic material in accordance with Section 5.3.1.

Aquatic disturbance and impacts on fish habitat

The introduction of pollutants from the proposal into the surrounding environment, if uncontrolled, could potentially impact on water quality further downstream.

The potential for water quality impacts on Wingecarribee River (which is downstream from the drainage line that runs along the western boundary of the proposal site), are considered to be low to moderate given the existing disturbance within and around the proposal site. Potential water quality impacts would be managed through the implementation of mitigation measures, including the provision of sedimentation basins, silt fences and other structures to intercept runoff and sediment.

No endangered aquatic communities, aquatic fauna or marine vegetation listed under the FM Act or EPBC Act occur in the proposal site and no significant impacts on riparian vegetation or habitats downstream of the proposal site are anticipated as a result of the proposal. There would be no impact on Key Fish Habitat as a result of the proposal.

5.4.2 Operation phase

Impacts on biodiversity values would be largely restricted to the construction phase of the proposal. Some beneficial impacts would occur as a result of the Riparian VMP and the revegetation associated with the realignment of the eastern watercourse. There are however a number of potential impacts to the surrounding landscape that may occur as a result of the operation of the proposal. These include:

– Generation of additional light and noise
– Erosion and sedimentation as a result of runoff from hard stand areas
– Introduction of weed propagules by vehicles
– Fauna mortality as a result of collision with vehicles
– Increased risk of fire.

Given current land uses at the proposal site and in adjacent areas, the proposal would not result in a substantial increase in the operation of any of these potential impacts.

These potential impacts are linked to human occupation of the proposal site and are likely to persist indefinitely. Mitigation measures to be implemented to minimise these potential impacts are discussed in Section 5.3.1.

5.5 Consideration of MNES

The proposal will result in impacts to one threatened species listed under the EPBC Act; *Eucalyptus macarthurii*. This species is listed as endangered under the EPBC Act, and nine planted specimens will be removed to allow construction of the new north-south road.

It is estimated that these trees are about 25 years old, and their provenance is unknown. They appear to have been planted as part of a wind break along the edge of a council-owned paper road. There is no evidence of natural recruitment, nor is there the likelihood of any natural regeneration around them, as the area in which they occur is grazed by cattle, and shows signs of significant livestock use and disturbance.

An assessment of significance has been prepared for *Eucalyptus macarthurii* in accordance with the '*Matters of National Environmental Significance Significant impact guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999*' (DoE 2013a) (refer to Appendix E). The outcome of this assessment is that the proposal is unlikely to result in a significant impact on this species. A referral to the minister is not considered necessary.

The proposal is unlikely to impact any other MNES protected under the EPBC Act.

5.6 Serious and irreversible impacts

The concept of serious and irreversible impacts is fundamentally about protecting threatened entities that are most at risk of extinction from potential development. The Biodiversity Offsets Scheme recognises that there are some types of serious and irreversible impacts that the community expects will not occur except where the consent authority considers that this type of impact is outweighed by the social and economic benefits that the development will deliver to the State (DPIE 2019).

Under the BC Act, a determination of whether an impact is serious and irreversible must be made in accordance with the principles set up in Section 6.7 of the BC Regulation.

The principles are aimed at capturing impacts which are likely to contribute significantly to the risk of extinction of a threatened species or ecological community in NSW.

The decision-maker must determine whether or not an impact on biodiversity values is likely to be a serious and irreversible impact (SAII). 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 SAII entity to ultimately determine if a proposal will indeed have a serious and irreversible impact (DPIE 2019).

5.6.1 Threatened ecological communities

One threatened ecological community identified as an SAII entity has been recorded in the proposal site, Southern Highlands Shale Woodlands of the Sydney Basin Bioregion (Southern Highlands Shale Woodland). A detailed assessment of impacts is provided in Table 5.3 in accordance with the BAM. A threshold of impacts has not been identified for this community. This community is considered to be at risk of SAII due to principle 1 and 2 (DPIE 2021b). The occurrence of this SAII entity is shown on Figure 2.1, in the small polygons mapped as PCT 944 along the north-south road alignment.

Table 5.3 Assessment of serious and irreversible impacts for Southern Highlands Shale Woodlands of the Sydney Basin Bioregion

Criteria	Assessment
1. Current status	
a. evidence of rapid decline (Principle 1, clause 6.7(2)(a) BC Regulation) as the current total geographic extent of the TEC in NSW AND the estimated reduction in geographic extent of the TEC since 1970 (not including impacts of the proposal)	Southern Highlands Shale Woodland has declined by more than 80 percent in 10 years or three generations (DPIE 2021b). The community is limited in its distribution and is estimated to have undergone a decline of between 75-90 percent of its pre-European extent, with less than 6,000 ha remaining, of which less than 1,000 ha would be of suitable condition to meet EPBC Act listing criteria (DoE 2015).

Criteria	Assessment
b. extent of reduction in ecological function for the TEC using evidence that describes the degree of environmental degradation or disruption to biotic processes (Principle 2, clause 6.7(2)(b) BC Regulation) indicated by: i. change in community structure ii. change in species composition iii. disruption of ecological processes iv. invasion and establishment of exotic species v. degradation of habitat, and vi. fragmentation of habitat	Southern Highlands Shale Woodland has undergone a reduction in ecological function and the TBDC displays "<50 individuals or <250 individuals where threats are known" (DPIE 2021b). This refers to TECs which have either been subject to high levels of environmental degradation or disruption of biotic processes, and any impact to them will result in an increased risk of failure to sustain their characteristic floristic assemblages. DoE (2015) list the following as threats to the EPBC Act-listed community: – Vegetation clearing and landscape fragmentation (previously due to agriculture and forestry; currently due to residential and commercial development) – Inappropriate grazing, mowing and slashing regimes – Removal of fallen timber and dead standing trees – Invasion by weeds – Invasion by introduced animals and aggressive native species – Loss of fauna and associated ecological functions – Inappropriate fire regimes – Climate change. OEH (2021b) indicate the following are threats to the BC Act-listed form of the community: – Clearing, including fragmentation, and other degradation for activities including agriculture, 'hobby farms', infrastructure establishment and maintenance (especially for roads, fences, dams, and asset protection zones), residential development and 'tidying-up' (including the removal or suppression of mid and understorey). – Private and small-scale commercial harvesting of firewood (either living or standing dead, including material on the ground). – Inappropriate fire regimes; primarily the absence of fire. – Weed invasion by non-native pasture species. – Grazing, browsing, trampling and other impacts such as ringbarking of remnants by domestic stock. – Grazing, browsing, trampling and other impacts such as ringbarking of remnants by feral herbivores.
c. evidence of restricted geographic distribution for the threatened species s (Principle 3, clause 6.7(2)(c) BC Regulation) presented by: i. extent of occurrence ii. area of occupancy iii. number of threat-defined locations	Southern Highlands Shale Woodland is generally found in a small area in the Southern Highlands of NSW, in an area bounded by the Illawarra Escarpment in the east, Burrawang and Bundanoon in the south, Canyonleigh in the west and Berrima and Colo Vale in the north.
d. evidence that the TEC is unlikely to respond to management (Principle 4, clause 6.7(2)(d) BC Regulation)	This TEC is, in general, able to respond to management practices such as weed control, removal of stock, control of feral herbivores and revegetation. Eucalyptus dominated grassy woodland communities are, in general, capable of responding to management (*pers. obs*). Standard environmental management measures such as weed control, supplementary planting, maintenance of natural fire regimes and treatment of pest fauna are likely to result in positive responses in the composition and ecological function of the community.
Impact assessment	
a. the impact on the geographic extent of the TEC (Principles 1 and 3) by estimating the total area of the TEC to be impacted by the proposal: i. in hectares, and	The proposal would result in an impact on a SAII entity through the proposed removal of up to 0.04 hectares of planted vegetation that broadly aligns with the final determination of the EEC. A stand of nine planted *Eucalyptus macarthurii* individuals occurs along the eastern boundary of the north-south road alignment. It is

Criteria	Assessment
	estimated that these trees are about 25 years old, and appeared to be in good condition at the time of the field survey. The understorey is primarily made up of exotic grass and herbaceous species, and there is ongoing grazing pressure. There is no nearby intact native vegetation. Given the underlying geology, regional vegetation mapping, results of the 'filter PCT' tool in the VIS, and presence of the species *Eucalyptus macarthurii*, a conservative approach has been taken and stand of trees has been allocated to PCT 944, which in turn has been assumed to be commensurate with Southern Highlands Shale Woodland. Data received from the BOS Helpdesk indicates that the species has undergone 95% decline in extent since 1750. The final determination notes that Southern Highlands Shale Woodlands has been extensively cleared for agriculture and rural development. Remnants are mostly small pockets. About 2000 ha, or less than 5% of the original extent now remains.
ii. as a percentage of the current geographic extent of the TEC in NSW	Data received from the BOS Helpdesk indicates that the community has experienced a decline of between 75-90% based on Tozer et al. (2010) mapping, while the final determination notes that the community has undergone a 95% decline in extent since 1750, having been extensively cleared for agriculture and rural development. – The estimated area of occupancy is 900km2 – The estimated extent of occupancy is 1132km2 – The estimated total current extent is 5376ha (DPE (2022). Clearing of 0.04ha for the proposal would result in a reduction of the total current extent by 0.0007%.
b. the extent that the proposed impacts are likely to contribute to further environmental degradation or the disruption of biotic processes (Principle 2) of the TEC by: i. estimating the size of any remaining, but now isolated, areas of the TEC; including areas of the TEC within 500 m of the development footprint or equivalent area for other types of proposals	Impacts on this SAII entity will result in the complete loss of the small patch within the proposal site but will not result in the fragmentation or isolation of any patches. The proposal will remove about 0.04ha of vegetation broadly commensurate with this EEC, and will not impact any other occurrences of the community elsewhere in the locality. There are no other patches of the community within 500m of the proposal site (DPE 2022). It should be noted that the individuals to be impacted are planted, rather than naturally occurring, and their provenance is unknown.
ii. describing the impacts on connectivity and fragmentation of the remaining areas of TEC measured by: distance between isolated areas of the TEC, presented as the average distance if the remnant is retained AND the average distance if the remnant is removed as proposed, and estimated maximum dispersal distance for native flora species characteristic of the TEC, and other information relevant to describing the impact on connectivity and fragmentation, such as the area to perimeter ratio for remaining areas of the TEC as a result of the development.	The proposal will result in the overall further fragmentation of the community in the locality, through the removal of the small stand of planted trees within the proposal site. It is unlikely that this stand is of much importance to the continued persistence of the community in the local area, as discussed below. The nearest patches of an equivalent PCT (PCT 3302) are about 1.12 km to the north-west, and 2.32 km to the north-east (DPE 2022). There are patches of forest about 770nm to the south and 790 m to the west, all of which are larger than the small stand of planted trees to be impacted by the proposal. The stand of trees within the proposal site is not included on regional vegetation mapping as native vegetation, and post-construction, it is likely that the distance between remaining stands of the community would be similar to what is currently there. Nine trees provide little in the way of habitat connectivity and contribute little in the way of genetic material to the local population.

Criteria	Assessment
	Dispersal studies suggest that eucalypt pollen can disperse over distances of over 1 km, although most is distributed within 200 m and seed crops are dominated by genetic material from nearby trees (Byrne et al. 2008; Broadhurst 2013). Eucalypt seeds lack any aerodynamic features, so their dispersal is largely influenced by factors such as tree height, canopy width, seed weight and wind strength. In light winds, light seeds are calculated to disperse around 50 m, with heavier seeds only dispersing around 20 m. Some eucalypt seeds may also be dispersed further by water, birds (eg uneaten seeds) and insects (eg accidental movement by stingless bees) (Booth, 2017). For small, isolated patches such as the patch on the proposal site, there is limited opportunity for dispersal of canopy species given surrounding agricultural practices.
iii. describing the condition of the TEC according to the vegetation integrity score for the relevant vegetation zone(s) (Section 4.3) including the relevant composition, structure and function condition scores for each vegetation zone	Southern Highlands Shale Woodland within the proposal site is in poor condition with a vegetation integrity score (VI) of 2.1. Vegetation in the study area adjoining the development area is in a comparable condition and would have a similar vegetation integrity score due to existing land uses and agricultural activities. Only two native species were recorded within the community; *Eucalyptus macarthurii*, which occurs as a linear stand of planted trees, and *Juncus continuus*, which occurs around a leaking bore pipe within the council-owned paper road easement. Development impacts are likely to be restricted to the proposal site. Given the mitigation measures specified in section 5.3, existing and adjoining land uses, and the extent of existing weed infestation and disturbance in the study area, the development is unlikely to significantly increase indirect impacts.

6. Offset requirements

6.1 Assessment of impacts requiring offsetting

The proposal would result in impacts to two plant community types (PCT) comprising removal of 0.32 ha of native vegetation including:

– 0.28 hectares of PCT 1256 Tableland swamp meadow on impeded drainage sites of the western Sydney Basin Bioregion and South Eastern Highlands Bioregion

– 0.04 hectares of PCT 944 Mountain Grey Gum - Narrow-leaved Peppermint grassy woodland on shales of the Southern Highlands, southern Sydney Basin Bioregion. It should be noted that the VI score of this vegetation zone was so low (2.1) that ecosystem credits are not required for residual impacts.

The proposal would remove 0.28 hectares of potential foraging and roosting habitat for the Southern Myotis, which is a species credit entity according to the BAM, as well as nine individuals of *Eucalyptus macarthurii*, which is also a species credit entity, assessed using the 'count' method.

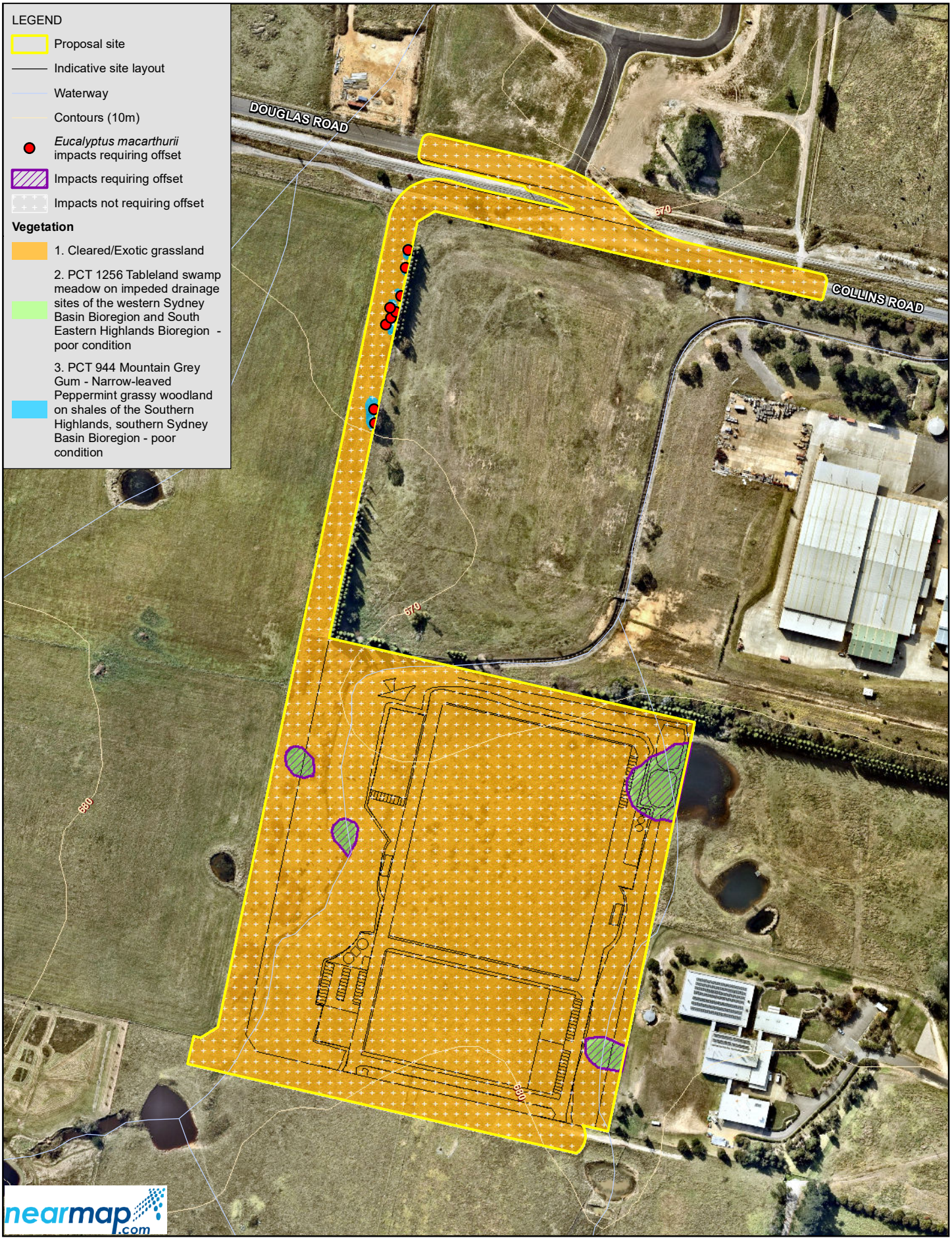
Impacts within the proposal site requiring offset are shown on Figure 6.1.

