Review of Environmental Factors

Final v1.0

Bungendore Road (Tarago) upgrade

Tarago NSW 2580

Prepared for Goulburn Mulwaree Council

5 February 2025

Ecology CONSULTING

About this document

This document has been prepared by Ecologists Shu Lee and Finbar Shields and approved for release to client by Principal Ecologist Lesley Peden, Accredited Biodiversity Assessor NSW licence BAAS19005.

Disclaimer

This is a working document and has been prepared based on information available at the time. Final concurrence from NSW DPI Fisheries is required. The REF may require amendment subject to advice from NSW DPI Fisheries and may be modified on receival of the project contractors CEMP.

This document may only be used for the purposes for which it was commissioned. Ecology Consulting accepts no liability for any damages or loss incurred if this report is used for any other purpose, or because of any inaccuracies or omissions in information that is identified as having been obtained from a third party.

Document tracking

Version	Type	Document Author	Reviewer	Date of review
v0.1	Draft - for client review	Shu Lee and Finbar Shields	Simon Vinson	24 January 2025
V1.0	Final	Shu Lee and Finbar Shields	Lesley Peden	5 February 2025

About Ecology Consulting

Accredited

We are NSW-accredited Biodiversity Assessors, licensed to do scientific fieldwork in NSW, and accredited with the national Land for Wildlife program.

Local knowledge

We specialise in the ecosystems of southern NSW, so we can survey, assess, and document your site efficiently and accurately.

Solutions - Not just science

We have helped hundreds of landholders find information, contacts, events, and funding to achieve better environmental outcomes.

Support for major projects

We partner with business, government, and not-for-profit organisations to deliver major construction, species conservation, and site rehabilitation projects.

Executive summary

This Review of Environment Factors (REF) relates to a project to remediate a landslip within the Goulburn Mulwaree Council (Council) Local Government Area (LGA). The landslip site occurs along Bungendore Road on the outskirts of Tarago township and has caused the closure of the westbound lane. Bungendore Road provides access and services within rural areas to the local community and visitors to the Goulburn region.

Council is the proponent for the proposal and is also the determining authority for the REF under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

The proposal

Council seeks to remediate a landslip on Bungendore Road on the outskirts of Tarago township where considerable erosion has occurred within the Mulwaree Riverbank and undercut sections of the road embankment.

Key features of the proposal include:

- removing slip debris from the benches and diversion drain,
- construction of a rock-filled drain upslope of the landslip,
- construction of a rock fill embankment on the bank of the Mulwaree River, and
- other ancillary work required to support the construction of the proposal including establishment of a stockpile site.

Construction is proposed to be carried out during recommended standard hours for construction, taking about 12 weeks to commence in February/March 2025 (subject to weather and approvals).

The proposed upgrades will include a main compound site and a potential stockpile site. The main compound site occurs approximately 2 km southwest of the project area, consisting of an existing stockpile/laydown site currently in use by Transport for NSW (TfNSW) and Council for maintenance work. This site has not been assessed by Ecology Consulting for this report; however, it is unlikely to have significant impacts on native vegetation as the site compound will be situated within the area that is already in active use as a stockpile site and works are not expected to exceed current boundaries. The potential stockpile site occurs 200 m west of the main works area and is approximately 0.19 ha.

Need for the proposal and objectives

Council identified that the current road infrastructure is unsafe for western vehicle travel along Bungendore Road and has temporarily closed the southern lane to traffic. Prior landslip events have also occurred on the northern side of the road, further compromising the integrity of Bungendore Road. The damage to this section of Bungendore Road is likely to only continue and increase the risk of further damage, putting the safety of drivers and road accessibility at greater risk. The objective of the proposal is to:

- restore full traffic access to Bungendore Road, and
- mitigate the risk of further erosion

Community and stakeholder consultation

Minimal community consultation will be required as current plans allow for one lane of the road to remain open during the completion of works and the project area is located within a road reserve.

Council will contact NSW Department of Primary Industries (DPI) Fisheries on advice and to apply for a permit for works on the northern bank of the Mulwaree River. Additional key stakeholders such as other government agencies will be contacted as soon as reasonably practicable.

Council and their contractors also intend to produce a Community and Stakeholder Engagement Plan as a part of the project's Construction Environmental Management Plan (CEMP).

Statutory and planning framework

The proposal is to be carried out by Council for the purpose of road and road infrastructure facilities. In accordance with Chapter 2, Part 2.2, Division 1 within *Infrastructure (ISEPP) of the State Environmental Planning Policy (Transport and Infrastructure) 2021* the proposal can therefore be assessed under Division 5.1 of the EP&A Act. This REF fulfils the Council's obligation under section 5.5 of the EP&A Act including to examine and fully consider possible all matters affecting or likely to affect the environment by reason of the activity.

An assessment of the proposal concluded that it would not significantly impact on Matters of National Environmental Significance (MNES) protected under the Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act) or significantly affect threatened species or ecological communities and their habitats under the NSW *Biodiversity Conservation Act* 2016 (BC Act). Therefore, the proposal is a valid development to be assessed under Division 5.1 of the EP&A Act and no further planning approval requirements would be triggered under the EPBC Act or BC Act.

Environmental impacts

Landforms, geology and soils

The topography of the project area has experienced modifications previously due to the construction and maintenance of Bungendore Road. The project area is characterised by rolling to steep hills on volcanics, commonly with surface gravel. The proposal is not expected to result in any substantial changes to the topography of the site, however sections of the work area have been mapped as 'Steep' under NSW Steep Land 18 degrees mapping.

Risk from erosion, sedimentation and dust emissions from the proposed works may contribute to minor topographic and soil changes. However, these risks are to be avoided or otherwise minimised through appropriate and standard controls and other mitigation measures identified within this REF.

Hydrology, flooding, GROUNDWATER, and water quality

The proposed activities have the potential to impact water quality within Crisps Creek and Mulwaree River as proposed works will occur directly adjacent to both waterways and within Mulwaree River. In-stream works must be managed by suitable measures such as silt curtains, and the migration of soils resulting from exposed surfaces are to be managed through the implementation of an Erosion and Sediment Control Plan (ESCP) to ensure sedimentation of waterways and consequently impacts to water quality are avoided. Further impacts could occur from pollution (spills and leaks of oils and chemicals). Water quality should be protected through the implementation of safeguard and management measures to ensure that spills are contained and removed correctly.

Biodiversity

Proposed works will require the removal of up to:

- 0.32 ha of Plant Community Type (PCT) 3338 Goulburn Tableland Frost Hollow Grassy Woodland associated with NSW Biodiversity Conservation (BC) Act listed Threatened Ecological Community (TEC) Werriwa Tablelands Cool Temperate Grassy Woodland, and

- 0.002 ha of PCT 3932 Central and Southern Tableland Swamp Meadow Complex associated with NSW TEC Montane Peatlands and Swamps.

Habitat features potentially impacted by the proposed works include native woodland (including native mistletoe and flowering overstory species), minor areas of rock habitat, riparian habitat within the Mulwaree River and minor derived native grassland.

One threatened species was observed within the work area during field inspection, Key's Matchstick Grasshopper (*Keyacris scurra*). It was observed within native woodland vegetation in the north of the works area. Otherwise, 22 threatened flora species and 53 threatened fauna species were assessed as potentially occurring within or utilising habitat within the project area. A Commonwealth and NSW Test of Significance for impacts of the proposal assessed both EPBC Act and BC Act listed threatened species concluded that the projects are unlikely to have a significant and long-term adverse impact on any threatened flora or fauna.

Ten weed species, including High Threat Exotic weeds (HTE), Weeds of National Significance (WoNS) and priority weeds were observed across the project area and the proposed activities may facilitate the introduction, spread, and establishment of weed species within the project area and surrounding landscape. To reduce this risk, weeds within project area should be managed before construction with water safe herbicides or using mechanical removal and planning should include the development of a weed management sub-plan as part of the project CEMP.

Overall, the proposal is not likely to have long term adverse effects on local biodiversity or significantly impact threatened species, populations, ecological communities, or their habitats. It is recommended that a suitably qualified ecologist supervises native vegetation, habitat clearing and weed removal to minimise harm to the remaining native flora and fauna.

Heritage (Aboriginal and non-aboriginal)

The project area is not identified on the Aboriginal Heritage Information Management System (AHIMS) as containing a known Aboriginal objects or places, however a Due Diligence assessment has notes that the heritage site consisted of isolated artefacts which were previously salvaged and no camp sites, scarred trees or areas of Potential Archaeological Deposit (PAD). The Due Diligence assessment also included a field inspection which did not find any unrecorded Aboriginal heritage sites or areas of PAD, concluding that no Aboriginal Heritage Impact Permit is required at this stage.

Neither project site contains or is within close proximity to any known heritage items or places.

Traffic and access

In the short term, the project will have some unavoidable adverse impacts on local traffic movement due to an increase in construction and staff vehicles entering the site. Delays/disruptions will be minimised through preparation of a Traffic Management Plan for the project.

In the long term, the project will restore two lane access to Bungendore Road, which is currently impeded with the closure of one lane and necessitating the use of portal traffic lights. The project will also reduce the likelihood of a landslip occurring within the site again in the future through the construction of a drain to direct waterflow through a natural gully.

Noise and vibration

In the short term, construction vehicles and machinery may increase in noise and vibrations in and around the project area, but lower speed limits for construction work may reduce the emissions from passing traffic. The proposal is not expected to result in any noticeable change in noise or vibration during operation.

Air quality

The project is likely to result in a short-term increase in emissions from construction vehicles and machinery, though the emissions are not likely to be significant considering the emissions associated with normal vehicle use and the very open nature of the sites.

Visual amenity and landscape

In the short term, the projects will involve setting up a construction site and materials stockpiles and the removal of a small amount of native vegetation. In the long term, the remediation will improve the visual effect of the current landslip and structures will have similar visual effect to what is consistent with the current infrastructure.

Rehabilitation plantings and using locally appropriate native vegetation within the riparian and upper banks of any impacted area will contribute to remedying any impacts to visual amenity in the long-term.

Chemical and waste management

Waste will inevitably be created and will need to be contained, to ensure it does not disperse across the site and into downstream/downwind areas. Among other things, waste materials must be managed in accordance with relevant EPA guidelines and disposed of at an appropriate waste management facility. Overall waste generated by the proposal is not expected to be in great volumes. No construction materials or any other kind of waste is to be placed, even temporarily, outside the defined works area.