6.2 Assessment of impacts not requiring offsetting

The proposal site includes 10.15 ha of exotic grassland that has been ploughed and grazed. Three floristic plots (Plots 1, 2 and 5) were sampled in exotic grassland (refer to Figure 2.1) to confirm the absence of native vegetation within these areas of the proposal site. Exotic grassland was entered into the BAM-C as PCT 994 to (a local woodland PCT) to ensure that offsets are not required for this vegetation type in accordance with section 9.2.1 of the BAM (OEH 2020). Plots 1, 2 and 5 had an integrity score of 1.5, as such offsets are not required for impacts to this vegetation zone.

Photo 1 Cleared land not requiring offsetting

The occurrence of PCT 944_poor within the north-south road alignment had a VI score of 2.1. This vegetation is aligned with the EEC *Southern Highlands Shale Woodlands of the Sydney Basin Bioregion*. Given the VI score is less than 15, ecosystem credit offsets for residual impacts on this vegetation zone are not required. Species credit offsets have been calculated for the planted *Eucalyptus macarthurii* within this PCT.



Paper Size ISO A4

0 60 120

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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Plasrefine Pty Ltd
Moss Vale Plastics Recycling Facility
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Date **02 Mar 2023**

Impact summary

FIGURE 6.1

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Data source: Aerial imagery - nearmap 2023 (image date 24/04/2021, image extracted 30/06/2021); General topo - NSW LPI DTDB 2020, 2015. Created by: fmackay

6.3 Calculation of the offset requirement for ecosystem credits

The data from the fieldwork and mapping was entered into version 1.4.0.00 of the BAM credit calculator (Case number 00024641) as a 'Development Assessment' to determine the number and type of biodiversity credits that would be required to offset impacts of the proposal. The Biodiversity credit report is included in Appendix F and summarised below.

A total of 7 ecosystem credits would be required to offset the impacts of the proposal as shown in Table 6 1.

Table 6.1 Ecosystem credits required to offset impacts of the proposal

Plant community type	Area (ha)	Current vegetation integrity score	Future vegetation integrity score	Ecosystem credits required
PCT 1256 - Tableland swamp meadow on impeded drainage sites of the western Sydney Basin Bioregion and South Eastern Highlands Bioregion	0.28	42.9	0	6
PCT 944 - Mountain Grey Gum - Narrow-leaved Peppermint grassy woodland on shales of the Southern Highlands, southern Sydney Basin Bioregion	0.04	2.1	0	0
Total	**0.32**			**6**

6.4 Calculation of the offset requirement for species credits

Species credits are required to offset impacts on the Southern Myotis and *Eucalyptus macarthurii*.

Possible calls of the Southern Myotis were recorded in March during the targeted survey over the water body in the northeast of the study area (see Anabat recording results in Appendix C and Figure 6.2). This waterbody may provide foraging habitat for this species. It may roost in tree hollows near the proposal site where they are located close to suitable foraging habitat. No such hollows were identified during the field survey of the proposal site, nor where any other potential bat roosts found.

Species credits were calculated for the species, by preparing a Southern Myotis species polygon consistent with the BAM and OEH (2018). The species polygon for the species was mapped based on the methods identified in OEH (2018), which indicates that "All habitat on the subject land where the subject land is within 200m of a waterbody with pools/ stretches 3m or wider including rivers, creeks, billabongs, lagoons, dams and other waterbodies on the subject land" should be included in a species polygon. The polygon was created using GIS to buffer the waterbodies that are 3m of more wide in the proposal site by 200 metres. Once this buffer was created, the species polygon was clipped to the PCTs in the proposal site that the species is associated with, as listed in the TBDC, that are within 200m of the mapped waterbodies. PCT 944 is not associated with the species, and so it was not included in the species polygon.

There are small ephemeral drainage lines and covered in weeds, with no standing, open pools suitable for foraging along the western and eastern boundaries of the study area (Figure 1-2). The reaches of these drainage lines within and adjacent to the study area are intermittent, with only occasional narrow and shallow pools. They would contain few, if any, aquatic prey species for the Southern Myotis. They do not feature open water surrounded by open fly ways that could be used for foraging by the Southern Myotis. These drainage lines do not comprise foraging habitat for the Southern Myotis and so they have not been mapped as part of a species polygon, except for areas of overlap with the polygon surrounding the permanent water body described above.

Based on the approach described above, a 0.28 hectares Southern Myotis species polygon was mapped at the proposal site as shown in Figure 6.2. Species credit requirements based on the removal of habitat within this species polygon are summarised in Table 6.2 below.

The proposal would impact on nine specimens of *Eucalyptus macarthurii*. This species is a species credit entity and is assessed using the 'count' method. Species credit requirements based on the removal of nine individuals are summarised in Table 6.2 below.

Table 6.2 Species credits required to offset impacts of the proposal

Species	Area of Habitat/count of individuals	Species Credits Required
Southern Myotis *(Myotis macropus)*	0.28 ha	6
Paddys River Box (*Eucalyptus macarthurii*)	9 individuals	18

6.5 Offsetting of impacts on MNES

No significant impacts to MNES will occur as a result of the proposed works, therefore no offsets are required to offset impacts to MNES on the proposal site.

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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Species polygon
Southern Myotis

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FIGURE 6.2

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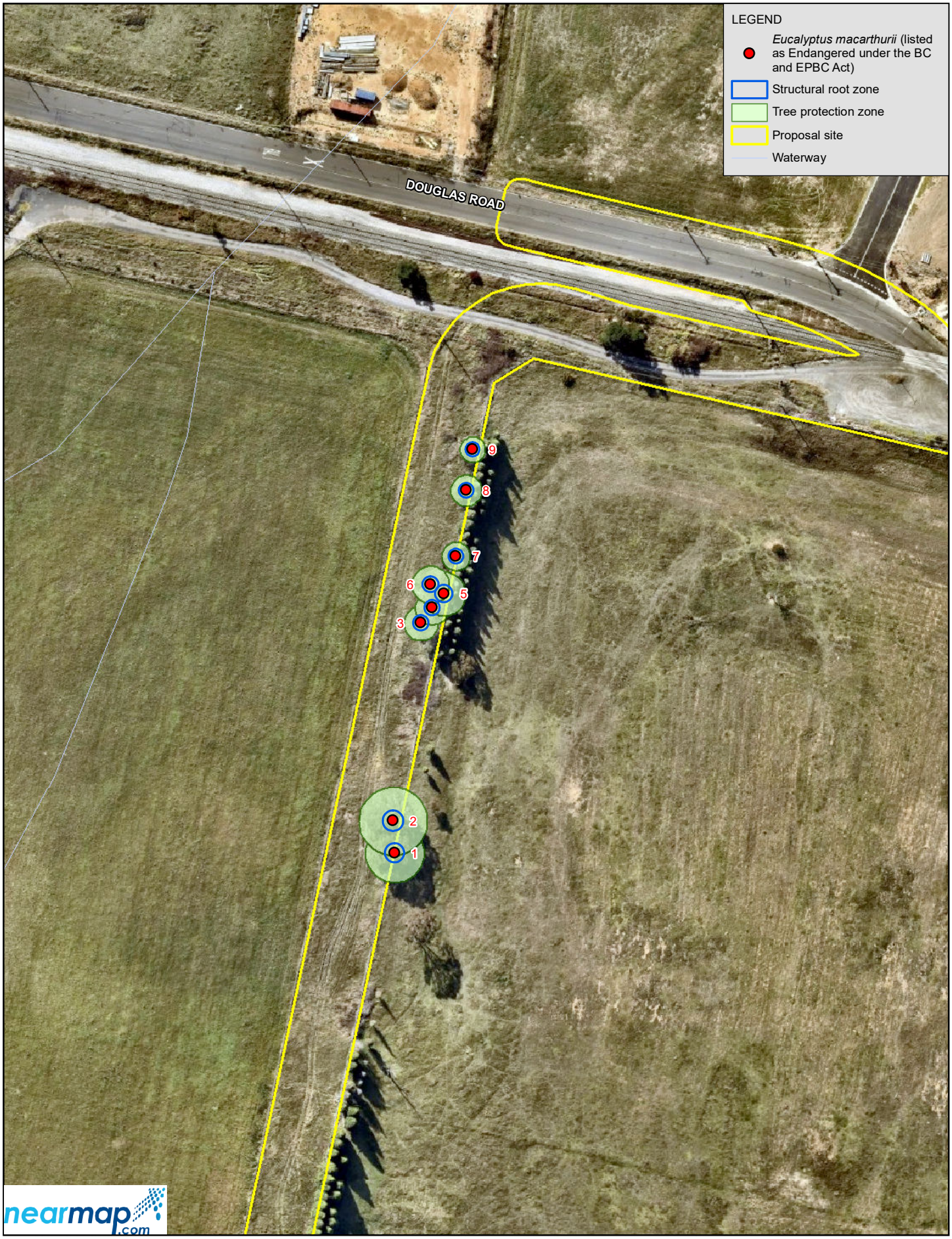
Data source: Aerial imagery - nearmap 2023 (image date 24/04/2021, image extracted 30/06/2021); General topo - NSW LPI DTDB 2020, 2015. Created by: fmackay



Paper Size ISO A4

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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***Eucalyptus macarthurii* impacts**

FIGURE 6.3

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Data source: Aerial imagery - nearmap 2023 (image date 24/04/2021, image extracted 30/06/2021); General topo - NSW LPI DTDB 2020, 2015. Created by: fmackay

7. Proposed conservation measures

7.1 Options to meet offset obligations

In accordance with the offset rules established by the *Biodiversity Conservation Regulation 2017* there are various means by which offset obligations described in Section 6.1 can be met. These include the following:

– Retiring the appropriate credits from an established stewardship site
– Monitory payment directly into the Biodiversity Conservation Fund, with the amount dictated by requesting a quote from the Biodiversity Conservation Fund Charge System, administered by the Biodiversity Conservation Trust (BCT)
– Funding an approved biodiversity action (note this mechanism is only available to actions listed in the ancillary rules for biodiversity conservation actions (OEH 2017d) and is not relevant to this project).

7.2 Conservation measures proposed to offset impacts of development

The preferred approach to offset the residual impacts of the proposal is to secure and retire appropriate credits from stewardship site/s that fit within the trading rules of the BOS in accordance with the 'like for like' report generated by the BAM calculator. If such credits are unavailable, credits would be sourced in accordance with the 'variation report' generated by the BAM calculator.

The variation rules of the BOS and the 'variation report' produced by the BAM calculator, indicate that PCT 1256 can be offset with 'like for like' options, including PCT 765, 766, 1229 or 1256 that occur within the Moss Vale, Burragorang, Ettrema, Illawarra and Sydney Cataract IBRA subregion, or any IBRA subregion that is within 100 km of the outer edge of the impacted site. The relevant offset trading group is the Montane Bogs and Fens - ≥ 70% - <90% cleared group (including Tier 2 or higher threat status).

PCT 944 is aligned with a threatened ecological community (TEC), and as such can only be offset with credits equivalent to the same TEC, which includes PCTs 944, 1107 and 1254 that occur within the Moss Vale, Burragorang, Ettrema, Illawarra and Sydney Cataract IBRA subregion, or any IBRA subregion that is within 100 km of the outer edge of the impacted site. Notwithstanding, the VI score for vegetation zones associated with PCT 944 was so low (2.1) within the proposal site, that ecosystem credits are not required to offset residual impacts on this vegetation zone as a result of the proposal.

Species credits can be sourced from any IBRA region in NSW, but must align with the species impacted.

A payment into the Biodiversity Conservation Fund would only be considered if a suitable number and type of biodiversity credits cannot be secured from third parties.

8. Conclusion

Plasrefine Recycling Pty Ltd is proposing to develop a plastics recycling and reprocessing facility, at 74-76 Beaconsfield Road, Moss Vale NSW. This revised Biodiversity Development Assessment Report (BDAR) has been prepared by GHD to identify the potential impacts of the proposal on biodiversity values within the proposal site, and includes updates to the proposal footprint since the original BDAR was reviewed during the EIS exhibition phase. This assessment has been completed in accordance with the BAM and includes:

– Desktop assessment to describe the existing environment and landscape features of the proposal site and to identify the suite of threatened biota potentially affected by the proposal
– Field survey to describe the biodiversity values of the proposal site and surrounding study area and to determine the likelihood of threatened biota and their habitats occurring in the proposal site or being affected by the proposal
– BAM calculations using the credit calculator version 1.4.0.00 to quantify the biodiversity impacts of the proposal following implementation of measures to avoid and minimise impacts and to determine the biodiversity credits that would be required to be retired to offset the residual impacts of the proposal.

The proposal would result in the following impacts:

– Removal of 0.28 ha of farm dams and associated vegetation that have been assigned to PCT 1256 - Tableland swamp meadow on impeded drainage sites of the western Sydney Basin Bioregion and South Eastern Highlands Bioregion
– Removal of 0.04 ha of planted trees that have been assigned to PCT 944 Mountain Grey Gum - Narrow-leaved Peppermint grassy woodland on shales of the Southern Highlands, southern Sydney Basin Bioregion
– Removal of 0.28 ha of potential habitat for the Southern Myotis
– Removal of nine planted specimens of *Eucalyptus macarthurii*, listed as endangered under the BC Act and EPBC Act
– Minimal potential indirect impacts to adjoining vegetation associated with edge effects, light spill, noise and introduction of weeds and pathogens.

The proposal would not impact any threatened biota listed under the *Fisheries Management Act 1994*.

Eucalyptus macarthurii is listed as an MNES under the EPBC Act. An assessment of significance has been completed for this species, which indicates that the proposal is unlikely to result in a significant impact on this species, and a referral is not considered necessary. The proposal is unlikely to result in any impacts to other MNES listed under the EPBC Act.

A BAM assessment and credit calculations have been performed in accordance with the methodology (OEH 2020) and using credit calculator version 1.4.0.00. Credits required to be retired to offset the impacts of the proposal include:

– 6 ecosystem credits to offset impacts to 0.28 ha of PCT 1256 Tableland swamp meadow on impeded drainage sites of the western Sydney Basin Bioregion and South Eastern Highlands Bioregion
– 6 Southern Myotis species credits to offset the removal of habitat within a 0.28 hectare species polygon.
– 18 *Eucalyptus macarthurii* species credits to offset the removal of nine individuals.

Other threatened species identified as potentially being impacted by the proposal are ecosystem credit species which would be offset through the retirement of the above listed ecosystem credits.

To avoid and minimise potential impacts of the proposal on biodiversity, a series of mitigation and management measures have been identified, which would be implemented as part of the construction environmental management plan for the proposal site.

The preferred approach to offset the residual impacts of the proposal is to secure and retire appropriate credits from stewardship sites that fit within the trading rules of the BOS in accordance with the ‘like for like’ report generated by the BAM calculator. If such credits are unavailable, credits would be sourced in accordance with the ‘variation report’ generated by the BAM calculator.

A payment to the Biodiversity Conservation Trust would only be considered if a suitable number and type of biodiversity credits cannot be secured from third parties.

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Appendix A

Likelihood of occurrence table

Threatened flora predicted or known to occur within 10 km of the proposal site options

Scientific name	Common name	BC Status	EPBC Status	Source	Habitat description	Likelihood of occurrence	Likelihood of impact
Acacia bynoeana	Bynoe's Wattle	E	V	186 records within 10km (OEH 2021a); Species or species' habitat may occur within 10km (DoEE 2021a)	Endemic to central eastern NSW, known a limited number of locations, often comprising populations of few plants. Grows mainly in heath/ dry sclerophyll forest on sandy soils, prefers open, sometimes slightly disturbed sites such as trail margins, road edges, and in recently burnt open patches. Flowers September to March, and fruit matures in November.	Unlikely. No forest vegetation on site. Entire site is highly modified and lacks intact native vegetation, has been subject to many decades of grazing.	Nil
Acacia pubescens	Downy Wattle	V	V	3 records within 10km (OEH 2021a)	Occurs mainly in Bankstown-Fairfield-Rookwood and Pitt Town areas, with outliers at Barden Ridge, Oakdale and Mountain Lagoon. Grows on alluviums, shales and shale/sandstone intergrades. Soils characteristically gravely, often with ironstone. Occurs in open woodland and forest, in communities including Cooks River/ Castlereagh Ironbark Forest, Shale/ Gravel Transition Forest and Cumberland Plain Woodland. Flowers from August to October.	Unlikely. No woodland or forest vegetation on site. Entire site is highly modified and lacks intact native vegetation, has been subject to many decades of grazing.	Nil
Amperea xiphoclada var. *pedicellata*		PE	Presumed extinct	2 records within 10km (OEH 2021a)	*Amperea xiphoclada* var*. pedicellata* is known only from the type specimen collected in 1892 from Sydney, NSW. The species has not been observed since and is presumed to be extinct. *Amperea xiphoclada* var*. pedicellata* was previously widespread in heath, woodland and forest in low-fertility, sandy soils.	Unlikely. No heath, woodland or forest vegetation on site. Entire site is highly modified and lacks intact native vegetation, has been subject to many decades of grazing. Species is presumed extinct.	Nil

Scientific name	Common name	BC Status	EPBC Status	Source	Habitat description	Likelihood of occurrence	Likelihood of impact
Boronia deanei	Deane's Boronia	V	V	Species or species' habitat likely to occur within 10km (DoEE 2021a) Predicted by BAM-C	This small erect shrub is found in scattered populations between the far south-east of NSW and the Blue Mountains (including the upper Kangaroo River near Carrington Falls, the Endrick River near Nerriga and Nalbaugh Plateau), mainly in conservation reserves. The species grows in wet heath, often at the margins of open forest adjoining swamps or along streams..	Unlikely. Habitat degraded and button checked in BAM-C. No local records. No known habitat associations present on site. No swamps, wet heath, or ecotone environments adjacent to dry open woodland or forest vegetation on site. Entire site is highly modified and lacks intact native vegetation and has been subject to many decades of grazing. Single line of planted *Eucalyptus macarthurii* does not provide suitable habitat for this species. No native shrubs identified within the footprint.	Nil
Caladenia tessellata	Thick Lip Spider Orchid	E	V	Species or species' habitat may occur within 10km (DoEE 2021a)	Occurs from Central Coast NSW to southern Victoria. Mostly coastal but extends inland to Braidwood in southern NSW. In NSW grows in grassy dry sclerophyll woodland on clay loam or sandy soils, and less commonly in heathland on sandy loam soils. Flowers between September and November.	Unlikely. No local records. No known habitat associations present on site. No heath, woodland or forest vegetation on site. Entire site is highly modified and lacks intact native vegetation, has been subject to many decades of grazing.	Nil
Callistemon linearifolius	Netted Bottle Brush	V		1 record within 10km (OEH 2021a)	Recorded from the Georges to Hawkesbury Rivers in Sydney, and north to Nelson Bay. There is also a recent record from the northern Illawarra. Grows in dry sclerophyll forest on the coast and adjacent ranges. Flowers from spring to summer	Unlikely. No forest vegetation on site. Entire site is highly modified and lacks intact native vegetation, has been subject to many decades of grazing.	Nil
Carex klaphakei	Klaphake's Sedge	E		6 records within 10km (OEH 2021a)	*Carex klaphakei* is found in only three locations, from the Blue Mountains (at Blackheath and Mt Werong) to the Southern Highlands (at Penrose). Grows with other native sedges and rushes in swamps on sandstone at altitudes of greater than 600 m.	Unlikely. Site is not on sandstone (it is on shale) and there are no swamps on sandstone present.	Nil

Scientific name	Common name	BC Status	EPBC Status	Source	Habitat description	Likelihood of occurrence	Likelihood of impact
Commersonia prostrata	Dwarf Kerrawang	E	E	45 records within 10km (OEH 2021a); Species or species' habitat likely to occur within 10km (DoEE 2021a)	In NSW occurs as individual plants at Penrose State Forest and Tallong with populations at Rowes Lagoon near the Corang and the Thirlmere lakes area, and at the Tomago sand beds near Newcastle. Grows on sandy, sometimes peaty soils in a variety of habitats. Associated native species may include *Imperata cylindrica, Empodisma minus* and *Leptospermum continentale*.	Unlikely. Entire site is highly modified and lacks intact native vegetation, has been subject to many decades of grazing.	Nil
Cryptostylis hunteriana	Leafless Tongue Orchid	V	V	1 record within 10km (OEH 2021a); Species or species' habitat may occur within 10km (DoEE 2021a)	Occurs in coastal areas from East Gippsland to southern Queensland. Habitat preferences not well defined. Grows mostly in coastal heathlands, margins of coastal swamps and sedgelands, coastal forest, dry woodland, and lowland forest. Prefers open areas in the understorey and is often found in association with Large Tongue Orchid and the Bonnet Orchid. Soils include moist sands, moist to dry clay loam and occasionally in accumulated eucalypt leaves. Flowers November-February.	Unlikely. Entire site is highly modified and lacks intact native vegetation, has been subject to many decades of grazing.	Nil
Cynanchum elegans	White-flowered Wax Plant	E	E	Species or species' habitat known to occur within 10km (DoEE 2021a)	Occurs from Gerroa (Illawarra) to Brunswick Heads and west to Merriwa in the upper Hunter. Most common near Kempsey. Usually occurs on the edge of dry rainforest or littoral rainforest, but also occurs in Coastal Banksia Scrub, open forest and woodland, and Melaleuca scrub. Soil and geology types are not limiting. Flowering occurs between August and May, with the peak in November.	Unlikely. Entire site is highly modified and lacks intact native vegetation, has been subject to many decades of grazing. No rainforest, scrub, forest or woodland present on site.	Nil

Scientific name	Common name	BC Status	EPBC Status	Source	Habitat description	Likelihood of occurrence	Likelihood of impact
Eucalyptus aggregata	Black Gum	V	V	40 records within 10km (OEH 2021a); Species or species' habitat known to occur within 10km (DoEE 2021a) Predicted by BAM-C	Occurs on the central and southern tablelands of NSW, and in a small disjunct population in Victoria. In NSW it occurs in the South Eastern Highlands Bioregion and on the western fringe of the Sydney Basin Bioregion. Black Gum grows in the lowest parts of the landscape, on grassy woodlands on alluvial soils in moist sites along creeks on broad, cold and poorly-drained flats and hollows. Commonly occurs with Candlebark, Ribbon Gum, and White Sally with a grassy understorey of Tussock. Also occurs as isolated paddock trees in modified native, exotic pastures or travelling stock reserves.	Unlikely. The only native vegetation present within the site is a single line of planted trees along a windbreak along the north-south road alignment, and aquatic vegetation around farm dams. All canopy trees on site have been identified as *Eucalyptus macarthurii*. Species not recorded despite targeted flora surveys undertaken during appropriate season.	Nil
Eucalyptus aquatica	Broad-leaved Sally	V	V	343 records within 10km (OEH 2021a) Predicted by BAM-C	Found primarily in the Penrose area near Goulburn where all records are either from State Forest or private property. There is also one record from within Morton National Park. Grows as scattered individuals on open, swampy flats.	Unlikely. No swampy flats present on site. The only native vegetation present within the site is a single line of planted trees along a windbreak along the north-south road alignment, and aquatic vegetation around farm dams. All canopy trees on site have been identified as *Eucalyptus macarthurii*. Habitat constraints (swamps; and land containing peat swamps and their margins or tributaries) unchecked in BAM-C.	Nil
Eucalyptus benthamii	Camden White Gum	V	V	3 records within 10km (OEH 2021a)	Occurs on the alluvial flats of the Nepean River and its tributaries. Known distribution from The Oaks (south) to Grose Wold (north) and Kedumba Valley (west). Two major subpopulations in Kedumba Valley and Bents Basin State Recreation Area. Occurs in wet open forest on alluvial flats, in well drained alluvial sands and gravels to 1 m deep. Requires a combination of deep alluvial sands and a flooding regime that permits seedling establishment.	Unlikely. No canopy trees present within the site.	Nil

Scientific name	Common name	BC Status	EPBC Status	Source	Habitat description	Likelihood of occurrence	Likelihood of impact
Eucalyptus macarthurii	Paddys River Box, Camden Woollybutt	E	E	1163 records within 10km (OEH 2021a); Species or species' habitat known to occur within 10km (DoEE 2021a) Predicted by BAM-C	Occurs from Moss Vale to Kanangra Boyd National Park. In the Southern Highlands occurs mainly on private land, often as isolated paddock trees. Grows in grassy woodlands on relatively fertile soils on broad cold flats.	Present. Nine planted individuals about 25 years of age present along the north-south road alignment.	Moderate
Genoplesium baueri	Bauer's Midge Orchid	E	E	Species or species' habitat may occur within 10km (DoEE 2021a)	Occurs from Ulladulla to Port Stephens, with only 13 known extant populations. Grows in sparse sclerophyll forest and moss gardens over sandstone. Flowers from February to March.	Unlikely. No local records. No sclerophyll forest or moss gardens present onsite.	Nil.
Genoplesium plumosum	Tallong Midge Orchid	CE	E	1 record within 10km (OEH 2021a)	Currently only known from Tallong and Morton National Park, although historically collected at Kurnell. Occurs exclusively in heathland, generally dominated by Violet Kunzea, Common Fringe-myrtle and Dillwynia spp. and grows on very shallow soils or within mosses on sandstone conglomerate shelves. Flowers from February to March.	Unlikely. No heathland on site. Entire site is highly modified and lacks intact native vegetation, has been subject to many decades of grazing.	Nil.
Gentiana wingecarribiensis	*Wingecarribee Gentian*	CE	E	Predicted by BAM-C	Known only from Hanging Rock Swamp and Wingecarribee Swamp in the Southern Highlands. The species grows in bogs, in Sphagnum Moss humps and in sedge communities.	Unlikely. No bogs, Sphagnum Moss humps or sedge communities present within the site. Habitat constraint buttons unchecked in BAM-C (Swamps; and Land containing peat bogs and margins on either Sphagnum Moss humps or sedge communities).	Nil
Grevillea molyneuxii	Wingello Grevillea	V	E	10 records within 10km (OEH 2021a); Species or species' habitat likely to occur within 10km (DoEE 2021a)	Restricted to a small area south of Penrose, above Tallowa Gully and Bundanoon Creek, in Morton National Park and on Crown Land. Grows in low heathland on sandstone, in skeletal soil on flat, wet sandstone shelves above dissected valleys. Prefers open areas within heathland patches and colonises tracks that bisect its habitat.	Unlikely. No heathland on site. Entire site is highly modified and lacks intact native vegetation, has been subject to many decades of grazing.	Nil.

Scientific name	Common name	BC Status	EPBC Status	Source	Habitat description	Likelihood of occurrence	Likelihood of impact
Grevillea parviflora subsp. *parviflora*	Small-flower Grevillea	V	V	143 records within 10km (OEH 2021a)	Occurs between Moss Vale/Bargo and lower Hunter Valley, with most occurrences in Appin, Wedderburn, Picton and Bargo. Broad habitat range including heath, shrubby woodland and open forest on light clay or sandy soils, and often in disturbed areas such as on the fringes of tracks.	Unlikely. No heath, woodland or forest vegetation on site. Entire site is highly modified and lacks intact native vegetation, has been subject to many decades of grazing.	Nil.
Grevillea raybrownii		V		727 records within 10km (OEH 2021a); Species or species' habitat known to occur within 10km (DoEE 2021a)	Generally occurs on ridgetops and, less often, slopes and benches of Hawkesbury Sandstone and Mittagong Formation. It occurs in Eucalyptus open forest and woodland with a shrubby understorey on sandy, gravelly loam soils derived from sandstone that are low in nutrients.	Unlikely. No woodland or forest vegetation on site. Entire site is highly modified and lacks intact native vegetation, has been subject to many decades of grazing.	Nil
Grevillea rivularis	Carrington Falls Grevillea	CE	E	36 records within 10km (OEH 2021a)	Restricted to the Carrington Falls area on the upper Kangaroo River west of Kiama, within Budderoo National Park. The species is found mainly on moist creek-sides on sandstone in open heath or eucalypt woodland.	Unlikely. No heath or woodland vegetation on site. Entire site is highly modified and lacks intact native vegetation, has been subject to many decades of grazing.	Nil
Helichrysum calvertianum		V		73 records within 10km (OEH 2021a); Species or species' habitat likely to occur within 10km (DoEE 2021a)	Helichrysum calvertianum is endemic to New South Wales where it is currently only known from the Wingecarribee Shire. There are seven known populations. Only one population occurs within the reserve estate, in the northern part of Morton National Park. It occurs in dry sclerophyll forest and heathland with rock outcrops, predominantly on Hawkesbury sandstone soils between 650-855 m elevation.	Unlikely. No heath or woodland vegetation on site. Entire site is highly modified and lacks intact native vegetation, has been subject to many decades of grazing.	Nil
Hibbertia puberula		E		2 records within 10km (OEH 2021a)	Distribution extending from Wollemi National Park south to Morton National Park and the south coast near Nowra. It favours low heath on sandy soils or rarely in clay, with or without rocks underneath. Habitats are typically dry sclerophyll woodland communities, although heaths are also occupied. Flowers from October to January	Unlikely. No heath or woodland vegetation on site. Entire site is highly modified and lacks intact native vegetation, has been subject to many decades of grazing.	Nil

Scientific name	Common name	BC Status	EPBC Status	Source	Habitat description	Likelihood of occurrence	Likelihood of impact
Irenepharsus trypherus	Illawarra Irene	E	E	7 records within 10km (OEH 2021a)	Recorded from 18 sites within the Kiama, Shellharbour, Shoalhaven, Tallaganda, Wingecarribee and Wollongong LGAs.Typically inhabits steep rocky slopes near cliff lines and ridge tops. Associated vegetation includes moist sclerophyll forest, Ironwood Backhousia myrtifolia thicket, and rainforest.	Unlikely. No steep rocky slopes, cliff lines or ridge tops present onsite.	Nil
Kunzea cambagei	Cambage Kunzea	V	V	3 records within 10km (OEH 2021a); Species or species' habitat known to occur within 10km (DoEE 2021a)	Mainly occurs in the Yerranderie/Mt Werong area with other populations also along the Wingecarribee River, Loombah Plateau east of Mount Werong, Kanangra-Boyd NP and the Nattai NP. Cambage Kunzea is restricted to damp, sandy soils in wet heath or mallee open scrub at higher altitudes on sandstone outcrops or Silurian group sediments.	Unlikely. No heath or scrub onsite.	Nil
Leucochrysum albicans var. tricolor	Hoary Sunray		E	Species or species' habitat may occur within 10km (DoEE 2021a); 1 record within 10km (OEH 2021a)	In NSW it currently occurs on the Southern Tablelands adjacent areas in an area roughly bounded by Albury, Bega and Goulburn, with a few scattered localities know from beyond this region. Occurs in a wide variety of grassland, woodland and forest habitats, generally on relatively heavy soils. The species is highly dependent on the presence of bare ground for germination and can occur in modified habitats such as semi-urban areas and roadsides.	Unlikely. Limited areas of bare ground present onsite	Nil
Leucopogon exolasius	Woronora Beard-heath	V	V	1409 records within 10km (OEH 2021a)	Occurs along the upper Georges River and in Heathcote NP, Royal NP and is also known from the Blue Mountains along the Grose River. Grows in woodland on sandstone and prefers rocky hillsides along creek banks up to 100 m altitude. Associated species include Sydney Peppermint and Silvertop Ash and Graceful Bush-pea, Flaky-barked Tea-tree and *Dillwynia retorta*.	Unlikely. No woodland or rocky areas onsite.	Nil

Scientific name	Common name	BC Status	EPBC Status	Source	Habitat description	Likelihood of occurrence	Likelihood of impact
Lysimachia vulgaris var. *davurica*	Yellow Loosestrife	E		101 records within 10km (OEH 2021a)	In NSW, Yellow Loosestrife is only known from Wingecarribee Swamp, the Boro area near Braidwood and the Bega River Valley. The NSW populations are in disparate habitat: extensive wetland on peaty soils, riparian wetland vegetation and pasture on a dairy farm.	Unlikely. No wetland or riparian habitat onsite. Species not recorded on the proposal site despite targeted flora surveys undertaken during appropriate season.	Nil
Melaleuca deanei	Deane's Paperbark	V	V	4 records within 10km (OEH 2021a)	Occurs from Nowra to St Albans and west to the Blue Mountains, with most records in Ku-ring-gai/Berowra and Holsworthy/Wedderburn areas. Mostly grows on broad flat ridgetops, dry ridges and slopes and strongly associated with low nutrient sandy loam soils, sometimes with ironstone. Grows in heath- open forest, often in sandstone ridgetop woodland communities.	Unlikely. No heath or open forest habitat onsite.	Nil
Persicaria elatior	Tall Knotweed	V	V	Species or species' habitat may occur within 10km (DoEE 2021a)	Tall Knotweed has been recorded in south-eastern NSW from Ulladulla to the Victorian border. In northern NSW it is known from Raymond Terrace and the Grafton area. This species normally grows in damp places, especially beside streams and lakes. Occasionally in swamp forest or associated with disturbance.	Unlikely. No local records. Entire site is highly modified and lacks intact native vegetation, has been subject to many decades of grazing.	Nil
Persoonia bargoensis	Bargo Geebung	E	V	1 record within 10km (OEH 2021a)	Restricted to the western edge of the Woronora Plateau and the northern edge of the Southern Highlands, bounded by Picton, Douglas Park, Yanderra and the Cataract River. Occurs in woodland or dry sclerophyll forest on sandstone and clayey laterite on heavier, well drained, loamy, gravely soils of Hawkesbury Sandstone and Wianamatta Shale. Tends to occur in disturbed areas e.g. roadsides and trail margins.	Unlikely. No woodland or forest vegetation on site. Entire site is highly modified and lacks intact native vegetation, has been subject to many decades of grazing.	Nil
Persoonia glaucescens	Mittagong Geebung	E	V	1241 records within 10km (OEH 2021a); Species or species' habitat known to occur within 10km (DoEE 2021a)	Found between Buxton and Berrima. The Mittagong Geebung grows in woodland to dry sclerophyll forest on clayey and gravely laterite. The preferred topography is ridge-tops, plateaux and upper slopes.	Unlikely. No woodland or forest vegetation on site. Entire site is highly modified and lacks intact native vegetation, has been subject to many decades of grazing.	Nil