Cumulative environmental impacts

As part of the Goulburn Mulwaree Council (GMC) LGA road infrastructure system, the remediation of the landslip of Bungendore is included in Council's maintenance and construction of roads. Road maintenance and construction might have cumulative impacts due to the works involved on multiple roads in the areas.

The project will require the removal or disturbance of up to 0.32 ha of mixed native and exotic vegetation, contributing to the cumulative impacts of road construction and maintenance throughout Goulburn Mulwaree Council LGA. This clearance of vegetation results in a reduction in the amount of native vegetation within the locality, however, is not considered to contribute to the cumulative impacts in any substantial way due to the relatively small area and existing disturbance due to the landslip event.

Two TECs were identified within the works area, however the removal or disturbance of vegetation belonging to these communities is unlikely to contribute substantially to the cumulative impacts on them due to the relatively small area and disturbed nature of the area due to the landslip event.

Conclusion

This REF recommends mitigation measures to ensure that the construction and operation of the Bungendore Road upgrade occurs without significant environmental impact. This REF has identified the likely impacts of the proposal, grounded by the design supplied by Council and other relevant documents and consultation with Council. The design may be further refined and may be subject to changes pending finalisation of the design and review of the projects Construction Environment Management Plan (CEMP). Changes to the design may require amendments to this REF where impacts of the proposal have been subject to change and yet to be reported. Furthermore, the contractor's CEMP must clearly outline how the site will be managed during construction and address all mitigation measures proposed to avoid environmental impacts. When received, the detailed design and CEMP may form part of this REF and mitigation measures updated to this document.

This REF will remain a working document until all construction mitigation measures are integrated and all phases of construction completed.

Conditions of approval to be checked/monitored

Weed management is to be undertaken across the entire project area to control invasive plant species prior to any construction works being undertaken. Specific attention and care should be focussed on any areas containing WoNS, HTEs and any other invasive plant species identified in this REF.

Council will maintain contact with NSW DPI Fisheries and continue consultation regarding the application for permits for the proposed works within Mulwaree River, as the site is mapped as Key Fish Habitat. Consultation with NSW DPI Fisheries will continue throughout the design and construction process, and conditions of the permit will be incorporated into the contractor's CEMP.

Provided the safeguards and mitigation measures recommended in **Section 6** are implemented, no additional permits or licenses appear to be required. This situation is, however, subject to change. If there are significant delays in the approval of the REF or commencement of construction work, this REF should be reviewed to ensure that it remains complete and accurate.

Table of contents

List of figures

List of tables

Abbreviations and common terms

agg.	aggregate
AHIMS	Aboriginal Heritage Information Management System
ALA	Atlas of Living Australia
AOBV	Area of Biodiversity Value declared under the NSW BC Act
AQI	Air Quality Index
AUSHD	Australian Heritage Database
BAM	Biodiversity Assessment Method
BC Act	*Biodiversity Conservation Act 2016* (NSW)
CE	denotes a species, population or ecological community listed as Critically Endangered under Commonwealth and/or State legislation
CEMP	Construction Environment Management Plan
Council	Goulburn Mulwaree Council
Cwlth	Commonwealth
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DECC	Department of Environment & Climate Change NSW
DPI	Department of Primary Industries
DPIE	Department of Planning, Industry and Environment
E	denotes a species, population or ecological community listed as Endangered under Commonwealth and/or State legislation
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
EPA	Environment Protection Authority (NSW)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cwlth)
EPI	Environmental planning instruments
ESCP	Erosion and Sediment Control Plan
FM Act	*Fisheries Management Act 1994*
GM LEP	Goulburn Mulwaree Local Environmental Plan 2009
ha	Hectare
HTE	High Threat Exotic - a type of declared weed in NSW
IBRA	Interim Biogeographic Region of Australia
ISEPP	*State Environmental Planning Policy (Infrastructure) 2021*
km	Kilometres
KTP	Key Threatening Process listed under Commonwealth and/or State legislation
LEP	Local Environmental Plan–a type of planning instrument made under the EP&A Act
LGA	Local Government Area
LLS	Local Land Services
m	Metres
MNES	Matters of National Environmental Significance
NP&W Act	*National Parks and Wildlife Act 1974 (NSW)*
NPWS	National Parks and Wildlife Service
NSW	New South Wales
OEH	Office of Environment and Heritage
PAD	Potential Archaeological Deposit
PBP	Planning for Bushfire Protection 2019
PCT	Plant Community Type
PMST	Commonwealth Protected Matters Search Tool
POEO Act	*Protection of the Environment Operations Act 1997 (NSW)*
REF	Review of Environmental Factors

RF Act	*Rural Fires Act 1997 (NSW)*
SEPP	State Environmental Planning Policy–a type of planning instrument made under the EP&A Act
SHR	State Heritage Register
sp./spp.	species (singular) / species (plural)
subsp.	Subspecies
TEC	Threatened Ecological Community or equivalent (terms may vary across jurisdictions)
TMP	Traffic Management Plan
UFP	Unexpected Finds Procedure
V	denotes a species, population or ecological community listed as Vulnerable under Commonwealth and/or State legislation
WIRES	Wildlife Information, Rescue and Education Service
WM Act	*Water Management Act 2000*
WONS	Weeds of National Significance

1. Introduction

1.1. Background

Ecology Consulting Pty Ltd has been commissioned by the proponent, Goulburn Mulwaree Council (Council) to prepare a Review of Environmental Factors (REF) for the proposed Bungendore Road upgrade within the Goulburn Mulwaree local government area (LGA).

The project aims to re-establish the Bungendore Road southern bank where considerable erosion has occurred within the Mulwaree River and undercut sections of the road embankment. A rock fill embankment will be constructed on the southside, while slip debris will be removed and a rock lined drain constructed on the north side of Bungendore Road. The proposed upgrade to Bungendore Road will provide reliable, safe and efficient freight corridor for local and regional traffic.

The proposed works will be carried out under Division 17 (Roads and road infrastructure facilities) of the *State Environmental Planning Policy (Transport and Infrastructure) 2021* (Transport and Infrastructure SEPP) and are permitted without consent. The environmental assessment of the proposal has been undertaken in accordance with Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). For this proposal, the Council is both a public authority proponent (EP&A Act s5.3) and the determining authority (EP&A Act s5.1). **Table 1** presents the proponent contact details.

TABLE 1: PROPONENT DETAILS

Project name	Bungendore Road (Tarago)
Proponent name	Goulburn Mulwaree Council
Project Manager	Ben Lyons
Position	Council's Project Manager
Contact details	ben.lyons@capital2coast.com.au

1.2. The site

1.2.1. Location of the proposed activity

The project site is located within the LGA of Goulburn Mulwaree Council. The proposed activity is in the rural locality of Tarago. It is ~ 2 km southwest of the Tarago town centre and ~ 28 km northeast of Bungendore, NSW (GPS co-ordinates -35.082852, 149.637280) (**Figure 1**).

According to the Interim Biogeographic Regionalisation of Australia (IBRA), the proposed activity is located within Monaro sub-region of the South Eastern Highlands region.

1.2.2. Landscape context

The project area is located within undulating country with an elevation ~ 720 m above sea level with a local relief of < 30 m, where Bungendore Road runs parallel to Mulwaree River. Mulwaree River is a perennial watercourse which flows in a generally easterly direction where it is adjoined by a several tributaries before heading north through Goulburn. The surrounding landscape is formed on closed drainage basins of Quaternary lakes and swamps set within block faulted ranges. Geology and lithology

include extensive Tertiary quartz gravel, sand, and mud overlying Silurian-Devonian gneissic granite and Silurian quartz sandstone and mudstone.[1]

The surrounding landscape is utilised as rural grazing land, however, there are large patches of native forest and woodland found within 1.5 km in the southwest and northwest direction of the site that occurs on privately owned land (**Figure 2**).

1.2.3. Traditional lands

The proposal is within the traditional lands of the Ngunnawal people and is within the area now administered by Pejar Local Aboriginal Land Council in Goulburn. A desktop search of the Native Title Tribunal Online Register revealed that the project site is not subject to a Native Title Claim and/or Freehold[2].

1.2.4. Current land use and ownership

The project area and its proposed areas of work are primarily within a Local Government Road Reserve managed by the Council. All bordering properties to each site are held in private ownership, with limited works to extend outside of Local Government Road Reserves. A rock-lined drain is proposed to be constructed beyond the fence line denoting road reserve from private land, within Lot 192 DP 655741. Stockpile areas are similarly situated within Council managed Road Reserved areas.

The project area adjoins rural land that is zoned for Rural Landscape (R2) to the south, east and north of Bungendore Road and Heavy Industrial (E5) to the southeast of Bungendore Road.

[1] Descriptions for NSW (Mitchell) Landscapes. Department of Environment & Climate Change NSW, (2002).
[2] Search the Registers and Databases for native title information at: National Native Title Tribunal. (2024). (http://www.nntt.gov.au/searchRegApps/Pages/default.aspx). (Accessed: 20/08/2024).