Scientific name	Common name	BC Status	EPBC Status	Source	Habitat description	Likelihood of occurrence	Likelihood of impact
Persoonia hirsuta	Hairy Geebung	E	E	28 records within 10km (OEH 2021a)	Occurs within the Blue Mountains, Southern Highlands and Sydney coastal regions from Hilltop to Glen Davis and Royal NP to Gosford. Population within the Hills Shire particularly important due to high density of plants. Grows on sandy soils in dry sclerophyll open forest, woodland and heath on sandstone up to 600 m above sea level.	Unlikely. No heath, woodland or forest vegetation on site. Entire site is highly modified and lacks intact native vegetation, has been subject to many decades of grazing.	Nil
Persoonia mollis subsp. *revoluta*		V		160 records within 10km (OEH 2021a)	*Persoonia mollis subsp. revoluta* is endemic to New South Wales where it is currently known to occur in seven populations, primarily in the area between Mittagong, Paddys River and High Range in the Southern Highlands with an outlying population in the Bindook Highlands. Most of the populations occur between 600 and 800m elevation asl. Mainly on relatively deep sandy soils on broad ridgetops and upper slopes	Unlikely. No ridgetops or upper slopes on site.	Nil
Phyllota humifusa	Dwarf Phyllota	V	V	460 records within 10km (OEH 2021a); Species or species' habitat known to occur within 10km (DoEE 2021a)	Occurs in the southern Blue Mountains (Bimlow Tableland), the Joadja area west of Mittagong and Penrose area near Paddys River. Occurs in dry sclerophyll forest, sometimes near swamps, in deep sandy soils or gravely loams over a sandstone substrate.	Unlikely. No forest vegetation on site. Entire site is highly modified and lacks intact native vegetation, has been subject to many decades of grazing.	Nil
Pomaderris brunnea	Brown Pomaderris	E	V	7 records within 10km (OEH 2021a)	Brown Pomaderris is found in a very limited area around the Colo, Nepean and Hawkesbury Rivers, including the Bargo area and near Camden. Brown Pomaderris grows in moist woodland or forest on clay and alluvial soils of flood plains and creek lines.	Unlikely. No woodland or forest vegetation on site. Entire site is highly modified and lacks intact native vegetation, has been subject to many decades of grazing.	Nil
Pomaderris cotoneaster	Cotoneaster Pomaderris	E	E	43 records within 10km (OEH 2021a); Species or species' habitat likely to occur within 10km (DoEE 2021a)	Disjunct distribution including the Nungatta area, Tumut, the Tantawangalo area, near Tallong, the Yerranderie area, the Canyonleigh area and Ettrema Gorge. Found in wide range of habitats, including forest with deep, friable soil, amongst rock beside a creek, on rocky forested slopes and in steep gullies between sandstone cliffs.	Unlikely. No forest vegetation on site. Entire site is highly modified and lacks intact native vegetation, has been subject to many decades of grazing.	Nil

Scientific name	Common name	BC Status	EPBC Status	Source	Habitat description	Likelihood of occurrence	Likelihood of impact
Pomaderris walshii	Carrington Falls Pomaderris	CE		34 records within 10km (OEH 2021a)	Highly restricted distribution, known only from the upper catchment of the Kangaroo River, above the escarpment near Robertson. It occurs as two small populations along a roughly 3 km riparian stretch, within habitats varying from shrubland to open grassy forest.	Unlikely. No woodland or forest vegetation on site. Entire site is highly modified and lacks intact native vegetation, has been subject to many decades of grazing.	Nil
Prasophyllum affine	Jervis Bay Leek Orchid	E	E	Species or species' habitat may occur within 10km (DoEE 2021a)	Known from three areas south-east of Nowra on South Coast. These are Kinghorne Point, Wowly Gully near the town of Callala Bay, and near the township of Vincentia. Grows on poorly drained clay soils that support low heathland and sedgeland communities.	Unlikely. No heathland or sedgeland vegetation on site. Entire site is highly modified and lacks intact native vegetation, has been subject to many decades of grazing.	Nil
Prasophyllum fuscum	Slaty Leek Orchid	CE	V	597 records within 10km (OEH 2021a); Species or species' habitat likely to occur within 10km (DoEE 2021a) Predicted by BAM-C	Restricted to an area of less than 4 km^2 in the upper catchment of the Georges River, southwest of Sydney in the Wilton district. Grows in moist heath, often along seepage lines. The known population grows in moist sandy soil over sandstone amongst sedges and grasses in an area that appears to be regularly slashed by the local council.	Unlikely. No heathland or sedgeland vegetation on site. Entire site is highly modified and lacks intact native vegetation, has been subject to many decades of grazing. Habitat degraded button checked in BAM-C.	Nil
Pterostylis pulchella	Waterfall Greenhood	V	V	13 records within 10km (OEH 2021a) Predicted by BAM-C	The Waterfall Greenhood is found only at Fitzroy Falls, Belmore Falls, upper Bundanoon Creek (Meryla) and Minnamurra Falls. The Waterfall Greenhood is found on cliff faces close to waterfalls and creek banks and mossy rocks alongside running water.	Unlikely. No cliffs, waterfalls or creekbanks onsite. Geographic limitation (within 1km of sandstone escarpment) unchecked in BAM-C	Nil
Pterostylis ventricosa		CE		1 record within 10km (OEH 2021a)	*Pterostylis ventricosa* is known from populations at St Georges Basin, Sussex Inlet and west of Nowra in the Shoalhaven and also near Tallong and Mittagong in the Southern Highlands. Predominantly in more open areas of tall coastal eucalypt forest often dominated by one or more of the following tree species: Turpentine, Spotted Gum, Grey Ironbark, Blackbutt, White Stringybark, Scribbly Gum and Sydney Peppermint.	Unlikely. No forest vegetation on site. Entire site is highly modified and lacks intact native vegetation, has been subject to many decades of grazing.	Nil

Scientific name	Common name	BC Status	EPBC Status	Source	Habitat description	Likelihood of occurrence	Likelihood of impact
Pultenaea aristata	Prickly Bush-pea	V	V	3 records within 10km (OEH 2021a)	Restricted to the Woronora Plateau, a small area between Helensburgh, south of Sydney, and Mt Kiera above Wollongong. Occurs in either dry sclerophyll woodland or wet heath on sandstone.	Unlikely. No heathland or woodland vegetation on site. Entire site is highly modified and lacks intact native vegetation, has been subject to many decades of grazing.	Nil
Pultenaea elusa	Elusive Bush-pea	CE	E	Predicted by BAM-C	Known only from swamp habitats, with the only records being from 1938 at Penrose and Wingello on the Southern Tablelands.	Unlikely. No swamp habitat present on site. Entire site is highly modified and lacks intact native vegetation, has been subject to many decades of grazing. Habitat degraded button checked in BAM-C.	Nil
Rhizanthella slateri	Eastern Australian Underground Orchid	V	E	Species or species' habitat may occur within 10km (DoEE 2021a)	Currently known only from 10 locations, including near Bulahdelah, the Watagan Mountains, the Blue Mountains, Wiseman's Ferry area, Agnes Banks and near Nowra. The species grows in eucalypt forest but no informative assessment of the likely preferred habitat for the species is available. Flowers September and November.	Unlikely. No local records. No forest vegetation onsite.	Nil
Rhodamnia rubescens	Scrub Turpentine	CE		Species or species' habitat may occur within 10km (DoEE 2021a)	Occurs in coastal districts north from Batemans Bay in New South Wales, to areas inland of Bundaberg in Queensland. Populations of *R. rubescens* typically occur in coastal regions and occasionally extend inland onto escarpments up to 600 m a.s.l. in areas with rainfall of 1,000 -1,600 mm. Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils.	Unlikely. No local records. No rainforest or wet sclerophyll Forest vegetation onsite.	Nil
Solanum armourense		E		7 records within 10km (OEH 2021a)	Confined to a relatively small area south-west of Sydney, from Mt Armour within Blue Mountains National Park south to the Wombeyan area. Occurs in eucalypt woodland, in shallow soil on steep rocky hillsides.	Unlikely. No woodland vegetation on site. Entire site is highly modified and lacks intact native vegetation, has been subject to many decades of grazing.	Nil
Solanum celatum		E		4 records within 10km (OEH 2021a)	Occurs from Wollongong to Nowra and inland to Bungonia. Grows in rainforest clearings, or in wet sclerophyll forests.	Unlikely. No rainforest or wet sclerophyll Forest vegetation onsite.	Nil

Scientific name	Common name	BC Status	EPBC Status	Source	Habitat description	Likelihood of occurrence	Likelihood of impact
Thelymitra kangaloonica	Kangaloon Sun Orchid	CE	CE	20 records within 10km (OEH 2021a); Species or species' habitat likely to occur within 10km (DoEE 2021a)	The Kangaloon Sun-orchid is only known to occur on the southern tablelands of NSW in the Moss Vale / Kangaloon / Fitzroy Falls area at 550-700 m above sea level. It is found in swamps in sedgelands over grey silty grey loam soils.	Unlikely. No swamps or sedgeland vegetation on site. Entire site is highly modified and lacks intact native vegetation, has been subject to many decades of grazing. Habitat constraints (Swamps; and within 200 m of swamp) unchecked in BAM-C.	Nil
Thesium australe	Austral Toadflax	V	V	Species or species' habitat likely to occur within 10km (DoEE 2021a)	Found in small, scattered populations along the east coast, northern and southern tablelands. Occurs in grassland or grassy woodland and is often found in association with Kangaroo Grass.	Unlikely. No local records. No native grassland or grassy woodland onsite.	Nil
Xerochrysum palustre	Swamp Everlasting		V	3 records within 10km (OEH 2021a); Species or species' habitat likely to occur within 10km (DoEE 2021a)	Found in Kosciuszko National Park and the eastern escarpment south of Badja. Swamp Everlasting grows in wetlands including sedge-swamps and shallow freshwater marshes, often on heavy black clay soils.	Unlikely. No swamps, shallow water marshes or sedgeland vegetation on site. Entire site is highly modified and lacks intact native vegetation, has been subject to many decades of grazing.	Nil
Zieria murphyi	Velvet Zieria	V	V	12 records within 10km (OEH 2021a); Species or species' habitat may occur within 10km (DoEE 2021a)	Found in the Blue Mountains at Mt Tomah and on the southern tablelands where it has been recorded in Morton National Park in the Bundanoon area. The Velvet Zieria is found in sheltered positions in moist gullies in moist eucalypt forest with sandy soil.	Unlikely. No moist eucalypt forest onsite.	Nil
Eucalyptus aggregata - endangered population	*Eucalyptus aggregata* population in the Wingecaribee local government area	EP	V	40 records within 10km (OEH 2021a)	This endangered population is located in the Wingecarribee local government area. Three sub populations, comprising less than 100 plants in total, are located in Berrima, Medway and Sutton Forest. Grows on alluvial soils, on cold, poorly-drained flats and hollows adjacent to creeks and small rivers.	Unlikely. Species not present on site; all canopy trees have been identified as *Eucalyptus macarthurii*.	Nil

Threatened fauna predicted or known to occur within 10km of the development site options

Scientific name	Common name	BC Status	EPBC Status	Source	Habitat description	Likelihood of occurrence	Likelihood of impact
Birds							
Anthochaera phrygia	Regent Honeyeater	CE	CE	7 records within 10km (OEH 2021a); Species or species' habitat likely to occur within 10km (DoEE 2021a)	The Regent Honeyeater mainly inhabits temperate woodlands and open forests of the inland slopes of south-east Australia. Birds are also found in drier coastal woodlands and forests in some years. Once recorded between Adelaide and the central coast of Queensland, its range has contracted dramatically in the last 30 years to between north-eastern Victoria and south-eastern Queensland. There are only three known key breeding regions remaining: north-east Victoria (Chiltern-Albury), and in NSW at Capertee Valley and the Bundarra-Barraba region. In NSW the distribution is very patchy and mainly confined to the two main breeding areas and surrounding fragmented woodlands. In some years flocks converge on flowering coastal woodlands and forests. The species inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak. Regent Honeyeaters inhabit woodlands that support a significantly high abundance and species richness of bird species. These woodlands have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes.	Unlikely. No woodland or forest habitat on site.	Nil.
Artamus cyanopterus cyanopterus	Dusky Woodswallow	V		95 records within 10km (OEH 2021a) Predicted by BAM-C	The Dusky Woodswallow is widespread from the coast to inland, including the western slopes of the Great Dividing Range and farther west. It is often recorded in woodlands and dry open sclerophyll forests, and has also been recorded in shrublands, heathlands regenerating forests and very occasionally in moist forests or rainforests. The understorey is typically open with sparse eucalypt saplings, acacias and other shrubs, often with coarse woody debris. It is also recorded in farmland, usually at the edges of forest or woodland or in roadside remnants or wind breaks with dead timber. The nest is an open shallow untidy cup frequently built in an open hollow, crevice or stump. Although Dusky Woodswallows have large home ranges, individuals may spend most of their time in about a 2 ha range and defend an area about 50 m around the nest. Dusky Woodswallows prefer larger remnants over smaller remnants. Competitive exclusion by Noisy Miners (*Manorina melanocephala*) is a significant threat to this species.	Unlikely. No large remnants of vegetation close to site. While the species may persist in wind breaks, such as the planted strip of *Eucalyptus macarthurii* in the north-south road alignment, there is no fallen timber present to provide perching habitat for the species within the site.	Nil.

Scientific name	Common name	BC Status	EPBC Status	Source	Habitat description	Likelihood of occurrence	Likelihood of impact
Botaurus poiciloptilus	Australasian Bittern	E	E	2 records within 10km (OEH 2021a); Species or species' habitat known to occur within 10km (DoEE 2021a) Predicted by BAM-C	Australasian Bitterns are widespread but uncommon over south-eastern Australia. In NSW they may be found over most of the state except for the far north-west. The Species favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes (*Typha* spp.) and spikerushes (*Eleocharis* spp.), it hides during the day amongst dense reeds or rushes and feed mainly at night on frogs, fish, yabbies, spiders, insects and snails. The species may construct feeding platforms over deeper water from reeds trampled by the bird; platforms are often littered with prey remains.	Unlikely. No freshwater wetlands with tall, dense emergent vegetation.	Nil.
Calidris ferruginea	Curlew Sandpiper	E	CE,C,J,K	Species or species' habitat may occur within 10km (DoEE 2021a)	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. It forages in or at the edge of shallow water, occasionally on exposed algal mats or waterweed, or on banks of beach-cast seagrass or seaweed.	Unlikely. No littoral or estuarine habitats onsite.	Nil.
Callocephalon fimbriatum	Gang-gang Cockatoo	V		324 records within 10km (OEH 2021a)	In New South Wales, the Gang-gang Cockatoo is distributed from the south-east coast to the Hunter region, and inland to the Central Tablelands and south-west slopes. It occurs regularly in the Australian Capital Territory. It is rare at the extremities of its range, with isolated records known from as far north as Coffs Harbour and as far west as Mudgee. In spring and summer the species is generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In autumn and winter, the species often moves to lower altitudes in drier more open eucalypt forests and woodlands particularly box-gum and box-ironbark assemblages, or in dry forest in coastal areas and often found in urban areas.	Unlikely. No woodland or forest habitat on site.	Nil.

Scientific name	Common name	BC Status	EPBC Status	Source	Habitat description	Likelihood of occurrence	Likelihood of impact
Calyptorhynchus lathami	Glossy Black-Cockatoo	V		474 records within 10km (OEH 2021a) Predicted by BAM-C	The species is uncommon although widespread throughout suitable forest and woodland habitats, from the central Queensland coast to East Gippsland in Victoria, and inland to the southern tablelands and central western plains of NSW, with a small population in the Riverina. It inhabits open forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur. Black Sheoak (*Allocasuarina littoralis*) and Forest Sheoak (*A. torulosa*) are important foods. Inland populations feed on a wide range of sheoaks, including Drooping Sheoak, *Allocasuaraina diminuta*, and *A. gymnathera*. Belah is also utilised and may be a critical food source for some populations. The species is dependent on large hollow-bearing eucalypts for nest sites.	Unlikely. No woodland or forest habitat containing *Allocasuarina* spp. or hollow bearing trees on site. Habitat constraint (Presence of *Allocasuarina* and *casuarina* species) unchecked in BAM-C. Habitat constraints (Hollow bearing trees; and Living or dead tree with hollows greater than 15cm diameter and greater than 8m above ground) unchecked in BAM-C.	Nil.
Chthonicola sagittata	Speckled Warbler	V		31 records within 10km (OEH 2021a)	The Speckled Warbler has a patchy distribution throughout south-eastern Queensland, the eastern half of NSW and into Victoria, as far west as the Grampians. The species is most frequently reported from the hills and tablelands of the Great Dividing Range, and rarely from the coast. There has been a decline in population density throughout its range, with the decline exceeding 40% where no vegetation remnants larger than 100 ha survive. The Speckled Warbler lives in a wide range of Eucalyptus dominated communities that have a grassy understorey, often on rocky ridges or in gullies, typical habitat would include scattered native tussock grasses, a sparse shrub layer, some eucalypt regrowth and an open canopy. Large, relatively undisturbed remnants are required for the species to persist in an area.	Unlikely. No woodland or forest habitat on site.	Nil.