FIGURE 1: THE PROJECT AREAS IN A REGIONAL CONTEXT

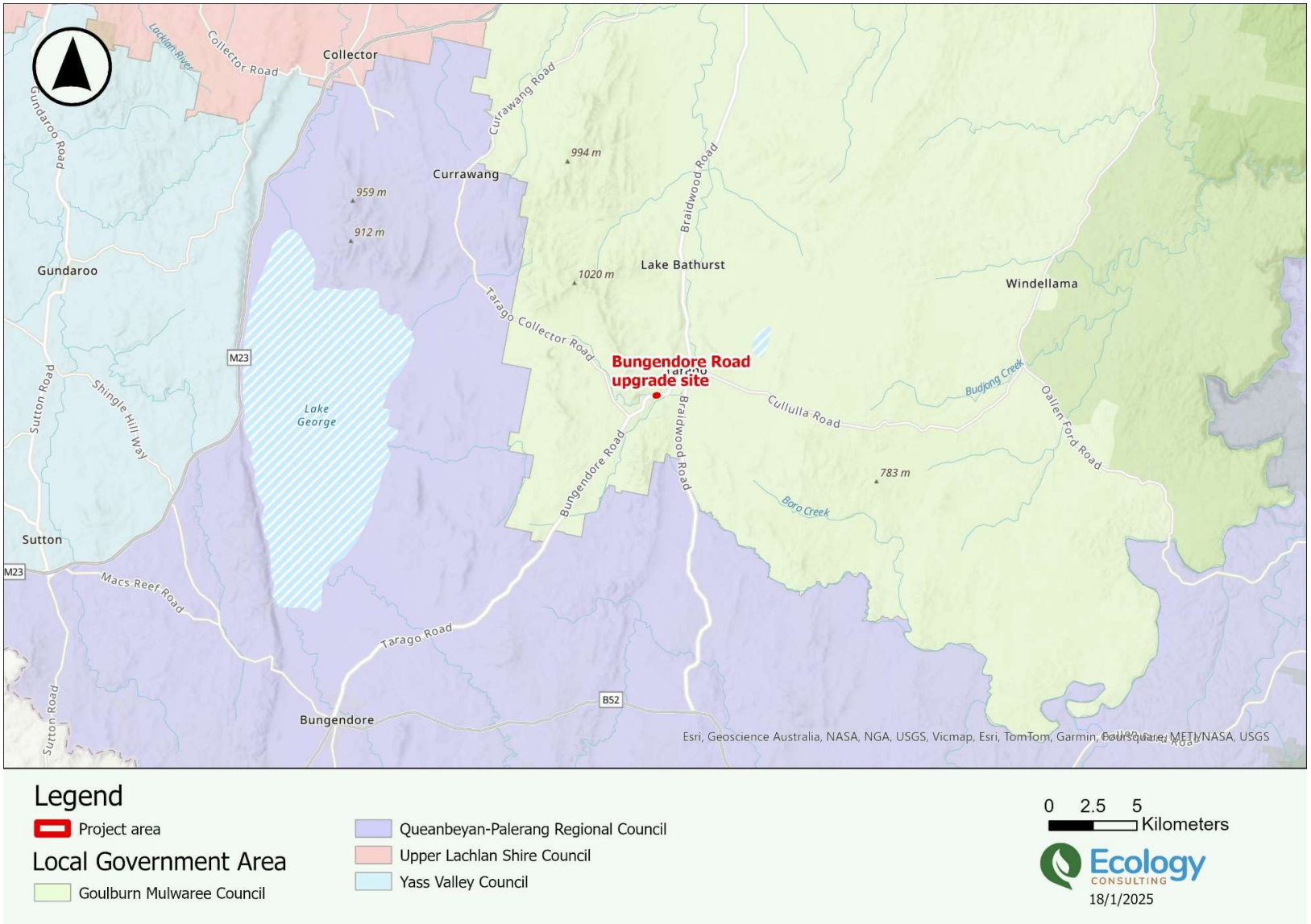
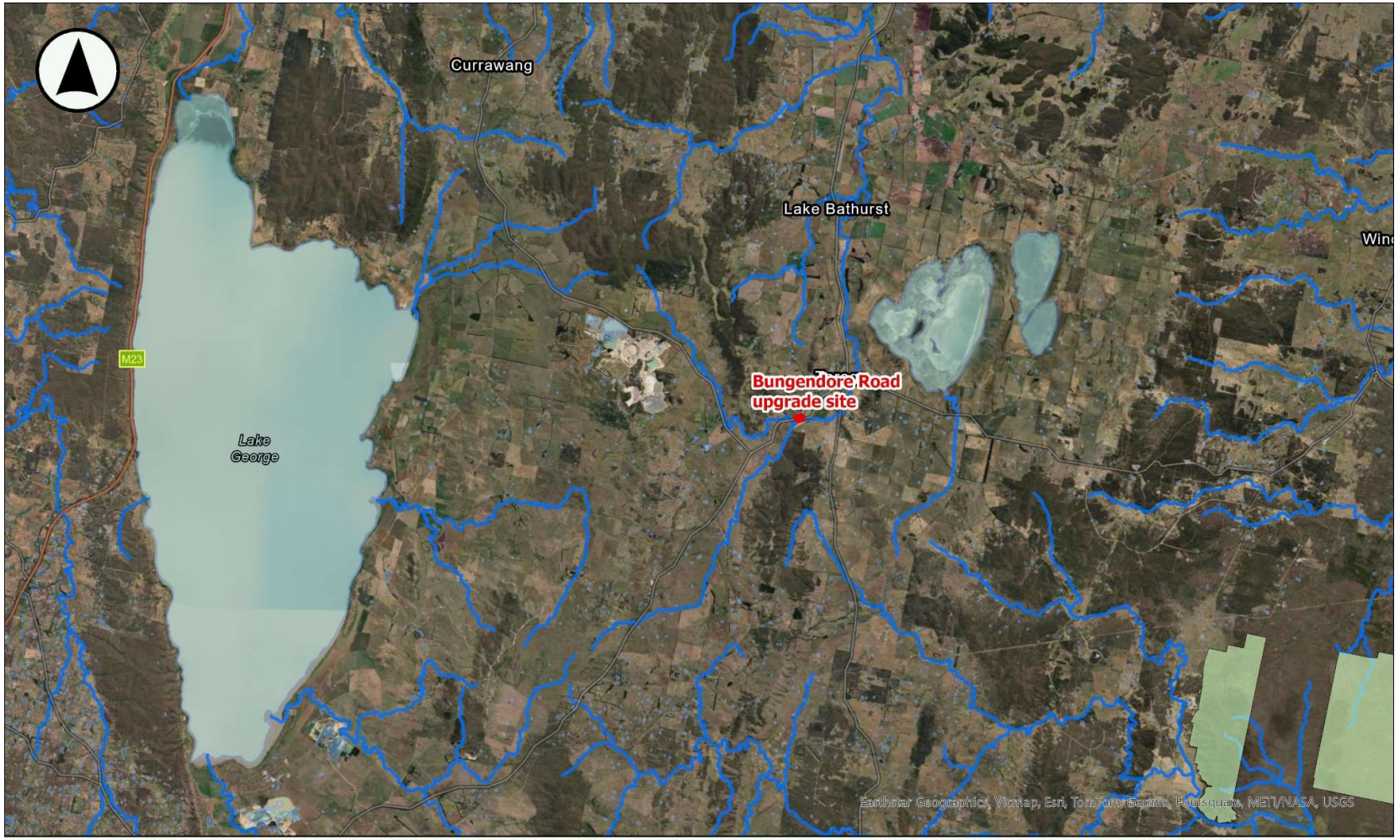


FIGURE 2: AERIAL VIEW OF PROJECT AREA AND PROPOSED MAIN COMPOUND SITE

FIGURE 3: THE PROJECT AREA IN AN ENVIRONMENTAL CONTEXT



1.3. Project justification

Council plans to upgrade a section of Bungendore Road ~ 500 m southwest of the south of the Tarago township. A section of this road has been impacted through a recent landslip event that has occurred on the southern side of the road where the road border the Mulwaree River corridor, likely caused through prior flooding events reducing road stability. This landslip event has caused the road to become unsafe for western vehicle travel along Bungendore Road, with a temporary closure of the southern road lane. Prior landslip events have also occurred on the northern side of the road, further compromising the integrity of Bungendore Road. The damage to this section of Bungendore Road is likely to only continue and increase the risk of further damage, putting the safety of drivers and road accessibility at greater risk.

Council's main justification for the site is to provide reliable and safe road access for the community and freight. The projects align with Council's mission statement "*To serve the community*" and Council's commitment to "*maintain and improve road infrastructure and connectivity*"[3].

1.4. Purpose of this report

The purpose of this REF is to facilitate the assessment of the proposed activities to be undertaken by Council. It describes the proposed works, relevant planning controls, the existing environment, the potential environmental impacts associated with the proposed works, and environmental mitigation measures to address any potential impacts identified.

The environmental assessment and determination of the proposal has been undertaken in accordance with Part 5 of the EP&A Act. For this proposal, Council is both a public authority proponent (EP&A Act s5.3) and the determining authority (EP&A Act s5.1).

[3] Strategy IN3 in *The Tablelands 2016 - 2036 Regional Community Strategic Plan*. Goulburn Mulwaree Council, Upper Lachlan Shire Council and Yass Valley Council. (2016).

2. Project description

The proposal involves the establishment of a new Bungendore Road southern embankment to re-establish road stability and safety through the structural remediation of this area. This includes works proposed to be undertaken on the northern roadside as to stabilise lands to reduce to potential for landslips to occur. The project area and its identified areas of impact are presented in **Figure 4** below.

A concept design has been prepared for the removal of slip debris and construction of a discharge drain on the northern side of Bungendore Road as well as works to stabilise lands on the southern side of the road, however, may be subject to changes pending review of the Construction Environment Management Plan (CEMP) and finalisation of detailed design. An overview of Council plans for the road embankment stabilisation is presented in **Figure 5** and **Figure 6**.

2.1. Scope of works

Proposed construction methodology for the site would involve the following general scope of works:

- Stage 1: Site establishment including:
  - preconstruction weed control,
  - establishment of site compound and stockpile areas,
  - delineation of construction site,
  - set-up of sediment and erosion control measures,
  - clearance of proposal site,
  - earthworks to level areas of the site as required, and
- Stage 2: Construction of the road embankment, alignment and associated structures including:
  - road and shoulder widening,
  - demolition and removal of existing infrastructure,
  - site preparation, including compaction and filling,
  - rock fill embankment installation and general road construction,
  - general culvert construction,
  - northern roadside land structural remediation,
  - road associated works, including compaction and filling,
  - line marking,
  - installation of traffic signage and guide posts, and
  - installation of safety barriers.
- Stage 3: Site demobilisation involving:
  - removal of waste and surplus materials,
  - remediate exposed areas e.g., through seeding or planting of exposed soil, and
  - monitor and control weed emergence in disturbed areas for a period of 12 months.

Ongoing maintenance of the site will then be managed through Council's Asset Management and Maintenance Plan.

The proposed activities will largely be confined to the works area, which has been assessed for this REF as 0.51 ha of impact area on Bungendore Road and within/surrounding Mulwaree River.

2.2. Machinery and equipment

A range of plant and equipment would be used during construction. An indicative list is provided below:

- crane,
- pile driving equipment,
- concrete pump,
- grader,
- 14T – 20T excavators,
- padfoot and smooth drum rollers,
- scraper,
- road trains and/or dumpers,
- flatbed trailers to transport precast units,
- concrete mixer trucks, and
- pumps and generators.

This is an indicative list and may change prior to construction depending on the agreed construction methodology. The final equipment and plant requirements for the site will be determined by the construction contractor.

2.3. Access and ancillary works

2.3.1. Ancillary sites

To support the construction of the proposal, it is anticipated that a site compound and stockpile area will be necessary for the site. Two sites have been proposed within Council Road reserve.

The proposed main compound site location (-35.094064, 149.618921) is situated approximately 2 km southwest of the main project area at the intersection of Bungendore Road and Tarago Collector Road. It is an existing stockpile/laydown site that is currently used by Transport for NSW (TfNSW) and Council for maintenance work. This site has not been assessed by Ecology Consulting for this report; however, Council has advised it will be situated within the area that is already in active use as a stockpile site.

A site 200 m west of the main works area has also been identified as a potential stockpile site (-35.083069, 149.635416) and is located within the project area (**Figure 4**).

2.3.2. Traffic and access

A detailed Traffic Management Plan (TMP) will be required for the proposal before construction commencement and must be reviewed by the Council before implementation on site.

Access to the project area will be unrestricted as it occurs on an accessible public road. Traffic will continue with the utilization of the eastbound lane of Bungendore Road. The westbound lane is currently closed due to the landslip and instability of the road on its southern side. Traffic management has been in use since the landslip event occurred and was identified. This closure will continue until the completion of the proposed works.

2.4. Duration and working hours

2.4.1. Duration

Depending on the final design and outcomes of contractor consultation, works are estimated to take 12 weeks, commencing in February/March 2025.

2.4.2. Construction work hours

Where possible, construction would be undertaken during recommended standard hours[4]. The recommended standard hours for construction are:

- Monday to Friday: 7 am to 6 pm,
- Saturday: 8 am to 1 pm, and
- no work on Sundays or public holidays.

No works are intended to be required outside standard hours. However, in the case that noise-generating works are required outside these times, justification would be provided in accordance with the *Draft Construction Noise Guidelines*.

[4] *Draft Construction Noise Guidelines*. State of NSW and the Environmental Protection Agency. (2020).

FIGURE 4: PROJECT IMPACT AREA

FIGURE 5: CONCEPT DESIGN FOR PROJECT (CLIENT SUPPLIED)

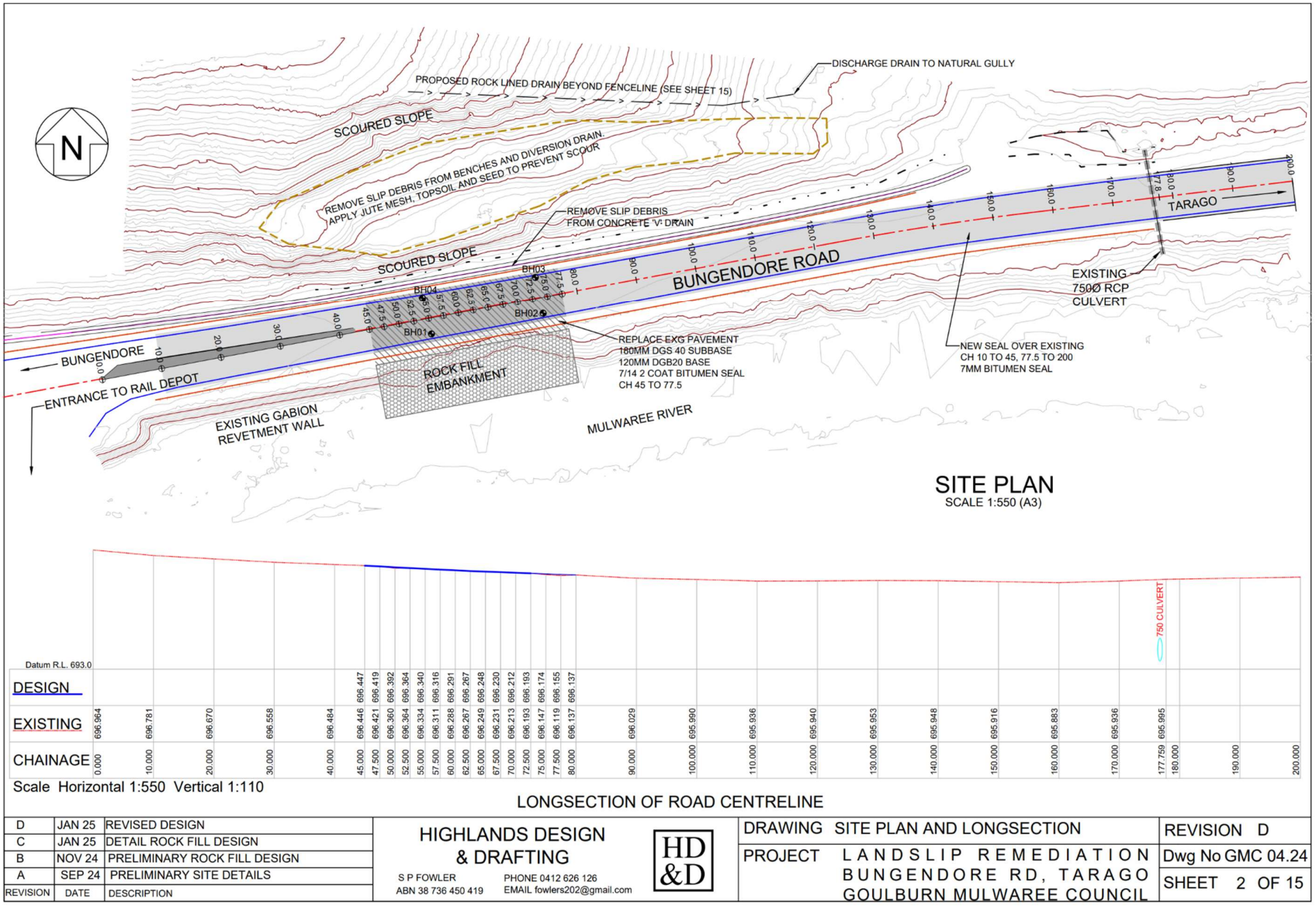
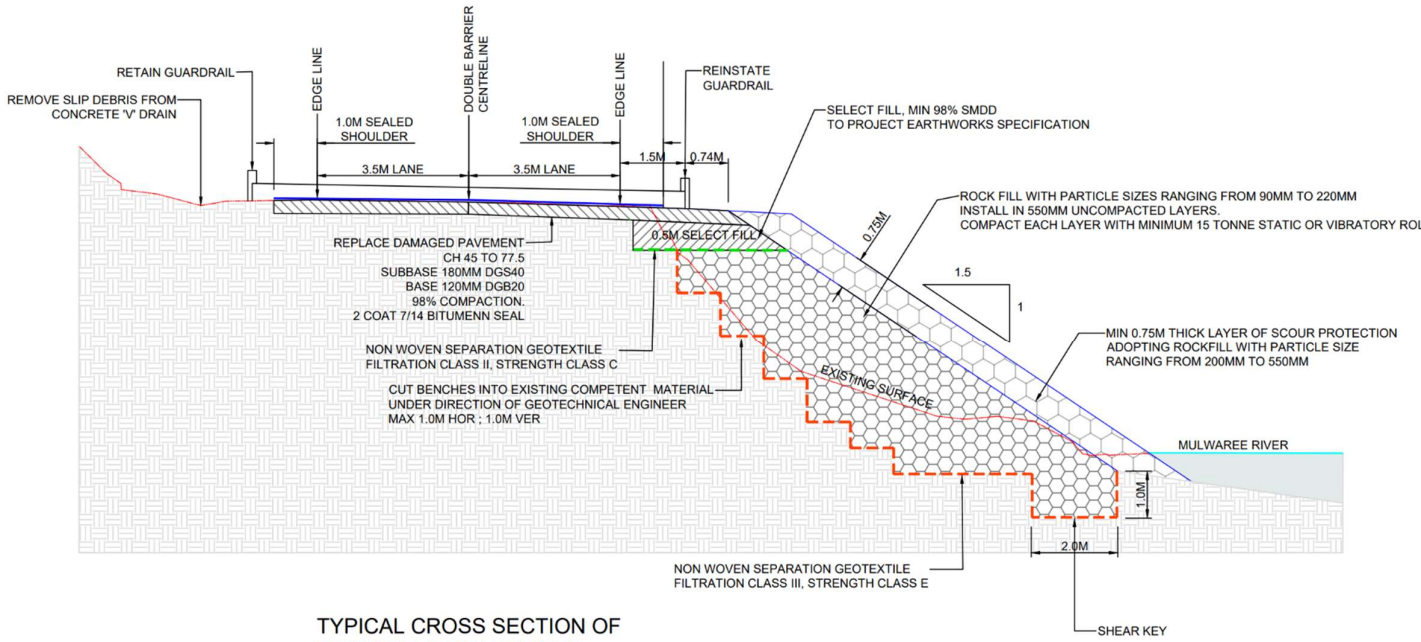


FIGURE 6: CONCEPT DESIGN FOR PROJECT (CLIENT SUPPLIED)



TYPICAL CROSS SECTION OF
ROCK FILL EMBANKMENT

NOTES:

1. SITE EXTENTS APPROXIMATED FROM OBSERVED SITE FEATURES. TO BE CONFIRED ON SITE BY PRINCIPAL GEOTECHNICAL ENGINEER DURING SITE SETOUT WORKS.
2. ALIGNMENT TO BE BASED ON SITE LIDAR DATA AND CIVIL DESIGN.
3. IT IS RECOMMENDED THAT THE SCOUR PROTECTION BUTTRESS BE CONSTRUCTED AT A SLOPE NO STEEPER THAN 1.5 H : 1.0 V.
4. ALL SPRAY SEAL DESIGNS SHALL BE UNDERTAKEN USING THE TfNSW 395K FORM, TO BE REVIEWED AND ENDORSED BY THE PRINCIPAL.
5. FOUNDATION AREAS MUST BE STRIPPED OF ALL TOPSOIL, VEGETATION, AND UNSUITABLE MATERIAL.
6. THE WORKS MUST BE CONSTRUCTED AND MAINTAINED IN GENERAL ACCORDANCE WITH TfNSW R44 AND AUS-SPEC#1 DEVELOPEMENT SPECIFICATION SERIES CONSTRUCTION
7. CONTRACTOR TO REINSATE ROAD FURNITURE FOLLOWING COMPLETION OF PAVEMENT WORKS, INCLUDING LINEMARKING, SIGNAGE, GUIDEPOSTS AND BARRIERS.
8. ALL DESIGN DRAWINGS TO BE READ IN CONJUNCTION WITH GEOTECNICAL DESIGN REPORT AND HYDROLOGICAL AND HYDRAULIC REPORT, WITH THE MORE ONEROUS REQUIREMENTS TO BE ADOPTED, UNLESS OTHERWISE AGREED WITH THE PRINCIPAL.