Scientific name	Common name	BC Status	EPBC Status	Source	Habitat description	Likelihood of occurrence	Likelihood of impact
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	V		43 records within 10km (OEH 2021a)	The western boundary of the range of the Brown Treecreeper runs approximately through Corowa, Wagga Wagga, Temora, Forbes, Dubbo and Inverell and along this line the subspecies intergrades with the arid zone subspecies of Brown Treecreeper which then occupies the remaining parts of the state. The species is often found in eucalypt woodlands (including Box-Gum Woodland) and dry open forest of the inland slopes and plains inland of the Great Dividing Range; 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 (*Eucalyptus camaldulensis*) Forest bordering wetlands with an open understorey of acacias, saltbush, lignum, cumbungi and grasses; usually not found in woodlands with a dense shrub layer; fallen timber is an important habitat component for foraging; also recorded, though less commonly, in similar woodland habitats on the coastal ranges and plains.	Unlikely. No woodland or forest habitat on site.	Nil.
Daphoenositta chrysoptera	Varied Sittella	V		98 records within 10km (OEH 2021a)	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 species inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland.	Unlikely. No woodland or forest habitat on site.	Nil.
Dasyornis brachypterus	Eastern Bristlebird	E	E	5 records within 10km (OEH 2021a)	Occurs in three disjunct areas of south-eastern Australia: southern Queensland/northern NSW, the Illawarra Region and in the vicinity of the NSW/Victorian border. The habitat for central and southern populations is characterised by dense, low vegetation including heath and open woodland with a heathy understorey. In northern NSW the habitat occurs in open forest with dense tussocky grass understorey and sparse mid-storey near rainforest ecotone; all of these vegetation types are fire prone. The age of habitat since fires (fire-age) is of paramount importance to this species. The Illawarra and southern populations reach maximum densities in habitat that has not been burnt for at least 15 years; however, habitat in northern NSW requires frequent fires to maintain habitat condition and suitability. The northern	Unlikely. No woodland or heathland habitat on site.	Nil.

Scientific name	Common name	BC Status	EPBC Status	Source	Habitat description	Likelihood of occurrence	Likelihood of impact
					fire regimes is between 3-6 years and of variable intensity depending on the habitat condition.		
Falco hypoleucos	Grey Falcon	E		Species or species' habitat likely to occur within 10km (DoEE 2021a)	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 species is 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. It also occurs near wetlands where surface water attracts prey.	Unlikely. No local records. No native shrubland, grassland or wooded watercourses on the site.	Nil.
Glossopsitta pusilla	Little Lorikeet	V		21 records within 10km (OEH 2021a)	The Little Lorikeet is distributed widely across the coastal and Great Divide regions of eastern Australia from Cape York to South Australia. NSW provides a large portion of the species' core habitat, with lorikeets found westward as far as Dubbo and Albury. Nomadic movements are common, influenced by season and food availability, although some areas retain residents for much of the year and 'locally nomadic' movements are suspected of breeding pairs. The species forages primarily in the canopy of open Eucalyptus forest and woodland, yet also finds food in Angophora, Melaleuca and other tree species. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity.	Unlikely. No woodland or forest habitat on site.	Nil.
Grantiella picta	Painted Honeyeater	V	V	3 records within 10km (OEH 2021a); Species or species' habitat likely to occur within 10km (DoEE 2021a)	The Painted Honeyeater is nomadic and occurs at low densities throughout its range. The greatest concentrations of the bird and almost all breeding occurs on the inland slopes of the Great Dividing Range in NSW, Victoria and southern Queensland. During the winter it is more likely to be found in the north of its distribution. The species inhabits Boree/ Weeping Myall (*Acacia pendula*), Brigalow (*A. harpophylla*) and Box-Gum Woodlands and Box-Ironbark Forests. It is a specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias. Prefers mistletoes of the genus *Amyema*.	Unlikely. No woodland or forest habitat on site.	Nil.

Scientific name	Common name	BC Status	EPBC Status	Source	Habitat description	Likelihood of occurrence	Likelihood of impact
Haliaeetus leucogaster	White-bellied Sea-Eagle	V		20 records within 10km (OEH 2021a) Predicted by BAM-C	The White-bellied Sea-eagle is widespread along the New South Wales coast, and along all major inland rivers and waterways. The species habitats are characterised by the presence of large areas of open water including larger rivers, swamps, lakes, and the sea. It occurs at sites near the sea or sea-shore, such as around bays and inlets, beaches, reefs, lagoons, estuaries and mangroves; and at, or in the vicinity of freshwater swamps, lakes, reservoirs, billabongs and saltmarsh. The terrestrial habitats the species has been recorded in, include coastal dunes, tidal flats, grassland, heathland, woodland, and forest (including rainforest).	Unlikely. No suitable foraging or breeding habitat on site. The only waterbodies present are small, unnamed ephemeral drainage lines and small farm dams, that do not provide sufficient habitat for the species. Habitat constraint (Living or dead mature trees within suitable vegetation within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines) unchecked in BAM-C.	Nil.
Hieraaetus morphnoides	Little Eagle	V		30 records within 10km (OEH 2021a)	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. The species occupies open eucalypt forest, woodland or open woodland. Sheoak or Acacia woodlands and riparian woodlands of interior NSW are also used. It nests in tall living trees within a remnant patch, where pairs build a large stick nest in winter.	Unlikely. No woodland or forest habitat on site.	Nil.

Scientific name	Common name	BC Status	EPBC Status	Source	Habitat description	Likelihood of occurrence	Likelihood of impact
Hirundapus caudacutus	White-throated Needletail		V,C,J,K	7 records within 10km (OEH 2021a); Species or species' habitat known to occur within 10km (DoEE 2021a) Predicted by BAM-C	White-throated Needletails often occur in large numbers over eastern and northern Australia. White-throated Needletails are aerial birds and for a time it was commonly believed that they did not land while in Australia. It has now been observed that birds will roost in trees, and radio-tracking has since confirmed that this is a regular activity.	Unlikely. No woodland onsite.	Nil.
Lathamus discolor	Swift Parrot	E	CE	Species or species' habitat likely to occur within 10km (DoEE 2021a)	The Swift Parrot breeds in Tasmania during spring and summer, migrating in the autumn and winter months to south-eastern Australia from Victoria and the eastern parts of South Australia to south-east Queensland. In NSW mostly occurs on the coast and southwest slopes. On the mainland the species occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Their favoured feed trees include winter flowering species such as Swamp Mahogany *Eucalyptus robusta*, Spotted Gum *Corymbia maculata*, Red Bloodwood *C. gummifera*, Forest Red Gum *E. tereticornis*, Mugga Ironbark *E. sideroxylon*, and White Box *E. albens*.	Unlikely. No local records. No winter flowering eucalyptus onsite.	Nil.
Lophoictinia isura	Square-tailed Kite	V		1 record within 10km (OEH 2021a)	The Square-tailed Kite ranges along coastal and subcoastal areas from south-western to northern Australia, Queensland, NSW and Victoria. In NSW, scattered records of the species throughout the state indicate that the species is a regular resident in the north, north-east and along the major west-flowing river systems. It is a summer breeding migrant to the south-east, including the NSW south coast, arriving in September and leaving by March. The species is found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses. In arid north-western NSW, it has been observed in stony country with a ground cover of chenopods and grasses, open acacia scrub and patches of low open eucalypt woodland.	Unlikely. No woodland or forest habitat on site.	Nil.

Scientific name	Common name	BC Status	EPBC Status	Source	Habitat description	Likelihood of occurrence	Likelihood of impact
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	V		20 records within 10km (OEH 2021a)	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 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. The species prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas. It also requires structurally diverse habitats featuring mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses.	Unlikely. No woodland or forest habitat on site.	Nil.
Neophema pulchella	Turquoise Parrot	V		24 records within 10km (OEH 2021a)	The Turquoise Parrot's range extends from southern Queensland through to northern Victoria, from the coastal plains to the western slopes of the Great Dividing Range. The species typically lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland.	Unlikely. No woodland or forest habitat on site.	Nil.
Ninox connivens	Barking Owl	V		3 records within 10km (OEH 2021a)	The Barking Owl is found throughout continental Australia except for the central arid regions. The owls sometimes extend their home range into urban areas, hunting birds in garden trees and insects attracted to streetlights. Extensive wildfires in 2019-20 reduced habitat quality further, burnt many old, hollow-bearing trees needed as refuge by prey species and reduced the viability of some regional owl populations. The species inhabit woodland and open forest, including fragmented remnants and partly cleared farmland. It is flexible in its habitat use, and hunting can extend in to closed forest and more open areas. Sometimes able to successfully breed along timbered watercourses in heavily cleared habitats (e.g. western NSW) due to the higher density of prey found on these fertile riparian soils. The species typically roost in shaded portions of tree canopies, including tall midstorey trees with dense foliage such as Acacia and Casuarina species.	Unlikely. No woodland or forest habitat on site.	Nil.

Scientific name	Common name	BC Status	EPBC Status	Source	Habitat description	Likelihood of occurrence	Likelihood of impact
Ninox strenua	Powerful Owl	V		88 records within 10km (OEH 2021a)	The Powerful Owl is endemic to eastern and south-eastern Australia, mainly on the coastal side of the Great Dividing Range from Mackay to south-western Victoria. In NSW, it is widely distributed throughout the eastern forests from the coast inland to tablelands, with scattered records on the western slopes and plains suggesting occupancy prior to land clearing. Now at low densities throughout most of its eastern range, rare along the Murray River and former inland populations may never recover. The Powerful Owl inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. The Powerful Owl requires large tracts of forest or woodland habitat but can occur in fragmented landscapes as well. The species breeds and hunts in open or closed sclerophyll forest or woodlands and occasionally hunts in open habitats. It roosts by day in dense vegetation comprising species such as Turpentine *Syncarpia glomulifera*, Black She-oak *Allocasuarina littoralis*, Blackwood *Acacia melanoxylon*, Rough-barked Apple *Angophora floribunda*, Cherry Ballart *Exocarpus cupressiformis* and a number of eucalypt species.	Unlikely. No woodland or forest habitat on site.	Nil.
Numenius madagascariensis	Eastern Curlew		CE,C,J,K	Species or species' habitat may occur within 10km (DoEE 2021a)	The Eastern Curlew is widespread in coastal regions in the north-east and south of Australia, including Tasmania, and scattered in other coastal areas. It is rarely seen inland. It breeds in Russia and north-eastern China. On passage, they are commonly seen in Japan, Korea and Borneo. Small numbers visit New Zealand. The Eastern Curlew is found on intertidal mudflats and sandflats, often with beds of seagrass, on sheltered coasts, especially estuaries, mangrove swamps, bays, harbours and lagoons.	Unlikely. No local records. No intertidal or estuarine habitats onsite.	Nil.
Oxyura australis	Blue-billed Duck	V		3 records within 10km (OEH 2021a)	The Blue-billed Duck is endemic to south-eastern and south-western Australia. It is widespread in NSW, but most common in the southern Murray-Darling Basin area. The species disperses during the breeding season to deep swamps up to 300 km away and is generally only during summer or in drier years that they are seen in coastal areas. The Blue-billed Duck prefers deep water in large permanent wetlands and swamps with dense aquatic vegetation. The species is completely aquatic, swimming low in the water along the edge of dense cover. It will fly if disturbed but prefers to dive if approached.	Unlikely. No large permanent wetlands or swaps with dense aquatic vegetation.	Nil.

Scientific name	Common name	BC Status	EPBC Status	Source	Habitat description	Likelihood of occurrence	Likelihood of impact
Petroica boodang	Scarlet Robin	V		126 records within 10km (OEH 2021a) Predicted by BAM-C	In NSW, the Scarlet Robin from the coast to the inland slopes. After breeding, some Scarlet Robins disperse to the lower valleys and plains of the tablelands and slopes. Some birds may appear as far west as the eastern edges of the inland plains in autumn and winter. The Scarlet Robin lives in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs. This species lives in both mature and regrowth vegetation. It occasionally occurs in mallee or wet forest communities, or in wetlands and tea-tree swamps. The species habitat usually contains abundant logs and fallen timber: these are important components of its habitat.	Unlikely. No woodland or forest habitat on site.	Nil.
Petroica phoenicea	Flame Robin	V		19 records within 10km (OEH 2021a) Predicted by BAM-C	In NSW, the Flame Robin breeds in upland areas and in winter, many birds move to the inland slopes and plains. It is likely that there are two separate populations in NSW, one in the Northern Tablelands, and another ranging from the Central to Southern Tablelands. The species breeds in upland tall moist eucalypt forests and woodlands, often on ridges and slopes, it prefers clearings or areas with open understoreys.	Unlikely. No woodland or forest habitat on site.	Nil.
Pezoporus wallicus wallicus	Eastern Ground Parrot	V		1 record within 10km (OEH 2021a)	In NSW Eastern Ground Parrot populations have declined and contracted to islands of coastal or subcoastal heathland and sedgeland habitats. The species is found in relatively large numbers on the north coast (Broadwater, Bundjalung, Yuraygir and Limeburners Creek NPs) and in smaller numbers at Myall Lakes on the central coast. There are also large populations on the NSW south coast, particularly Barren Grounds NR, Budderoo NP, the Jervis Bay area and Nadgee NR. The Ground Parrot occurs in high rainfall coastal and near coastal low heathlands and sedgelands, generally below one metre in height and very dense (up to 90% projected foliage cover).	Unlikely. No coastal low heathlands or sedgelands onsite.	Nil.

Scientific name	Common name	BC Status	EPBC Status	Source	Habitat description	Likelihood of occurrence	Likelihood of impact
Rostratula australis	Australian Painted Snipe	E	E	1 record within 10km (OEH 2021a); Species or species' habitat known to occur within 10km (DoEE 2021a)	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. No wetlands onsite.	Nil.
Stagonopleura guttata	Diamond Firetail	V		30 records within 10km (OEH 2021a)	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, Cental 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. The species is found in grassy eucalypt woodlands, including Box-Gum Woodlands and Snow Gum Eucalyptus pauciflora Woodlands. It also occurs in open forest, mallee, Natural Temperate Grassland, and in secondary grassland derived from other communities, and often found in riparian areas (rivers and creeks), and sometimes in lightly wooded farmland.	Unlikely. No woodland or forest habitat on site.	Nil.
Stictonetta naevosa	Freckled Duck	V		2 records within 10km (OEH 2021a)	The Freckled Duck is found primarily in south-eastern and south-western Australia, occurring as a vagrant elsewhere. It breeds in large temporary swamps created by floods in the Bulloo and Lake Eyre basins and the Murray-Darling system, particularly along the Paroo and Lachlan Rivers, and other rivers within the Riverina. The duck is forced to disperse during extensive inland droughts when wetlands in the Murray River basin provide important habitat. The species may also occur as far as coastal NSW and Victoria during such times. The species prefer permanent freshwater swamps and creeks with heavy growth of Cumbungi, Lignum or Tea-tree. During drier times they move from ephemeral breeding swamps to more permanent waters such as lakes, reservoirs, farm dams and sewage ponds.	Unlikely. No freshwater swamps or wooded creeklines.	Nil.