REVISION	DATE	DESCRIPTION
D	JAN 25	REVISED DESIGN
C	JAN 25	DETAIL ROCK FILL DESIGN
B	NOV 24	PRELIMINARY ROCK FILL DESIGN
A	SEP 24	PRELIMINARY SITE DETAILS

HIGHLANDS DESIGN & DRAFTING
S P FOWLER
ABN 38 736 450 419
PHONE 0412 626 126
EMAIL fowlers202@gmail.com
HD &D

DRAWING TYPICAL ROCK FILL CROSS SECTION	REVISION D
PROJECT LANDSLIP REMEDIATION BUNGENDORE RD, TARAGO GOULBURN MULWAREE COUNCIL	Dwg No GMC 04.24
	SHEET 3 OF 15

3. Consultation

3.1. Community

Bungendore Road is an important road for connectivity within the region, connecting a number of residences through Tarago and Bungendore, New South Wales (NSW). However, it is currently expected that minimal community consultation will be required. The current plans allow for one lane of the road to remain open during the completion of works as well as majority of the project area being located within a road reserve.

The area planned for the site compound similarly occurs within the road reserve. Some works will be undertaken with the Mulwaree River corridor to establish a more secure river bank that is less susceptible to flooding events and subsequent erosion. However, this is unlikely to require community consultation.

Council and their contractors also intend to produce a Community and Stakeholder Engagement Plan as a part of the Construction Environmental Management Plan (CEMP).

3.2. Government agencies

3.2.1. Transport for NSW

Transport for NSW (TfNSW) is a key stakeholder in the project. It is suggested that Council contact TfNSW to keep them informed on the concept design and progress.

3.2.2. NSW Department of Primary Industries (DPI) Fisheries

Council has will contact NSW Department of Primary Industries (DPI) Fisheries on possible issues regarding works within and in close proximity to Mulwaree River, mapped as Key Fish Habitat (KFH) (see **Section 4.2.3**).

Consultation with NSW DPI Fisheries will continue throughout the design and construction process, including applying for a Part 7 Fisheries Permit for works associated with the proposal. Conditions of the permit/s are to be incorporated into the contractor's CEMP.

3.3. SEPP notification and consultation

Chapter 2, *Transport and Infrastructure (SEPP) of the State Environmental Planning Policy 2021*, contains provisions to consult with public authorities prior to the commencement of certain types of development if certain circumstances apply as outlined in Part 2.2, Division 1. An assessment of compliance with the consultation requirements of the Transport and Infrastructure SEPP is presented in **Table 2**.

TABLE 2: ISEPP NOTIFICATION AND CONSULTATION

ISEPP Clause	Substance	Consultation Required
2.10	Impacts on council-related infrastructure or services (1) Consultation is required if the public authority is of the opinion that the development: (a) will have a substantial impact on stormwater management services provided by a council, or (b) is likely to generate traffic to an extent that will strain the capacity of the road system in a local government area, or (c) involves connection to, and a substantial impact on the capacity of, any part of a sewerage system owned by a council, or (d) involves connection to, and use of a substantial volume of water from, any part of a water supply system owned by a council, or (e) involves the installation of a temporary structure on, or the enclosing of, a public place that is under a council's management or control that is likely to cause a disruption to pedestrian or vehicular traffic that is not minor or inconsequential, or (f) involves excavation that is not minor or inconsequential of the surface of, or a footpath adjacent to, a road for which a council is the roads authority under the *Roads Act 1993* (if the public authority that is carrying out the development, or on whose behalf it is being carried out, is not responsible for the maintenance of the road or footpath).	**Yes**, and consultation has occurred or will occur as Council is the proponent.
2.11	Impacts on local heritage (1) Consultation is required if the development: (a) is likely to affect the heritage significance of a local heritage item, or of a heritage conservation area, which is not also a state heritage item, in a way that is more than minor or inconsequential, and (b) is development that this Chapter provides may be carried out without consent.	No. The project area includes one recorded Aboriginal heritage item. However, the item has been collected and no new items observed during inspection by a qualified heritage consultant (**Section 5.5**).
2.12	Impacts on flood liable land (1) (Repealed) (2) A public authority, or a person acting on behalf of a public authority, must not carry out, on flood liable land, development that this Chapter provides may be carried out without consent and that will change flood patterns other than to a minor extent unless the authority or person has– (a) given written notice of the intention to carry out the development (together with a scope of works) to the council for the area in which the land is located, and (b) taken into consideration any response to the notice that is received from the council within 21 days after the notice is given.	Not applicable. The project area is not mapped as flood liable land by NSW Environmental planning instruments (EPI).
2.15	Consultation with public authorities other than councils (2) Consultation is required if the development is: (a) development adjacent to land reserved under the *National Parks and Wildlife Act 1974* or to land acquired under Part 11 of that Act–the Office of Environment and Heritage, (b) development on land in Zone C1 National Parks and Nature Reserves or in a land use zone that is equivalent to that zone, other than land reserved under the *National Parks and Wildlife Act 1974*– the Office of Environment and Heritage, (c) development comprising a fixed or floating structure in or over navigable waters– TfNSW, (d) development that may increase the amount of artificial light in the night sky and that is on land within the dark sky region as identified on the dark sky region map– the Director of the Observatory, (e) development on defence communications facility buffer land within the meaning of clause 5.15 of the Standard Instrument–the Secretary of the Commonwealth Department of Defence, (f) development on land in a mine subsidence district within the meaning of the *Mine Subsidence Compensation Act 1961*–the Mine Subsidence Board. (g) development on, or reasonably likely to have an impact on, a part of the Willandra Lakes Region World Heritage Property– the World Heritage Advisory Committee and Heritage NSW, (h) development within a Western City operational area specified in the *Western Parkland City Authority Act 2018*, Schedule 2 with an estimated development cost of $30 million or more–the Western Parkland City Authority constituted under that Act.	No.

4. Statutory and planning framework

4.1. Commonwealth legislation

4.1.1. Commonwealth Environment Protection & Biodiversity Conservation Act 1999

Key provisions

The EPBC Act provides a framework to protect Matters of National Environmental Significance (MNES), including Commonwealth-listed threatened species and threatened ecological communities (TECs)[5]. Any actions that will or are likely to have a significant impact on MNES are likely to be considered a Controlled Action under the EPBC Act and require approval from the Minister for the Environment.

Relevance to this project

Desktop research using the Commonwealth Protected Matters Search Tool (the PMST) on 9 January 2025 for a 10 km buffer identified several potential MNES on or near to the project site[6]. The project's expected impacts were assessed in accordance with the Significant Impact Guidelines 1.1[7]. The assessment found that a significant impact is not likely to result (**Table 3**) and therefore a referral to the Department that administers the EPBC Act is not required.

TABLE 3: OVERVIEW OF MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

MNES	Impacts	More information
World Heritage Properties	None	None, the project site does not contain a World Heritage Property nor is it sited within 10 km of a World Heritage Property.
National Heritage Places	None	None, the project site does not contain a National Heritage Place nor is it sited within 10 km of a National Heritage Place.
Wetlands of international importance (RAMSAR wetlands)	None	The project site does not contain, nor is within 10 km of a RAMSAR wetland. The nearest RAMSAR wetlands are the Towra Nature Reserve near Sydney and the Ginini Flats Wetland Complex to the southwest of Canberra.
Nationally threatened ecological communities and species	**Potential, not likely significant.**	EPBC PMST reports flag a total of two TECs and 54 threatened species listed by the Commonwealth are known or may occur within 10 km of the project area. A likelihood of occurrence assessment was undertaken with the following results for Commonwealth listed species (see **Appendix A8**). **TECs:** The project area does not contain any Commonwealth-listed TEC (**Appendix A7.1**). **Threatened Flora:** No threatened flora species were identified within the project area. The following Commonwealth listed flora species have been assessed as having the potential or are likely to occur within the project area: • Dwarf Kerrawang (*Commersonia prostrata*), • Creeping Hop-bush (*Dodonaea procumbens*), • Black Gum (*Eucalyptus aggregata*), and • Hoary Sunray (*Leucochrysum albicans* subsp. *tricolor*). The project is considered unlikely to have a significant impact on any of the abovementioned nationally threatened flora species. This is

[5] Access Federal Register of Legislation, Environment Protection and Biodiversity Conservation Act 1999 Commonwealth of Australia. (2023). (Accessed: 06/08/2024).
[6] Desktop research on Protected Matters Search Tool. Commonwealth of Australia, Department of Climate Change, Energy, the Environment and Water. (2024). (Accessed: 06/08/2024).
[7] Access Matters of National Environmental Significance, Significant Impact Guideline 1.1. Commonwealth of Australia, Department of Environment. (2013). (Accessed: 06/08/2024).

MNES	Impacts	More information
		predominantly due to no individuals being identified within the project area during field surveys, disturbed or degraded habitat available and small area of potential habitat relative to the surrounding landscape. Each species is discussed in relation to conditions present in the project area within **Appendix A7.2** and **A8.1**. **Threatened fauna:** The following ten Commonwealth-listed threatened fauna species were assessed as having the potential to, or are likely to utilise habitat within the project area: • Southern Whiteface (*Aphelocephala leucopsis*), • Australasian Bittern (*Botaurus poiciloptilus*), • Sharp-tailed Sandpiper (*Calidris acuminata*), • Curlew Sandpiper (*C. ferruginea*), • Gang-gang Cockatoo (*Callocephalon fimbriatum*), • Latham's Snipe (*Gallinago hardwickii*), • White-throated Needletail (*Hirundapus caudacutus*), • Diamond Firetail (*Stagonopleura guttata*), • Common Greenshank (*Tringa nebularia*), and • Green and Golden Bell Frog (*Litoria aurea*). The proposed works are not likely to have a significant impact on these species as the project will only require the removal or otherwise impact a small area of habitat relative to the surrounding landscape. Furthermore, mitigation measures discussed in **Section 6** will be employed to minimise potential impacts, with native remediation of the Mulwaree River made a priority.
Migratory species	**Potential, not likely significant.**	A total of 15 listed migratory species are known or likely to occur within 10 km of the project area. The following have the potential or are likely to utilise the project area: • White-throated Needletail (*Hirundapus caudacutus*), • Sharp-tailed Sandpiper (*Calidris acuminata*), • Curlew Sandpiper (*Calidris ferruginea*), • Pectoral Sandpiper (*C. melanotos*), • Red-necked Stint (*C. ruficollis*), • Latham's Snipe (*Gallinago hardwickii*), • Little Curlew (*Numenius minutus*), and • Common Greenshank (*Tringa nebularia*). The proposed works are not likely to have a significant impact on any listed migratory species as it is not likely to: • substantially modify (including by fragmenting, altering fire regimes, altering nutrient or hydrological cycles), destroy or isolate an area of important habitat, • result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species, or • seriously disrupt the lifecycle (breeding, feeding, migration or nesting behaviour) of an ecologically significant proportion of the population of a migratory species.
Commonwealth marine areas	None	None, the project area is not near and does not drain into any Commonwealth marine areas.
Great Barrier Reef Marine Park	None	None, the project area is not near and does not drain into the Great Barrier Reef Marine Park.
Nuclear actions including uranium mining	None	None, the project does not involve any nuclear actions.
A water resource, in relation to coal seam gas development/ large coal mining development	None	None, the proposed works do not involve water usage for any form of coal development.