Scientific name	Common name	BC Status	EPBC Status	Source	Habitat description	Likelihood of occurrence	Likelihood of impact
Tyto novaehollandiae	Masked Owl	V		12 records within 10km (OEH 2021a)	The Masked Owl occurs from the coast where it is most abundant to the western plains. Overall records for this species fall within approximately 90% of NSW, excluding the most arid north-western corner. There is no seasonal variation in its distribution. This species lives in dry eucalypt forests and woodlands from sea level to 1100 m an often hunts along the edges of forests, including roadsides. Roosts and breeds in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting.	Unlikely. No woodland or forest habitat on site.	Nil.
Tyto tenebricosa	Sooty Owl	V		14 records within 10km (OEH 2021a)	The Sooty Owl occupies the easternmost one-eighth of NSW, occurring on the coast, coastal escarpment and eastern tablelands. This species occurs in rainforest, including dry rainforest, subtropical and warm temperate rainforest, as well as moist eucalypt forests. Sooty Owls roost by day in the hollow of a tall forest tree or in heavy vegetation and nest in very large tree hollows. This species hunts by night for small ground mammals or tree-dwelling mammals such as the Common Ringtail Possum (*Pseudocheirus peregrinus*) or Sugar Glider (*Petaurus breviceps*).	Unlikely. No woodland or forest habitat on site.	Nil.
Amphibians							
Heleioporus australiacus	Giant Burrowing Frog	V	V	19 records within 10km (OEH 2021a); Species or species' habitat likely to occur within 10km (DoEE 2021a)	The Giant Burrowing Frog is distributed in south eastern NSW and Victoria, and appears to exist as two distinct populations: a northern population largely confined to the sandstone geology of the Sydney Basin and extending as far south as Ulladulla, and a southern population occurring from north of Narooma through to Walhalla, Victoria. It is found in heath, woodland and open dry sclerophyll forest on a variety of soil types except those that are clay based.	Unlikely. No heath, woodland or dry sclerophyll forest onsite.	Nil.
Litoria aurea	Green and Golden Bell Frog	E	V	Predicted by the BAM -C	Inhabits marshes, dams and stream-sides, particularly those containing bullrushes (*Typha* spp.) or spikerushes (*Eleocharis* spp.). Optimum habitat includes water-bodies that are unshaded, free of predatory fish such as Plague Minnow (*Gambusia holbrooki*), have a grassy area nearby and diurnal sheltering sites available.	Unlikely. No local records and minimal areas of suitable habitat. Some cover of Eleocharis around farm dams, but no local source population and no suitable breeding habitat present.	Low

Scientific name	Common name	BC Status	EPBC Status	Source	Habitat description	Likelihood of occurrence	Likelihood of impact
Litoria littlejohni	Littlejohn's Tree Frog	V	V	350 records within 10km (OEH 2021a); Species or species' habitat may occur within 10km (DoEE 2021a)	Littlejohn's Tree Frog has a distribution that includes the plateaus and eastern slopes of the Great Dividing Range from Watagan State Forest (90 km north of Sydney) and south to Buchan in Victoria. The majority of records are within the Sydney Basin Bioregion with only scattered records south to the Victorian border. The species has not been recorded in southern NSW within the last decade and records are isolated and tend to be at high altitude. The species breeds in the upper reaches of permanent streams and in perched swamps. Non-breeding habitat is heath based forests and woodlands where it shelters under leaf litter and low vegetation, and hunts for invertebrate prey either in shrubs or on the ground.	Unlikely. No foraging or breeding habitat onsite.	Nil.
Mixophyes balbus	Stuttering Frog	E	V	2 records within 10km (OEH 2021a); Species or species' habitat known to occur within 10km (DoEE 2021a)	Stuttering Frogs occur along the east coast of Australia from southern Queensland to north-eastern Victoria. Considered to have disappeared from Victoria and to have undergone considerable range contraction in NSW, particularly in south-east NSW. The Dorrigo region, in north-east NSW, appears to be a stronghold for this species. It is found in rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range. Outside the breeding season adults live in deep leaf litter and thick understorey vegetation on the forest floor.	Unlikely. No rainforest or open forest habitat on the site.	Nil.
Pseudophryne australis	Red-crowned Toadlet	V		42 records within 10km (OEH 2021a)	The Red-crowned Toadlet has a restricted distribution. It is confined to the Sydney Basin, from Pokolbin in the north, the Nowra area to the south, and west to Mt Victoria in the Blue Mountains. It occurs in open forests, mostly on Hawkesbury and Narrabeen Sandstones. The species inhabits periodically wet drainage lines below sandstone ridges that often have shale lenses or cappings.	Unlikely. No suitable habitat.	Nil.

Scientific name	Common name	BC Status	EPBC Status	Source	Habitat description	Likelihood of occurrence	Likelihood of impact
Insects							
Petalura gigantea	Giant Dragonfly	E		10 records within 10km (OEH 2021a)	The Giant Dragonfly is found along the east coast of NSW from the Victorian border to northern NSW. It is not found west of the Great Dividing Range. There are known occurrences in the Blue Mountains and Southern Highlands, in the Clarence River catchment, and on a few coastal swamps from north of Coffs Harbour to Nadgee in the south. The species live in permanent swamps and bogs with some free water and open vegetation.	Unlikely. No swamps or bog habitat onsite. Habitat constraints (swamps; and within 500m of swamps) unchecked in BAM-C.	Nil.
Mammals							
Cercartetus nanus	Eastern Pygmy-possum	V		23 records within 10km (OEH 2021a)	The Eastern Pygmy-possum is found in south-eastern Australia, from southern Queensland to eastern South Australia and in Tasmania. In NSW it extents from the coast inland as far as the Pilliga, Dubbo, Parkes and Wagga Wagga on the western slopes. The species is found in a broad range of habitats from rainforest through sclerophyll (including Box-Ironbark) forest and woodland to heath, but in most areas woodlands and heath appear to be preferred, except in north-eastern NSW where they are most frequently encountered in rainforest. It feeds largely on nectar and pollen collected from banksias, eucalypts and bottlebrushes and is an important pollinator of heathland plants such as banksias; soft fruits are eaten when flowers are unavailable.	Unlikely. No woodland or forest habitat on site.	Nil.
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	32 records within 10km (OEH 2021a); Species or species' habitat likely to occur within 10km (DoEE 2021a)	The Large-eared Pied Bat is found mainly in areas with extensive cliffs and caves, from Rockhampton in Queensland south to Bungonia in the NSW Southern Highlands. It is generally rare with a very patchy distribution in NSW. There are scattered records from the New England Tablelands and North West Slopes. The species roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (*Petrochelidon ariel*), frequenting low to mid-elevation dry open forest and woodland close to these features. Females have been recorded raising young in maternity roosts (c. 20-40 females) from November through to January in roof domes in sandstone caves and overhangs. It is found in well-timbered areas containing gullies.	Unlikely. No caves or other roosting habitat onsite.	Nil.

Scientific name	Common name	BC Status	EPBC Status	Source	Habitat description	Likelihood of occurrence	Likelihood of impact
Dasyurus maculatus	Spotted-tailed Quoll	V	E	20 records within 10km (OEH 2021a); Species or species' habitat known to occur within 10km (DoEE 2021a) Predicted by BAM-C	The range of the Spotted-tailed Quoll has contracted considerably since European settlement. It is now found in eastern NSW, eastern Victoria, south-east and north-eastern Queensland, and Tasmania. Only in Tasmania is it still considered relatively common. The species has been recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Individual animals use hollow-bearing trees, fallen logs, small caves, rock outcrops and rocky-cliff faces as den sites. Females occupy home ranges of 200-500 hectares, while males occupy very large home ranges from 500 to over 4000 hectares. Are known to traverse their home ranges along densely vegetated creeklines.	Unlikely. No wooded vegetation communities or potential den sites on the proposal site. No densely vegetated creek lines present, and no hollows, fallen logs or other habitat resources present.	Nil.
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V		44 records within 10km (OEH 2021a) Predicted by BAM-C	The Eastern False Pipistrelle is found on the south-east coast and ranges of Australia, from southern Queensland to Victoria and Tasmania. The species prefer moist habitats, with trees taller than 20 m.	Unlikely. No moist habitats or trees taller than 20 m onsite.	Nil.
Greater Glider population in the Mount Gibraltar Reserve area	Greater Glider population in the Mount Gibraltar Reserve area	EP	V	18 records within 10km (OEH 2021a)	Greater Glider population occurs within the Mount Gibraltar Reserve area around Mittagong.	Nil. Outside of known range for the threatened population.	Nil.
Isoodon obesulus obesulus	Southern Brown Bandicoot	E	E	Species or species' habitat likely to occur within 10km (DoEE 2021a)	The Southern Brown Bandicoot has a patchy distribution. It is found in south-eastern NSW, east of the Great Dividing Range south from the Hawkesbury River, southern coastal Victoria and the Grampian Ranges, south-eastern South Australia, south-west Western Australia and the northern tip of Queensland. Southern Brown Bandicoots are largely crepuscular (active mainly after dusk and/or before dawn). They are generally only found in heath or open forest with a heathy understorey on sandy or friable soils. Males have a home range of approximately 5-20 hectares whilst females forage over smaller areas of about 2-3 hectares.	Unlikely. No local records. No heath or open forest habitat onsite.	Nil.

Scientific name	Common name	BC Status	EPBC Status	Source	Habitat description	Likelihood of occurrence	Likelihood of impact
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	V		9 records within 10km (OEH 2021a)	The Eastern Freetail-bat is found along the east coast from south Queensland to southern NSW. The species typically inhabit dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range. It roosts mainly in tree hollows but will also roost under bark or in man-made structures.	Possible. Potential foraging habitat in the open grassland.	Low. A small patch of poor condition foraging habitat would be impacted
Miniopterus australis	Little Bent-winged Bat	V		5 records within 10km (OEH 2021a)	The Little Bentwing-bat occurs along the east coast and ranges of Australia from Cape York in Queensland to Wollongong in NSW. It prefers moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub. Generally found in well-timbered areas. The species roost in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats.	Unlikely. Minimal foraging habitat as there is no vegetation habitats onsite. No roosting habitat onsite.	Nil.
Miniopterus orianae oceanensis	Large Bent-winged Bat	V		54 records within 10km (OEH 2021a) Predicted by BAM-C	Large Bentwing-bats occur along the east and north-west coasts of Australia. The species use caves as the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures.	A possible call was recorded on site. The site may provide poor condition foraging habitat. No breeding habitat on site or within 2km of the proposal site. Habitat constraints for breeding habitat (Caves; Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding including species records with microhabitat code "IC - in cave; observation type code E nest-roost; and with numbers of individuals >500)	Low.

Scientific name	Common name	BC Status	EPBC Status	Source	Habitat description	Likelihood of occurrence	Likelihood of impact
						unchecked in BAM-C	
Myotis macropus	Southern Myotis	V		41 records within 10km (OEH 2021a)	The Southern Myotis is mainly coastal but may occur inland along large river systems. Usually associated with permanent waterways at low elevations in flat/undulating country, usually in vegetated areas. Forages over streams and watercourses feeding on fish and insects from the water surface. Roosts in a variety of habitats including caves, mine shafts, hollow-bearing trees, stormwater channels, buildings, under bridges and in dense foliage, typically in close proximity to water.	A possible call was recorded onsite. Suitable foraging habitat present within the dams. No suitable roosting habitat onsite. Assumed to be present on site and species polygon created.	Low. A small patch of poor condition foraging habitat would be impacted
Petauroides volans	Greater Glider		V	512 records within 10km (OEH 2021a); Species or species' habitat known to occur within 10km (DoEE 2021a)	The greater glider is restricted to eastern Australia, occurring from the Windsor Tableland in north Queensland through to central Victoria (Wombat State Forest), with an elevational range from sea level to 1200 m above sea level. It prefers taller montane, moist eucalypt forest with relatively old trees and abundant hollows.	Unlikely. No forest or woodland habitat on the site.	Nil.
Petaurus australis	Yellow-bellied Glider	V		154 records within 10km (OEH 2021a)	The Yellow-bellied Glider is found along the eastern coast to the western slopes of the Great Dividing Range, from southern Queensland to Victoria. The species occur in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils. Vegetation preferences vary with latitude and elevation; mixed coastal forests to dry escarpment forests in the north; moist coastal gullies and creek flats to tall montane forests in the south.	Unlikely. No forest or woodland habitat on the site.	Nil.
Petaurus norfolcensis	Squirrel Glider	V		12 records within 10km (OEH 2021a)	The Squirrel Glider is widely though sparsely distributed in eastern Australia, from northern Queensland to western Victoria. The species inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas.	Unlikely. No forest, heath or woodland habitat on the site.	Nil.

Scientific name	Common name	BC Status	EPBC Status	Source	Habitat description	Likelihood of occurrence	Likelihood of impact
Petrogale penicillata	Brush-tailed Rock-wallaby	E	V	14 records within 10km (OEH 2021a); Species or species' habitat likely to occur within 10km (DoEE 2021a)	In NSW the Brush-tailed Rock-wallaby occurs from the Queensland border in the north to the Shoalhaven in the south, with the population in the Warrumbungle Ranges being the western limit. The species occupy rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges, often facing north. It typically shelters or basks during the day in rock crevices, caves and overhangs and are most active at night when foraging.	Unlikely. No suitable rocky habitats onsite.	Nil.
Phascolarctos cinereus	Koala	V	V	3697 records within 10km (OEH 2021a); Species or species' habitat known to occur within 10km (DoEE 2021a)	The Koala has a fragmented distribution throughout eastern Australia from north-east Queensland to the Eyre Peninsula in South Australia. In New South Wales, koala populations are found on the central and north coasts, southern highlands, southern and northern tablelands, Blue Mountains, southern coastal forests, with some smaller populations on the plains west of the Great Dividing Range. The species inhabit eucalypt woodlands and forests, and feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species.	Unlikely. The only Eucalyptus species present on site is *Eucalyptus macarthurii*, which is not included as a Koala use tree for the central and southern tablelands in Appendix C of DPE (2022a).	Nil.
Phoniscus papuensis	Golden-tipped Bat	V		1 record within 10km (OEH 2021a)	The Golden-tipped Bat is distributed along the east coast of Australia in scattered locations from Cape York Peninsula in Queensland to south of Eden in southern NSW. The species is found in rainforest and adjacent wet and dry sclerophyll forest up to 1000 m. Also recorded in tall open forest, Casuarina-dominated riparian forest and coastal Melaleuca forests. The species roost mainly in rainforest gullies on small first- and second-order streams in usually abandoned hanging Yellow-throated Scrubwren and Brown Gerygone nests modified with an access hole on the underside. Bats may also roost under thick moss on tree trunks, in tree hollows, dense foliage and epiphytes.	Unlikely. No rainforest or sclerophyll forest onsite.	Nil.

Scientific name	Common name	BC Status	EPBC Status	Source	Habitat description	Likelihood of occurrence	Likelihood of impact
Potorous tridactylus	Long-nosed Potoroo	V	V	54 records within 10km (OEH 2021a); Species or species' habitat may occur within 10km (DoEE 2021a)	The long-nosed potoroo is found on the south-eastern coast of Australia, from Queensland to eastern Victoria and Tasmania, including some of the Bass Strait islands. In NSW it is generally restricted to coastal heaths and forests east of the Great Dividing Range, with an annual rainfall exceeding 760 mm. It inhabits coastal heaths and dry and wet sclerophyll forests. Dense understorey with occasional open areas is an essential part of habitat, and may consist of grass-trees, sedges, ferns or heath, or of low shrubs of tea-trees or melaleucas. A sandy loam soil is also a common feature.	Unlikely. No coastal heaths or sclerophyll forest habitat onsite.	Nil.
Pseudomys novaehollandiae	New Holland Mouse		V	Species or species' habitat likely to occur within 10km (DoEE 2021a)	The New Holland Mouse has a fragmented distribution across Tasmania, Victoria, New South Wales and Queensland. The species is known to inhabit open heathlands, woodlands and forests with a heathland understorey and vegetated sand dunes	Unlikely. No local records. No heathlands, woodland or forest on the site.	Nil.
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	149 records within 10km (OEH 2021a); Species or species' habitat known to occur within 10km (DoEE 2021a) Predicted by BAM-C	Grey-headed Flying-foxes are generally found within 200 km of the eastern coast of Australia, from Rockhampton in Queensland to Adelaide in South Australia. In times of natural resource shortages, they may be found in unusual locations. The species occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy.	Possible. Small linear strip of potentially suitable foraging habitat on site. No roost camps present. Habitat constraint (breeding camps) unchecked in BAM-C.	Low. Minor impacts to low quality potential foraging habitat.
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V		1 record within 10km (OEH 2021a)	The Yellow-bellied Sheathtail-bat is a wide-ranging species found across northern and eastern Australia. In the most southerly part of its range - most of Victoria, south-western NSW and adjacent South Australia - it is a rare visitor in late summer and autumn. There are scattered records of this species across the New England Tablelands and North West Slopes. It forages in most habitats across its very wide range, with and without trees; appears to defend an aerial territory.	Possible. Potential foraging habtiat in the open grassland. No roosting habitat onsite.	Low. A small patch of poor condition foraging habtiat would be impacted

Scientific name	Common name	BC Status	EPBC Status	Source	Habitat description	Likelihood of occurrence	Likelihood of impact
Scoteanax rueppellii	Greater Broad-nosed Bat	V		29 records within 10km (OEH 2021a)	The Greater Broad-nosed Bat is found mainly in the gullies and river systems that drain the Great Dividing Range, from north-eastern Victoria to the Atherton Tableland. It extends to the coast over much of its range. In NSW it is widespread on the New England Tablelands, however does not occur at altitudes above 500 m. The species utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest.	Unlikely. No woodland or forest onsite.	Nil.
Reptiles							
Hoplocephalus bungaroides	Broad-headed Snake	E	V	62 records within 10km (OEH 2021a)	The Broad-headed Snake is largely confined to Triassic and Permian sandstones, including the Hawkesbury, Narrabeen and Shoalhaven groups, within the coast and ranges in an area within approximately 250 km of Sydney. The species shelters in rock crevices and under flat sandstone rocks on exposed cliff edges during autumn, winter and spring.	Unlikely. No rock crevices or sandstone cliffs on the site.	Nil.
Varanus rosenbergi	Rosenberg's Goanna	V		9 records within 10km (OEH 2021a)	Rosenberg's Goanna occurs on the Sydney Sandstone in Wollemi National Park to the north-west of Sydney, in the Goulburn and ACT regions and near Cooma in the south. There are records from the South West Slopes near Khancoban and Tooma River and found in heath, open forest and woodland. Rosenberg's Goanna is associated with termites, the mounds of which this species nests in; termite mounds are a critical habitat component. Individuals require large areas of habitat and helters in hollow logs, rock crevices and in burrows, which they may dig for themselves, or they may use other species' burrows, such as rabbit warrens. Runs along the ground when pursued (as opposed to the Lace Monitor, which climbs trees). Feeds on carrion, birds, eggs, reptiles and small mammals.	Unlikely. No suitable habitat onsite.	Nil.