4.2. NSW legislation

4.2.1. NSW Biodiversity Conservation Act 2016

Key provisions[8]

The BC Act aims to maintain a healthy, productive, and resilient environment for the greatest well-being of the community, now and into the future, consistent with the principles of ecologically sustainable development. Among other things, it identifies all the species and ecological communities that are listed as threatened or otherwise protected in NSW.

Under the BC Act, proponents of Part 5 activities must apply the 5-part Test of Significance under s 7.3 to assess whether the proposed activity is likely to significantly affect threatened species, ecological communities, their habitats, a declared Area of Outstanding Biodiversity Value (AOBV) or key threatening process (KTP). If the activity is likely to have a significant impact, or will be carried out in an AOBV, the proponent must either:

- undertake a Biodiversity Development Assessment Report (BDAR) and enter into the NSW Biodiversity Offsets Scheme and meet biodiversity offset credit obligations, or
- prepare a Species Impact Statement (SIS) that meets the requirements of clause 7.6 of the *BC Regulation 2017* and refer the project to the Environment Agency Head for approval[9].

Note: The environmental impact of activities that do not have a significant impact on threatened species must still be assessed under s 5.5 of the EP&A Act.

Relevance to this project

Desktop research has been conducted to identify all the TECs and threatened/migratory species that are known, are likely, or may occur in, or within 10 km of the project site.

The likelihood of a particular TEC or species occurring on site has then been assessed considering:

- available scientific records,
- habitat present on site, and
- the known characteristics/preferences of individual TECs and species.

For more information about the assessment of likelihood of TEC/species occurrence within the project area and immediate surrounds, refer to **Appendix A7**.

The project's impact on species that are likely to occur on or within 1.5 km of the project site has been assessed using the Test of Significance set out in **Appendix A8**.

Based on the process described above, it has been assessed that project is unlikely to:

- have an adverse impact on the lifecycle of a threatened species, such that a viable local population of the species is likely to be placed at risk of extinction (clause A),
- have an adverse impact on the extent or modify the composition of a TEC such that its local occurrence is likely to be placed at risk of extinction (clause B),

[8] This content draws heavily on information accessed from the NSW register of legislation: Biodiversity Conservation Act 2016. The State of New South Wales. (2024). (Accessed: 06/08/2024).

[9] Biodiversity Conservation Regulation 2017. The State of New South Wales. (2024). (Accessed: 06/08/2024).

- result in the removal, modification, fragmentation, or isolation of areas of habitat, especially habitat that is important to the long-term survival of the species or TEC in the locality (clause C),
- have an adverse impact on any declared Area of Outstanding Biodiversity Value, of which there are only four in NSW (clause D),
- contribute to or otherwise increase the impact of a Key Threatening Process (clause E), or

Furthermore, the project area covers a section of the Mulwaree River and its immediate surrounds which are mapped as "Biodiversity Riparian Land" on the NSW Biodiversity Values Map (refer to **Figure 7,** and as discussed in **Section 5.3.1**). Impact of the proposed activity to this mapped biodiversity value is justified in **Section 5.3.2**.

4.2.2. NSW Biosecurity Act 2015

Key provisions[10]

The *Biosecurity Act 2015* aims to manage biosecurity risks from animal and plant pests and diseases, weeds, and contaminants by preventing their entry into NSW, eradicating them quickly wherever practical, and managing their impact if not.

Relevance to this project

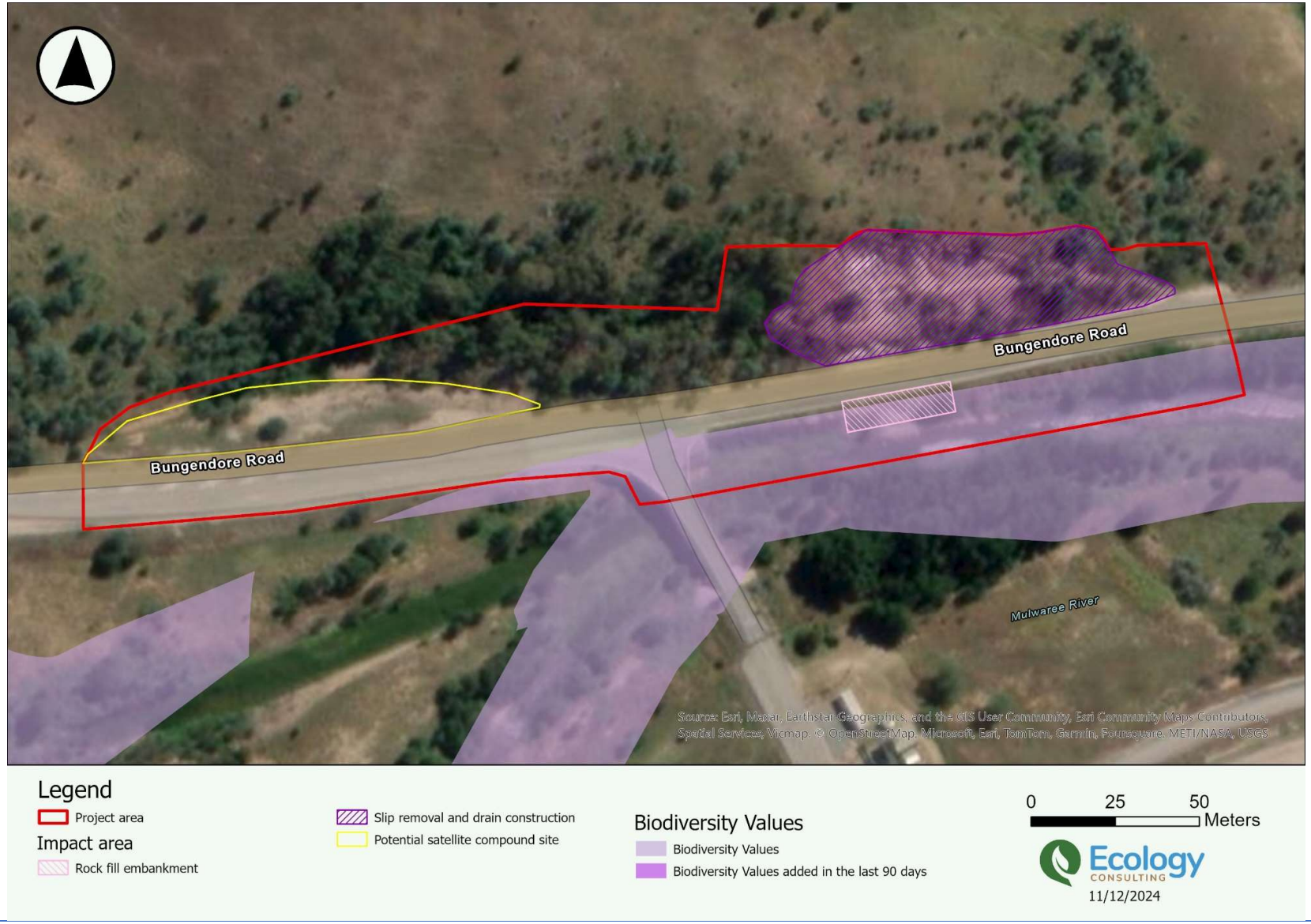
Among other things, the *Biosecurity Act 2015* requires landholders including Councils to eliminate (or if this is not possible, control) pest, weed and pathogen species.

In NSW, all plants are regulated with a general biosecurity duty to prevent, eliminate, or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated, or minimised, so far as is reasonably practicable. Additional control measures are in place for 'regional priority weeds', which should not be sold or moved in certain Local Land Service regions of NSW.

Throughout the project area, a total of seven High Threat Exotic (HTE) and three Weeds of National Significance (WoNS) species were observed occurring which must be managed prior to any clearing of vegetation. These are listed in **Appendix A3.1**.

[10] This content draws heavily on information accessed from the NSW register of legislation: Biosecurity Act 2015. State of New South Wales. (2024). (Accessed: 06/08/2024).

FIGURE 7: BIODIVERSITY VALUES MAP FOR PROJECT AREA



4.2.3. NSW Fisheries Management Act 1994

KEY PROVISIONS[11]

The *Fisheries Management Act 1994* (FM Act) provides for the protection, conservation, and recovery of threatened species, populations and ecological communities of fish and marine vegetation and fish habitats, as well as promoting the development and sharing of fishery resources in NSW. A permit or consultation under the FM Act is required for the following activities:

- harm to marine vegetation such as mangroves, saltmarsh, seagrass, and microalgae (s 205), and
- dredging of a creek bed, land reclamation, excavation of bed or bank or obstructing fish passage in an area mapped as Key Fish Habitat (s 199, s 200, s 218, s 219).

The FM Act states objectives of threatened species conservation under Part 7A, and lists threatened species, populations, and ecological communities under Schedule 4, 4A and 5. Schedule 6 lists key threatening processes for species, populations, and ecological communities in NSW waters.

Relevance to this project

The Mulwaree River is mapped as KFH through the Fisheries NSW Spatial Data Portal (**Figure 8**). The project will involve works within a KFH mapped area as the rock fill embankment will be installed in the northern bank of the Mulwaree River from the edge of the road to below the surface of the Mulwaree River (**Figure 6**).

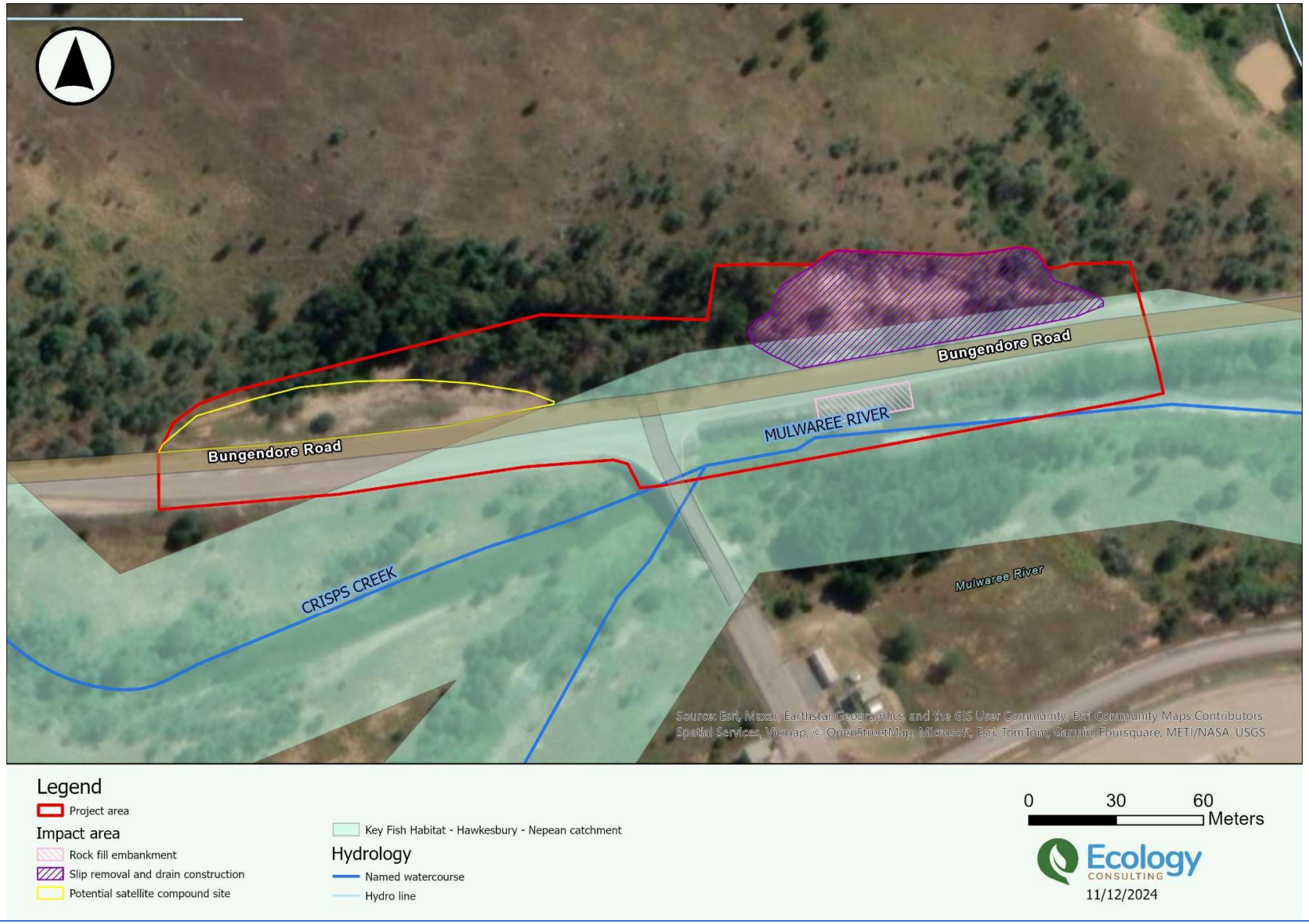
Council will seek advice and apply for a Part 7 permit for the construction of the rock fill embankment on the banks of the Mulwaree River. This will contain conditions of approval and will be incorporated into the contractor's CEMP.

Despite Mulwaree River being mapped as KFH, the waterway registers on NSW DPI Fisheries Freshwater Fish Community Status maps the river as being "Very Poor" in community status. The likelihood of occurrence assessment revealed that no threatened fish species listed under the FM Act are considered likely to be present within the site or immediately downstream (**Figure 8**). This is predominately based on their mapped distribution within the Species Profile and Threats Database and Fisheries NSW Spatial Data Portal. Furthermore, no threatened populations or ecological communities listed under the FM Act are considered likely to be present within the site or immediately downstream.

For more information about aquatic biodiversity and habitat assessment refer to **Appendix A2.5**.

[11]This content draws heavily on information accessed from the NSW register of legislation Fisheries Management Act 1994. State of New South Wales. (2024). (Accessed: 06/08/2024).

FIGURE 8: KEY FISH HABITAT PROJECT AREA



4.2.4. NSW Heritage Act 1977

Key provisions[12]

The *Heritage Act 1977* sets out the process by which items or places of State and Local Heritage Significance are protected and managed. Items are considered significant in relation to the historical, scientific, cultural, social, archaeological, architectural, natural, or aesthetic value of the item.

Approval is required when making changes to a heritage place listed on the State Heritage Register or covered by an interim heritage order, or when excavating any land in NSW where the excavations might disturb an archaeological relic.

If the works are only minor in nature and will have minimal impact on the heritage significance of the place, they may be exempted from the requirement to submit a section 60 application for approval or section 140 application for a permit.

Relevance to this project

Searches of relevant registers found that the proposed activities do not involve impacts to an item or place listed on the NSW State Heritage Register or the subject of an interim heritage order or listing and are therefore not a controlled activity. Approval of works on the site are therefore not required under Part 4 of the Heritage Act. For more information about the heritage of the site refer to **Section 5.4** and **Section 5.5**.

4.2.5. NSW Local Land Services Act 2013

Key provisions[13]

The NSW *Local Land Services Act 2013* (LLS Act) establishes a framework for the management of natural resources including native vegetation and private native forestry. There are two broad categories of land under the LLS Act:

- Category 1 (Exempt) land, and
- Category 2 (Regulated, Vulnerable or Sensitive) land.

Approval for clearing native vegetation is not required under the LLS Act if the activity is carried out by or on behalf of a determining authority within the meaning of Part 5 of the EP&A Act.

Relevance to this project

The clearing of native vegetation involved in this project is minimal and approval of the work by LLS is not required as it is being conducted under Part 5 of the EP&A Act.

[12] This content draws heavily on information accessed from the NSW register of legislation: Heritage Act 1977. State of New South Wales. (2024). (Accessed: 07/08/2024).
[13] This content draws heavily on information accessed from the NSW register of legislation: Local Land Services Act 2013. State of New South Wales (2024). (Accessed: 07/08/2024).

4.2.6. NSW National Parks and Wildlife Act 1974

Key provisions[14]

The NSW *National Parks and Wildlife Act 1974* (NP&W Act) aims to protect and control the natural and cultural heritage of NSW. Two key issues under the Act include activities on or near National Parks, Nature Reserves or Special Conservation Areas (NPWS land), and Aboriginal places and objects.

In the context of NPWS land, there is a requirement to engage with NSW NPWS planning decisions when the following may impact NPWS land:

- erosion or the movement of sediment cause by works,
- stormwater runoff attributed to works,
- wastewater impacts due to works,
- pests, weeds and edge effects attributed to the works,
- fire and asset protection measures,
- boundary encroachment or access through NPWS land,
- reduction of amenity,
- threat to ecological connectivity and groundwater dependent ecosystems,
- cultural heritage, and
- the access to parks[15].

In the context of Aboriginal heritage, a desktop assessment is required under NSW legislation[16]. Depending on the level of risk, further assessment may be required to identify and mitigate potential impacts to Aboriginal places or objects such as scar trees, including appropriate consultation with Aboriginal representatives and stakeholders.

If impacts to Aboriginal objects or places cannot be avoided, an Aboriginal Heritage Impact Permit must be obtained under Section 90 of the NP&W Act.

Relevance to this project

There is no requirement to consult NPWS regarding this project. The project site does not adjoin any NPWS land. The nearest NPWS land is as follows:

- Nadgigomar Nature Reserve, which is ~ 18 km southeast of the site,
- Scott Nature Reserve, which is ~ 21 km south of the site,
- Nadgigomar Nature Reserve, which is ~22 km southeast of the site, and
- Mcleods Creek Nature Reserve, which is ~ 32 km west of the site.

Given the distance from the proposed work to the nearest NPWS land, the impact is minimal.

[14] This content draws heavily on information accessed from the NSW register of legislation: National Parks and Wildlife Act 1974 State of New South Wales. (2024). (Accessed: 07/08/2024).
[15] *Guidelines for consent and planning authorities on Developments adjacent to NPWS lands.* State of NSW and Department of Planning, Industry and Environment. (2020).
[16] *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW.* State of New South Wales and the Department of Environment, Climate Change and Water NSW. (2010).

A Due Diligence assessment was undertaken by qualified heritage consultant Past Traces Pty Ltd to identify and mitigate potential adverse impacts on Aboriginal places and objects (**Attachment A**). The results of which are discussed in **Section 5.4.1**.

4.2.7. NSW Protection of the Environment Operations Act 1997

Key provisions[17]

The NSW *Protection of the Environment Operations Act 1997* (POEO Act) is the key environmental protection and pollution statute. It is administered by the NSW Environment Protection Authority (EPA) and establishes a single licensing arrangement relating to air pollution, water pollution, noise pollution and waste management. The POEO Act contains a list of activities that require a licence, including any work potentially resulting in pollution.

Relevance to this project

A number of measures are to be put in place to avoid, minimise, and mitigate the risk of pollution and waste (**Section 6**). The expected impacts of the project will be managed through mitigation measures outlined in the CEMP and the risk of pollution and waste minimised. A licence under the POEO Act is therefore not required.

4.2.8. NSW Roads Act 1993[18]

Key provisions

The *Roads Act 1993* regulates the carrying out of various activities on public roads. Roads and Maritime has jurisdiction over major roads, while local government has jurisdiction over minor roads, and the Land and Property Management Authority over Crown roads. Under s 138, consent from the appropriate road authority must be received if there is a need to:

- erect a structure or carry out a work in, on or over a public road,
- dig up or disturb the surface of a public road,
- remove or interfere with a structure, work, or tree on a public road,
- pump water into a public road from any land adjoining the road, or
- connect a road (whether public or private) to a classified road, otherwise than with the consent of the appropriate road’s authority.

Among other things, it provides that (s 88):

> *A roads authority may, despite any other Act or law to the contrary, remove or lop any tree or other vegetation that is on or overhanging a public road if, in its opinion, it is necessary to do so for the purpose of carrying out road work or removing a traffic hazard.*

[17] This content draws heavily on information accessed from the NSW register of legislation: Protection of the Environment Operations Act 1997. State of New South Wales. (2024). (Accessed: 07/08/2024).
[18] This content draws heavily on information accessed from the NSW register of legislation: Roads Act 1993. State of New South Wales. (2024). (Accessed: 07/08/2024).