Migratory species predicted or known to occur within 10 km of the development site options

Scientific name	Common name	BC Status	EPBC Status	Source	Habitat description	Likelihood of occurrence	Likelihood of impact
Actitis hypoleucos	Common Sandpiper		C,J,K	Species or species' habitat may occur within 10km (DoEE 2021a)	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.	Unlikely. No suitable wetland habitat onsite.	Nil.
Calidris acuminata	Sharp-tailed Sandpiper		C,J,K	Species or species' habitat known to occur within 10km (DoEE 2021a)	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.	Unlikely. No suitable wetland habitat onsite.	Nil.
Calidris ferruginea	Curlew Sandpiper	E	CE,C,J,K	Species or species' habitat may occur within 10km (DoEE 2021a)	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. It forages in or at the edge of shallow water, occasionally on exposed algal mats or waterweed, or on banks of beach-cast seagrass or seaweed.	Unlikely. No suitable littoral or estuarine habitat onsite.	Nil.

Scientific name	Common name	BC Status	EPBC Status	Source	Habitat description	Likelihood of occurrence	Likelihood of impact
Calidris melanotos	Pectoral Sandpiper		J,K	Species or species' habitat may occur within 10km (DoEE 2021a)	Widespread but scattered records across NSW, east of the divide and in the Riverina and Lower Western regions. Breeds in the northern hemisphere. In Australasia, prefers shallow fresh to saline wetlands and is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands. Usually in coastal or near-coastal habitats, and prefers wetlands with open mudflats and low emergent or fringing vegetation such as grass or samphire.	Possible. Potential habitat in the farm dams.	Nil.
Cuculus optatus	Oriental Cuckoo		C,J,K	Species or species' habitat may occur within 10km (DoEE 2021a)	This species migrates to northern and eastern Australia in the warmer months. Occurs south to the Shoalhaven area. Occurs in a range of habitats, including monsoon forest, rainforest edges, leafy trees in paddocks, river flats, roadsides and mangroves.	Unlikely. No suitable habitat onsite.	Nil.
Gallinago hardwickii	Latham's Snipe		J,K	Species or species' habitat known to occur within 10km (DoEE 2021a) Predicted by BAM-C	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.	Possible. Potential habitat in the farm dams and exotic grassland	Low. Small area of poor condition habitat would be impacted
Hirundapus caudacutus	White-throated Needletail		V,C,J,K	Species or species' habitat known to occur within 10km (DoEE 2021a)	White-throated Needletails often occur in large numbers over eastern and northern Australia. White-throated Needletails are aerial birds and for a time it was commonly believed that they did not land while in Australia. It has now been observed that birds will roost in trees, and radio-tracking has since confirmed that this is a regular activity.	Unlikely. No suitable roosting habitat on site.	Nil.
Monarcha melanopsis	Black-faced Monarch			Species or species' habitat known to occur within 10km (DoEE 2021a)	The Black-faced Monarch is found along the coast of eastern Australia, becoming less common further south. It is found in rainforests, eucalypt woodlands, coastal scrub and damp gullies. It may be found in more open woodland when migrating.	Unlikely. No suitable rainforest, woodland or coastal scrub on site.	Nil.

Scientific name	Common name	BC Status	EPBC Status	Source	Habitat description	Likelihood of occurrence	Likelihood of impact
Motacilla flava	Yellow Wagtail		C,J,K	Species or species' habitat may occur within 10km (DoEE 2021a)	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.	Possible. Suitable habitat in the exotic grassland and farm dams.	Low. Small area of poor condition habitat would be impacted
Myiagra cyanoleuca	Satin Flycatcher			Species or species' habitat known to occur within 10km (DoEE 2021a)	The Satin Flycatcher is found along the east coast of Australia from far northern Queensland to Tasmania, including south-eastern South Australia. It is also found in New Guinea. The Satin Flycatcher is not a commonly seen species, especially in the far south of its range, where it is a summer breeding migrant. The Satin Flycatcher is found in tall forests, preferring wetter habitats such as heavily forested gullies, but not rainforests.	Unlikely. No suitable forested vegetation on site.	Nil.
Numenius madagascariensis	Eastern Curlew		CE,C,J,K	Species or species' habitat may occur within 10km (DoEE 2021a)	The Eastern Curlew is widespread in coastal regions in the north-east and south of Australia, including Tasmania, and scattered in other coastal areas. It is rarely seen inland. It breeds in Russia and north-eastern China. On passage, they are commonly seen in Japan, Korea and Borneo. Small numbers visit New Zealand. The Eastern Curlew is found on intertidal mudflats and sandflats, often with beds of seagrass, on sheltered coasts, especially estuaries, mangrove swamps, bays, harbours and lagoons.	Unlikely. No suitable littoral or estuarine habitat onsite.	Nil.
Pandion haliaetus	Osprey			Species or species' habitat likely to occur within 10km (DoEE 2021a)	Eastern Ospreys are found right around the Australian coast line, except for Victoria and Tasmania. They are common around the northern coast, especially on rocky shorelines, islands and reefs. The species is uncommon to rare or absent from closely settled parts of south-eastern Australia. There are a handful of records from inland areas. The species favour coastal areas, especially the mouths of large rivers, lagoons and lakes. The species breeds in NSW from July to September.	Unlikely. No suitable coastal habitat onsite.	Nil.
Rhipidura rufifrons	Rufous Fantail			Species or species' habitat known to occur within 10km (DoEE 2021a)	The Rufous Fantail is found along NSW coast and ranges. Inhabits rainforest, dense wet forests, swamp woodlands and mangroves. During migration, it may be found in more open habitats or urban areas.	Unlikely. No suitable rainforest, forest or woodland habitat onsite.	Nil.

Scientific name	Common name	BC Status	EPBC Status	Source	Habitat description	Likelihood of occurrence	Likelihood of impact
Tringa nebularia	Common Greenshank		C,J,K	Species or species' habitat may occur within 10km (DoEE 2021a)	The Common Greenshank breeds in the Palaearctic regions and is widespread in Africa, Coastal Asia, the Indian subcontinent, the Philippines and southern New Guinea. They are common throughout Australia in the summer. Common Greenshanks are found both on the coast and inland, in estuaries and mudflats, mangrove swamps and lagoons, and in billabongs, swamps, sewage farms and flooded crops.	Unlikely. No suitable wetland habitat onsite.	Nil.

Appendix B

Fauna species recorded within the study area

Exotic	Scientific Name	Common Name	Observation type*
Amphibia			
	Limnodynastes peronii	Brown-striped Frog	H
	Limnodynastes tasmaniensis	Spotted grass Frog	H
	Litoria fallax	Eastern Dwarf Tree Frog	H
	Litoria verreauxii	Verreaux's Frog	H
	Crinia signifera	Common Eastern Froglet	H
Aves			
	Hirundo neoxena	Welcome Swallow	O
	Chenonetta jubata	Australian Wood Duck	O
	Platycercus elegans	Crimson Rosella	O
	Cracticus torquatus	Grey Butcherbird	O
	Rhipidura albiscapa	Grey Fantail	O
	Anthochaera carunculata	Red Wattlebird	O
	Egretta novaehollandiae	White-faced Heron	O
	Platycercus eximius	Eastern Rosella	O
	Cacatua galerita	Sulphur-crested Cockatoo	O
	Eolophus roseicapillus	Galah	O
	Coracina novaehollandiae	Black-faced Cuckoo-shrike	O
	Acanthiza nana	Yellow Thornbill	O
	Smicrornis brevirostris	Weebill	O
	Grallina cyanoleuca	Magpie-lark	O
	Calyptorhynchus funereus	Yellow-tailed Black-Cockatoo	O
	Anthus novaeseelandiae	Australian Pipit	O
	Pelecanus conspicillatus	Australian Pelican	O
	Cracticus tibicen	Australian Magpie	O
	Manorina melanocephala	Noisy Miner	O
*	*Sturnus vulgaris*	Common Starling	O
	Ocyphaps lophotes	Crested Pigeon	O
	Corvus coronoides	Australian Raven	O
*	*Sturnus tristis*	Common Myna	O
	Malurus sp.	Unidentified Fairy-wren	O
Mammalia			
	Austronomus australis	White-striped Free-tailed bat	SG
	Chalinolobus gouldii	Gould's wattled Bat	D
	Myotis macropus	Southern Myotis	SG
	Vespadelus vulturnus	Little forest Bat	D
	Vespadelus darlingtoni	Large forest Bat	D
	Miniopterus orianae oceanensis	Large Bent-winged Bat	SG
	Vespadelus pumilus	Eastern Forest Bat	SG
	Vespadelus troughtoni	Eastern Cave Bat	SG

Exotic	Scientific Name	Common Name	Observation type*
	Chalinolobus.morio	Chocolate Wattled Bat	SG
	Vespadelus regulus	Southern Forest Bat	SG
	Trichosurus vulpecula	Common Brushtail Possum	O
*	*Oryctolagus cuniculus*	Rabbit	O
	Macropus giganteus	Eastern Grey Kangaroo	O
	Equus caballus	Horse	O
	Mus musculus	House Mouse	O
Reptilia			
	Pseudechis porphyriacus	Red-bellied Black Snake	O

*Observation key: O – Observed, H – Heard, D - Definite (anabat), Pr - Probable (anabat), SG - Species Group (Call made by one of two or more species. Call characteristics overlap making it too difficult to distinguish between species)

Appendix C

Anabat analysis

GHD Tower, Level 3, 24 Honeysuckle Drive
Newcastle, New South Wales 2300
Australia
www.ghd.com

Anabat analysis – 12524108 - Moss Vale Plastics Recycling and Reprocessing Facility

Analysis method

Bat calls were recorded during field surveys using Anabat Express Zero Crossing detectors (Titley Scientific).

The full night zero crossing analysis file (zca file) recorded using the detector was converted to zc sequence files using Anabat Insight (version 1.9.7) for analysis and in order to add metadata (e.g. species label etc). During the conversion process a filter was applied to identify bat sequences and remove noise files. Noise files were moved to a separate folder for later checking.

The *Bat calls of NSW: Region based guide to the echolocation calls of microchiropteran bats* (Pennay et al. 2004) was used to assist call analysis. Call identification was also assisted by consulting distribution information for potential species (Pennay et al 2011; Churchill 2008; Van Dyck et al. 2013) and records from BioNet (December 2020). No reference calls were collected during the survey.

A call (pass) was defined as a sequence of three or more consecutive pulses of similar frequency and shape. Calls with less than three defined consecutive pulses of similar frequency and shape were not unambiguously identified to a species but were used as part of the activity count for the survey area. Due to variability in the quality of calls and the difficulty in distinguishing some species the identification of each call was assigned a confidence rating (see Mills *et al.* 1996 & Duffy *et al.* 2000 for similar process) as summarised in Table 1. Due to the absence of reference calls from the survey area, high level of variability within a bat call and overlap in call characteristics between some species, a conservative approach was taken when analysing calls.

Species nomenclature follows van Dyck et al. (2013) and Reardon et al (2014).

Table 1 Confidence ratings applied to calls

Identification	Description
D - Definite	Species identification not in doubt.
PR - Probable	Call most likely to represent a particular species, but there exists a low probability of confusion with species of similar call type or call lacks sufficient detail.
SG - Species Group	Call made by one of two or more species. Call characteristics overlap making it too difficult to distinguish between species for e.g. *Chalinolobus gouldii /Mormopterus ozimops sp.* *Nyctophilus sp.* The calls of *Nyctophilus geoffroyi / gouldi* cannot be distinguished during the analysis process and are therefore lumped together. *Nyctophilus sp/Myotis macropus.* The calls of these species can be easily confused during the analysis process and are therefore often lumped together.

Summary of results and survey effort

Anabat detector surveys were completed within the study area at 2 sites for one night on 2nd March 2021. Approximately 738 zc files were recorded and analysed. Three species were positively (Definite) identified of the 25 or so species that are known to occur from the locality of the study area (BioNet 2020, Pennay et al, 2011; Van Dyck et al. 2013). As many as seven other species may also have been recorded, but poor data quality and/or interspecific call similarities precluded reliable identification of additional species.

Two threatened species, listed under the NSW *Biodiversity Conservation Act 2016* (BC Act) were identified as probably (PR) identified from within the study area.

– *Miniopterus orianae oceanensis* (vulnerable BC Act) - Species Group (SG) recordings were attributed to the species group *Austronomus australis,M.o.oceanensis/V.vulturnus* species. It is likely that some calls from the species group are from *Miniopterus orianae oceanensis.*
– *Myotis macropus* (vulnerable BC Act) – Species Group (SG) recordings were attributed to the species group *Nyctophilus sp./Myotis Macropus.* The call characteristics of both species are very similar and can be easily confused particularly when call quality is less than optimal. It is likely that some calls attributed to the species group *Nyctophilus sp./Myotis Macropus* are *Myotis macropus*.

Examples of bat call sonograms definitively identified to species are presented in Appendix 1.

Table 2 Summary of bat call analysis – March 2020

	Unit/date	**Unit/date**
Species/ Species group	SN542859	SN507312
	2/03/2020	2/03/2020
Austronomus australis,M.o.oceanensis/V.vulturnus		SG
Chalinolobus gouldii	D	D
C.gouldii/Ozimops sp.	SG	SG
M. australis/V. pumilus		SG
Myotis macropus (v) / Nyctophilus sp.	SG	
M.o.oceanensis/Vespadelus sp.	SG	
V. pumilus/troughtoni		SG
V.darlingtoni/V.regulus	SG	
Vespadelus sp./C.morio		SG
Vespadelus vulturnus		D
Vespadelus darlingtoni	D	

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Appendix 1 - Examples of bat call sonograms.

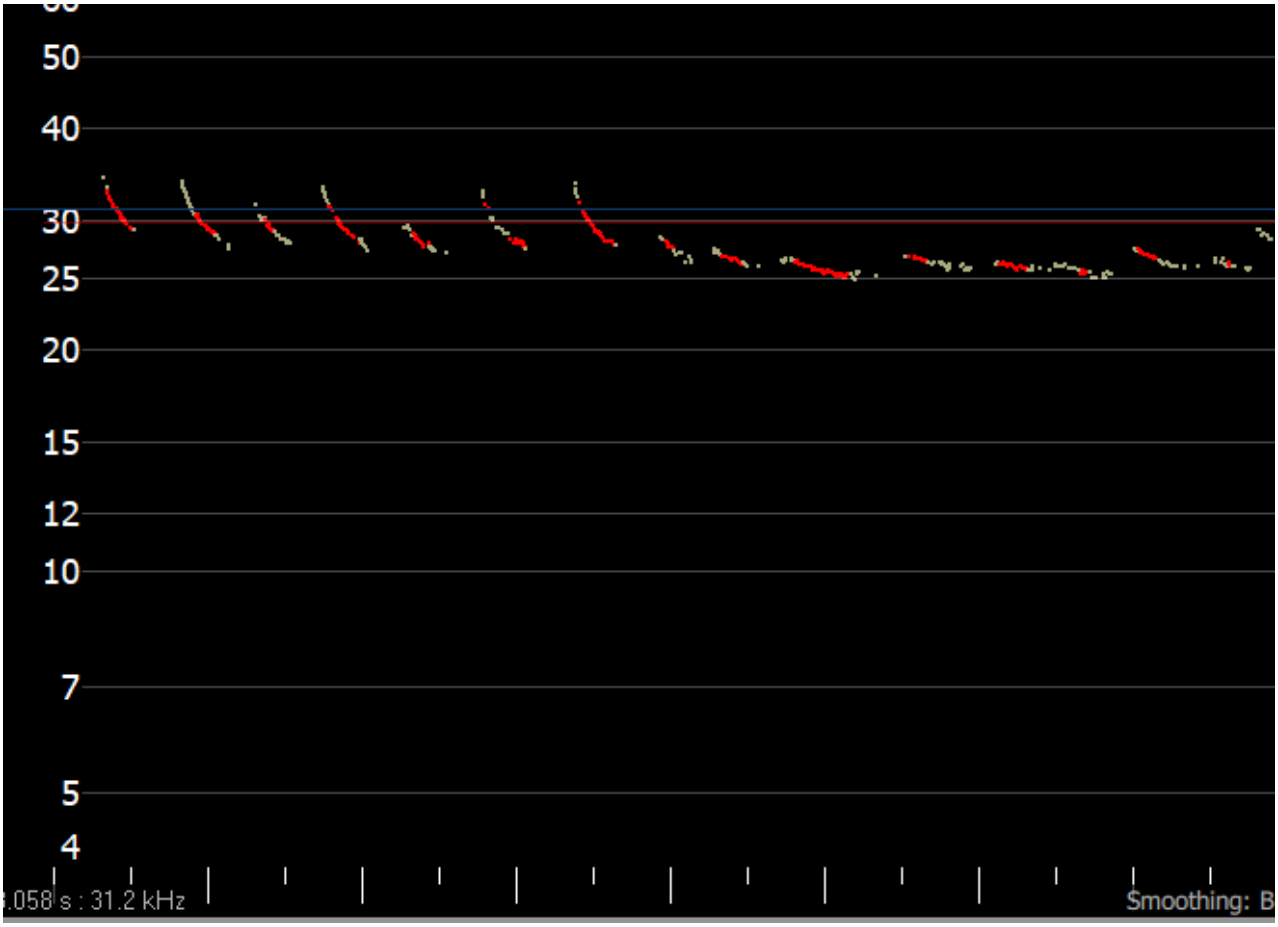

Figure 1 *Bat call recording attributed to Chalinolobus gouldii*

Appendix D

PCT and vegetation integrity plot data

Summary of vegetation integrity plot data

PCT ID	Plot	Tree richness	Shrub richness	Grass and grass-like richness	Forb richness	Fern richness	Other richness	Tree cover	Shrub cover	Grass and grass-like cover	Forb cover	Fern cover	Other cover	Litter cover	Total length of fallen logs (m)	Number of large trees (threshold >80 cm dbh)
Farm Dams																
1256	**Benchmark**	**1**	**10**	**9**	**8**	**2**	**1**	**0**	**6**	**94**	**7**	**0**	**0**	**0**	**0**	**0**
	3	0	0	7	1	0	0	0	0	43.4	50	0	0	0	0	0
	4	0	0	4	3	0	0	0.0	0.0	65.3	25.1	0.0	0.0	0	0	0
Planted *Eucalyptus macarthurii*																
944	**Benchmark**	**5**	**8**	**7**	**15**	**2**	**4**	**55**	**11**	**34**	**13**	**3**	**3**	**70**	**87**	**2**
	7_22	1	0	1	0	0	0	10	0	2	0	0	0	8	0	0
Exotic grassland																
	1	0	0	6	3	0	0	0.0	0.0	13.5	0.6	0.0	0.0	0	0	0
	2	0	0	6	3	0	0	0.0	0.0	19.8	0.8	0.0	0.0	0	0	0
	8_22	0	0	3	2	0	0	0.0	0.0	0.2	0	0	0.0	9.0	0	0

Appendix E

EPBC Act assessment of significance

Eucalyptus macarthurii – endangered species

Habitat requirements

Eucalyptus macarthurii generally occurs in grassy woodland on fertile soils on cold flats, as well as near swamps and streams. Within the Southern Highlands, it is primarily known from private farming land and roadsides within the Wingecarribee Shire Council LGA. The species is also known from the Boyd Plateau in the southern Blue Mountains. It is known from the Kanangra Boyd National Park, Cecil Hoskins Nature Reserve and the Stingray Swamp Flora Reserve within Penrose State Forest (TSSC 2016).

Habitat in the proposal site

Eucalyptus macarthurii was recorded within the new north-south road alignment. Nine planted specimens were recorded along the eastern boundary of the council-owned paper road. It is estimated that these specimens are about 25 years old (G. Leonard, *pers comm* via email, 1/2/2023), and appear to be in good condition. Their provenance is unknown.

Assessment of significance – Eucalyptus macarthurii

Criteria	Discussion
According to the DotE (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	This species is tree to 40m in height, known from two main areas – the southern Highlands/Wingecarribee Shire, and the southern Blue Mountains on the Boyd Plateau. The conservation advice indicates that the total number of mature individuals was likely to be more than 10,000. The proposal will remove a total of nine planted specimens from within a paper road. There was no evidence of regeneration or natural recruitment of the species within the proposal site. Grazing is a continued pressure within the portion of the proposal site that the species was recorded in, and the TSSC (2016) notes that "*grazing and trampling as well as other forms of disturbance preclude establishment of seedlings in many locations*". If the proposal was not built, it is likely that the small group of trees within the proposal site would eventually senesce and would not be replaced given the grazing pressures on the proposal site. There are no areas of intact native vegetation close to the proposal site, nor are there any areas where natural regeneration or recruitment of the species would occur, given surrounding land uses. In this sense, the small group of trees to be impacted is unlikely to be viable in the long-term, and does not contribute to the overall local population of the species in terms of gene pool and seed sources. There are 1163 records of the species from within 10km of the proposal site. Removal of nine planted individuals of unknown provenance is unlikely to lead to a substantial decrease in the size of a population, given the context of the individuals to be impacted. Removal of nine individuals, that were not included in the 1163 records from the locality, would result in a loss of 0.8% of the total known population of the species from the Southern Highlands.
Reduce the area of occupancy of the species	The proposal will remove 0.04ha of land that supports the nine planted individuals of the species. The total area of occupancy is estimated to be 144km^2 (TSSC 2016). There is very low likelihood that any new individuals would regenerate from the specimens to be impacted, given the degree of grazing pressure experienced in the paper road, as well as the land uses in surrounding properties. Removal of a small, isolated stand of planted trees does not reflect impacts to a viable population contributing to the ongoing persistence of the species in the local area. Given the small area of potential habitat to be impacted, the proposal is unlikely to reduce the area of occupancy of the species.
Fragment an existing population into two or more populations	The proposal would require the clearing of the entire stand of planted specimens of *Eucalyptus macarthurii*. This stand is isolated from any other stands of intact native vegetation, is on and adjacent to land subject to ongoing grazing pressure, and is unlikely to be viable in the long-term, with little likelihood of recruitment or natural regeneration. Given the distance of the proposal site from any stands of intact native vegetation, the proposal is unlikely to fragment an existing population into two or more populations.

Criteria	Discussion
Adversely affect habitat critical to the survival of a species	No areas of habitat critical to the survival of the species are identified in the conservation advice for the species (TSSC 2016). Given the nine planted individuals within the proposal site are not included in the total number known from the locality, exist within an isolated, grazed paddock surrounded by other grazed and cropped land, and are of unknown genetic provenance, it is unlikely that they are contributing in any substantial form to the ongoing persistence of the species in the locality. Taking this into consideration, the proposal is unlikely to affect habitat critical to the survival of the species.
Disrupt the breeding cycle of a population	*Eucalyptus macarthurii* seed is dispersed via wind or gravity, and there is no mechanism for dormancy (TSSC 2016). The species does not spread vegetatively, and is largely fire-tolerant, and able to resprout post-fire. The nine planted individuals within the proposal site do not represent a viable population, given their isolation from any stands of intact native vegetation, lack of suitable habitat for recruitment or regeneration, and ongoing grazing pressure within the council-owned paper road, that will form the new north-south road alignment. The proposal will not disrupt the breeding cycle of any specimens of *Eucalyptus macarthurii* elsewhere in the locality, and the proposal will not represent a barrier to movement for pollinators such as birds and insects.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposal will result in the removal of nine planted specimens of *Eucalyptus macarthurii*. The stand of trees to be impacted are of unknown provenance, and are about 25 years old (G. Leonard, *pers comm* via email, 1/2/2023). The small area of occupied habitat to be removed (0.04ha in size) represents very poor long-term habitat for the species, given the land uses of the proposal site, ongoing grazing pressure, threat of weed infestation, and lack of opportunity for regeneration or recruitment of saplings. The conservation advice for the species (TSSC 2016) suggests that "*unless a large-scale project to protect and reconnect remnants is implemented*", "*existing levels of fragmentation are such that further habitat decline and degradation is highly likely*". The proposal will not influence the adoption of regional-scale revegetation or habitat connectivity works. Instead, it will result in a discrete impact to a small stand of planted individuals. Given this, it is unlikely that the proposal would influence the habitat of the species to the extent that the species is likely to decline.
Result in invasive species that are harmful to the species becoming established in the species' habitat	Invasion by weeds is identified in the conservation advice for the species as a known threat (TSSC 2016). Invasion by Blackberry (Rubus spp.) is noted as a particular concern in the local region. Blackberry is established across large portions of the proposal site, including within the new north-south road alignment. It is likely that existing infestations would continue to grow in size and number, potentially endangering the ongoing persistence of the species in the proposal site. Mitigation measures are provided in this BDAR, and are recommended for inclusion in the CEMP for the proposal, that would minimise the threat of any new weed species becoming established in the proposal site during construction and operation of the proposal. Taking this into account, it is unlikely that the proposal would result in the establishment of any new invasive species that could threatened *Eucalyptus macarthurii* within the proposal site.
Introduce disease that may cause the species to decline	The proposal is unlikely to introduce disease into the proposal site that may cause the species to decline. Existing land uses such as grazing and cropping surround the proposal site, and the proposal site is already subject to regular disturbance. Mitigation measures are included in this BDAR and are recommended for inclusion in the CEMP for the proposal to limit the potential for introduction of any diseases of relevance to this species, such as *Phytophthora*, which is known to be a threat to this species (TSSC 2016).
Interfere with the recovery of the species	There is no recovery plan for *Eucalyptus macarthurii*. The conservation advice for the species identifies the main threats and recommended recovery activities for the species. Threats include: – Land clearing – Weed invasion – Grazing – Land subsidence and alteration of surface and subsurface hydrology (resulting from mining and gas extraction) – Hybridisation – Plant disease – Climate change.

Criteria	Discussion
	Key conservation actions for the species are listed as follows: 1. Prevent land clearing and resulting habitat destruction at all indigenous localities. 2. Maintain and enhance existing and potential habitat 3. Prevent grazing by cattle and other introduced herbivores 4. Manage weeds at all indigenous localities. The proposal will result in land clearing and the loss of nine planted individuals. While this represents a threat to the species, given the context of where the species occurs, the number of known records elsewhere in the locality, and the ongoing grazing pressure and weed presence within the proposal site, the proposal is unlikely to interfere with the recovery of the species. It is questionable whether the nine planted specimens are contributing to the existing population, given their provenance is unknown, and they occur as a stand of isolated paddock trees, in a property with little chance for natural regeneration.
Conclusion	The proposal is unlikely to have a significant impact on *Eucalyptus macarthurii* given the proposal is unlikely to: – Lead to a long-term decrease in the size of a population given only nine planted individuals will be removed, which have not been included within previous surveys of the species in the local area, based on results in NSW BioNet – Reduce the area of occupancy of the species, given only nine planted individuals will be removed from a windbreak, which is not at the edge of the species range, nor a known occurrence of the species in the local area – Fragment an existing population into two or more populations given the entire, isolated, planted, linear stand will be removed, with no impact on any other individuals in the local area – Adversely affect habitat critical to the survival of a species, as no such habitat has been described or identified – Disrupt the breeding cycle of a population, given the individuals to be removed are of unknown provenance, unlikely to regenerate, or contribute to the gene pool of the species in the local area, noting the context in which they occur – Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, given only nine planted individuals will be removed from within a highly modified landscape that lacks suitable conditions for self recruitment or natural regeneration of any other individuals, due to ongoing grazing pressure and surrounding land uses – Result in invasive species that are harmful to the species becoming established in the species' habitat, given the presence of existing weed infestations within the proposal site – Introduce disease that may cause the species to decline, given the mitigation measures recommended in this BDAR, to be incorporated into the CEMP for the proposal.

Appendix F

BAM credit report

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id
00024641/BAAS17031/21/00024642

Proposal Name
Plasrefine - Moss Vale Plastics Recycling and Reprocessing Facility

BAM data last updated *
01/02/2023

Assessor Name
Kath Chesnut

Assessor Number
BAAS17031

BAM Data version *
57

Proponent Names
Nancy Zheng

Report Created
02/03/2023

BAM Case Status
Finalised

Assessment Revision
3

Assessment Type
Major Projects

Date Finalised
02/03/2023

* 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.

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Southern Highlands Shale Woodlands in the Sydney Basin Bioregion	Endangered Ecological Community	944-Mountain Grey Gum - Narrow-leaved Peppermint grassy woodland on shales of the Southern Highlands, southern Sydney Basin Bioregion

Species
Nil

Additional Information for Approval

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
Calyptorhynchus lathami / Glossy Black-Cockatoo

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

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
1256-Tableland swamp meadow on impeded drainage sites of the western Sydney Basin Bioregion and South Eastern Highlands Bioregion	Not a TEC	0.3	0	6	6
944-Mountain Grey Gum - Narrow-leaved Peppermint grassy woodland on shales of the Southern Highlands, southern Sydney Basin Bioregion	Southern Highlands Shale Woodlands in the Sydney Basin Bioregion	0.0	0	0	0

BAM Biodiversity Credit Report (Like for like)

944-Mountain Grey Gum - Narrow-leaved Peppermint grassy woodland on shales of the Southern Highlands, southern Sydney Basin Bioregion

Like-for-like credit retirement options

Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region
Southern Highlands Shale Woodlands in the Sydney Basin Bioregion This includes PCT's: 944, 1107, 1254	-	944_Poor	No	0	Moss Vale, Burragorang, Ettrema, Illawarra and Sydney Cataract. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

1256-Tableland swamp meadow on impeded drainage sites of the western Sydney Basin Bioregion and South Eastern Highlands Bioregion

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region
Montane Bogs and Fens This includes PCT's: 765, 766, 1229, 1256	Montane Bogs and Fens >=70% and <90%	1256_Poor	No	6	Moss Vale, Burragorang, Ettrema, Illawarra and Sydney Cataract. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

BAM Biodiversity Credit Report (Like for like)

Species Credit Summary

Species	Vegetation Zone/s	Area / Count	Credits
Eucalyptus macarthurii / Paddys River Box, Camden Woollybutt	**944_Poor**	9.0	18.00
Myotis macropus / Southern Myotis	**1256_Poor**	0.3	6.00

Credit Retirement Options

Like-for-like credit retirement options

Eucalyptus macarthurii / Paddys River Box, Camden Woollybutt	Spp	IBRA subregion
	Eucalyptus macarthurii / Paddys River Box, Camden Woollybutt	Any in NSW
Myotis macropus / Southern Myotis	Spp	IBRA subregion
	Myotis macropus / Southern Myotis	Any in NSW

BAM Biodiversity Credit Report (Variations)

Proposal Details

Assessment Id

00024641/BAAS17031/21/00024642

Proposal Name

Plasrefine - Moss Vale Plastics Recycling and Reprocessing Facility

BAM data last updated *

01/02/2023

Assessor Name

Kath Chesnut

Assessor Number

BAAS17031

BAM Data version *

57

Proponent Name(s)

Nancy Zheng

Report Created

02/03/2023

BAM Case Status

Finalised

Assessment Revision

3

Assessment Type

Major Projects

Date Finalised

02/03/2023

* 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.

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Southern Highlands Shale Woodlands in the Sydney Basin Bioregion	Endangered Ecological Community	944-Mountain Grey Gum - Narrow-leaved Peppermint grassy woodland on shales of the Southern Highlands, southern Sydney Basin Bioregion

Species
Nil

Additional Information for Approval

PCT Outside Ibra Added

None added

BAM Biodiversity Credit Report (Variations)

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
Calyptorhynchus lathami / Glossy Black-Cockatoo

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

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
1256-Tableland swamp meadow on impeded drainage sites of the western Sydney Basin Bioregion and South Eastern Highlands Bioregion	Not a TEC	0.3	0	6	6.00
944-Mountain Grey Gum - Narrow-leaved Peppermint grassy woodland on shales of the Southern Highlands, southern Sydney Basin Bioregion	Southern Highlands Shale Woodlands in the Sydney Basin Bioregion	0.0	0	0	0.00

944-Mountain Grey Gum - Narrow-leaved Peppermint grassy woodland on shales of the Southern Highlands, southern Sydney Basin Bioregion

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region
Southern Highlands Shale Woodlands in the Sydney Basin Bioregion This includes PCT's: 944, 1107, 1254	-	944_Poor	No	0	Moss Vale,Burragorang, Ettrema, Illawarra and Sydney Cataract. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Variation options

Formation	Trading group	Zone	HBT	Credits	IBRA region

	Wet Sclerophyll Forests (Grassy sub-formation)	Tier 3 or higher threat status	944_Poor	No	0	IBRA Region: Sydney Basin, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
1256-Tableland swamp meadow on impeded drainage sites of the western Sydney Basin Bioregion and South Eastern Highlands Bioregion	**Like-for-like credit retirement options**					
	Class	Trading group	Zone	HBT	Credits	IBRA region
	Montane Bogs and Fens This includes PCT's: 765, 766, 1229, 1256	Montane Bogs and Fens >=70% and <90%	1256_Poor	No	6	Moss Vale,Burragorang, Ettrema, Illawarra and Sydney Cataract. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Variation options					
	Formation	Trading group	Zone	HBT	Credits	IBRA region
	Freshwater Wetlands	Tier 2 or higher threat status	1256_Poor	No	6	IBRA Region: Sydney Basin, 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
Eucalyptus macarthurii / Paddys River Box, Camden Woollybutt	**944_Poor**	9.0	18.00
Myotis macropus / Southern Myotis	**1256_Poor**	0.3	6.00

Credit Retirement Options

Like-for-like options

Eucalyptus macarthurii/ Paddys River Box, Camden Woollybutt	Spp		IBRA region
	Eucalyptus macarthurii/Paddys River Box, Camden Woollybutt		Any in NSW
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Flora	Endangered	Moss Vale, Burragorang, Ettrema, Illawarra and Sydney Cataract. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Myotis macropus/ Southern Myotis	Spp		IBRA region
	Myotis macropus/Southern Myotis		Any in NSW
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region

	Fauna	Vulnerable	Moss Vale, Burragorang, Ettrema, Illawarra and Sydney Cataract. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

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