Relevance to this project

Council has jurisdiction over Bungendore Road and therefore does not require consent to undertake works. Efforts have been made to avoid, minimise, and mitigate the project's environmental impacts, refer to **Section 6** for further details.

4.2.9. NSW Rural Fires Act 1997

Key provisions[19]

The NSW *Rural Fires Act 1997* (RF Act) provides a statutory framework for the prevention, mitigation, and suppression of the threat of bushfire within NSW.

Part 4 of the RF Act contains provisions which relate to bushfire prevention and bushfire hazards reduction. Amongst other things, the RF Act requires approval (s.100B) for certain types of developments in areas mapped as bushfire prone land. The RF Act establishes the NSW Rural Fire Service (RFS) along with *Planning for Bush Fire Protection 2019* (PBP)[20] and provides the framework for development located on bushfire-prone land in NSW. The PBP 2019 advises that within a bushfire-prone area, road systems need to:

- provide firefighters with access to structures, for efficient use of firefighting resources,
- provide evacuation routes for firefighters and the public, and
- provide access to areas of bush fire hazard for firefighting and hazard mitigation purposes.

Additionally, access roads and any causeways must have the capacity to carry fully loaded firefighting vehicles (up to 23 tonnes), and causeways are to clearly indicate their load rating.

Relevance to this project

The project is not a development, so no formal approval is required under the RF Act. The project area is situated within a large area mapped by NSW RFS for category 3 (grasslands) bushfire-prone land, surrounded by patches of category 1 (forest, woodlands) bushfire-prone land. The proposal for activities within Mulwaree River and Bungendore Road will reduce traffic flow over the course of the works due to the requirement to close a single lane of traffic, with traffic control present throughout the duration of the works. The closure of a single lane is considered unlikely to limit the ability of residents and firefighters to access the surrounding landscape in the case of an emergency.

4.2.10. NSW Water Management Act 2000 (WM act)

Key provisions[21]

The NSW *Water Management Act 2000* (WM Act) aims to manage NSW water in a sustainable and integrated manner that will benefit today's generations without compromising future generations' ability to meet their needs.

[19]This content draws heavily on information accessed from the NSW register of legislation: Rural Fires Act 1997. State of New South Wales. (2024). (Accessed: 07/08/2024).
[20] *Planning For Bush Fire Protection*. State of New South Wales through the NSW Rural Fire Service. (2019).
[21] This content draws heavily on information accessed from the NSW register of legislation: Water Management Act 2000. State of New South Wales. (2024). (Accessed: 07/08/2024).

Section 91E of the Act establishes an approval regime for controlled activities within waterfront land, but clause 41 of the *Water Management (General) Regulation 2018* provides an exemption for public authorities in relation to all controlled activities on waterfront land[22].

Relevance to this project

The project is being undertaken by a public authority, so no approval is required under the WM Act. However, as the proposed activity involves works within a waterway, water flow and quality issues have been considered as part of this REF (**Section 5.2**).

4.3. Planning legislation and framework

4.3.1. Environmental Planning and Assessment Act 1979

Key provisions[23]

The EP&A Act sets out the major concepts and principles for planning and development in NSW, including special rules for road and/or road infrastructure works carried out by or on behalf of a public authority (i.e., Part 5 activities).

The Act allows public authorities such as Councils to not only propose but also determine (approve) Part 5 activities without needing to seek additional consents, subject to certain conditions. Key requirements are that the works must be subject to an environmental assessment that considers:

- all matters affecting or relating to the environment, to the fullest extent possible (s 5.5 of the EP&A Act), and
- the 18 factors listed in section 171 of *the EP&A Regulation 2021*[24].

The assessment of all matters affecting or relating to the environment is usually taken to mean that all current planning laws and policies must be considered. These may include not only instruments made under the EP&A Act, but also many other laws and policies as described throughout **Section 4**.

It is usual to document the assessment process in the form of a REF, to provide assurance to Council and other decision makers that all relevant laws and policies have been considered.

Relevance to this project

The project involves works carried out by or on behalf of a public authority, Goulburn Mulwaree Council, and are Part 5 activities under the EP&A Act.

This REF has been prepared to assist Council in demonstrating compliance with Part 5 of the Act and includes a clause-by-clause assessment against s 171 of the EP&A Regulation 2021. That assessment suggests that the project is likely to have a neutral impact under the EP&A Regulation (see **Appendix B**).

4.4. State Environmental Planning Policies

Several planning instruments have been made under the EP&A Act regarding specific aspects of planning at the State or regional level. State Environmental Planning Policy (SEPPs) are environmental planning

[22] Water Management (General) Regulation 2018. State of New South Wales. (2024). (Accessed: 07/08/2024).
[23] This content draws heavily on information accessed from the NSW register of legislation: Environmental Planning and Assessment Act 1979. State of New South Wales. (2024). (Accessed: 07/08/2024).
[24] Environmental Planning and Assessment Regulation 2021. State of New South Wales. (2024). (Accessed: 07/08/2024).

instruments made under the EP&A Act that outline policy objectives relevant to planning at the State or regional level.

On 2 December 2021, the Minister for Planning and Public Spaces announced 9 key principles and themes for the NSW planning system[25]. In effect from 1 March 2022, 45 former SEPPs were consolidated into 11 new SEPPs based on the theme-based project areas. No policy changes were made.

4.4.1. State Environmental Planning Policy (Biodiversity and Conservation) 2021[26]

The *State Environmental Planning Policy (Biodiversity and Conservation) 2021* (Biodiversity and Conservation SEPP) protect the biodiversity values of trees, vegetation and other amenity in non-rural areas, controls foreshores and waterways areas and provides provisions for Koala habitat protection.

Several chapters within the Biodiversity and Conservation SEPP do not apply to land within and/or adjoining the two sites. Those chapters with obvious relevance to this REF are detailed below.

Chapter 2 – Vegetation in Non-Rural Areas

Key provisions

This chapter aims to protect the biodiversity value of trees and other vegetation in non-rural areas, which is defined as

- land in nominated Local Government Areas (not including Goulburn Mulwaree Council)
- land zoned for certain uses including but not limited to RU5, R1– R5, B1– B8, E1–E5, IN1– IN4, MU1, SP1– SP5, RE1 & RE2 and C2 – C4.

Under s 2.7 the SEPP specifies that an authority to clear vegetation under the SEPP is not required if the clearing is authorised under s60(O) of the *Local Land Services Act 2013*. Section 60(O) provides an exemption for clearing required for activities under Part 5 of the EP&A Act.

Relevance to this project

The project involves activities being undertaken under Part 5 of the EP&A Act, therefore do not require consent under this SEPP.

Chapter 3 and 4 - Koala Habitat Protection 2020 and 2021

Key provisions

Koala Habitat Protection 2020 and 2021 aims to encourage the proper conservation and management of areas of natural vegetation that provide habitat for Koala (*Phascolarctos cinereus*) to ensure a permanent free-living population over their present range and reverse the current trend of Koala population decline. They specify that Councils must consider whether a development is likely to impact on potential Koala habitat or core Koala habitat.

Relevance to this project

The Koala SEPP only applies to 'development' under Part 4 EP&A Act, specifically excluding Part 5 'activities' which are primarily carried out by or on behalf of public authorities. The project is not a development under part 4 of the EP&A Act so the Koala SEPP does not apply in any form.

[25] The Minister's Planning Principles NSW Department of Planning, Industry and Environment. (2021).
[26] This content draws heavily on information accessed from the NSW register of legislation: SEPP (Biodiversity and Conservation) 2021. State of New South Wales. (2024). (Accessed: 07/08/2024).

Nevertheless, as Koala's are listed as threatened species, an assessment of the site's impact to Koala's are included in this REF (see **Section 4.1.1**).

4.4.2. State Environmental Planning Policy (Transport and Infrastructure) 2021[27]

The *State Environmental Planning Policy (Transport and Infrastructure) 2021* (Transport and Infrastructure SEPP) aims to facilitate the effective delivery of transport and infrastructure across the state.

A number of chapters within the Transport and Infrastructure SEPP do not apply to land within and/or adjoining the project site. One chapter with obvious relevance to this REF or project is detailed below.

Chapter 2 – Infrastructure

Key provisions

Chapter 2 facilitates the delivery of infrastructure across NSW by identifying what types of infrastructure require consent. Part 2.3 Division 17 specifies that certain works for roads and road infrastructure facilities carried out by or on behalf of public authorities do not require consent or are otherwise exempt from this requirement. They include development for:

- development for the purpose of a road or road infrastructure facilities that are carried out subject to certain rules (s 2.109 to s 2.111), and
- ancillary works such as the installation, maintenance, reconstruction, and replacement of ancillary works such as safety barriers, signage, erosion control, landscaping, culverts, and more (s 2.113).

Part 2.2 Division 1 of the Chapter 2 also specifies situations in which developers (including public authorities such as Councils) must consult or do not need to consult with certain bodies. These consultation requirements apply even if Council does not require consent for works or the works are exempt.

Relevance to this project

The project does not appear to require consent under s 2.109 and s 2.113 of the Transport and Infrastructure SEPP but is still subject to its consultation requirements. These requirements and Council compliance with them have been in **Table 2**.

4.4.3. State Environmental Planning Policy (Resilience and Hazards) 2021[28]

The *State Environmental Planning Policy (Resilience and Hazards) 2021* (Resilience and Hazards SEPP) aims to provide a statewide planning approach to development and management of hazardous areas. A couple of chapters within the Resilience and Hazards SEPP do not apply to land within and/or adjoining the two sites. One chapter with obvious relevance to this REF or project is detailed below.

Chapter 4 – Remediation of land

Key provisions

Chapter 4 of Resilience and Hazards SEPP aims to establish a statewide planning approach to remediate contaminated land, primarily to mitigate risks to human health and environmental well-being or any

[27] This content draws heavily on information accessed from the NSW register of legislation: SEPP (Transport and Infrastructure) 2021. State of New South Wales. (2024). (Accessed: 07/08/2024).
[28] This content draws heavily on information accessed from the NSW register of legislation: SEPP (Resilience and Hazards) 2021. State of New South Wales. (2024). (Accessed: 07/08/2024).

other aspect of the environment. Clause 4.6 of Chapter 4 also specifies that when remediation is necessary for the purpose of development, the land must be adequately remediated before it is used for that purpose.

Relevance to this project

Chapter 4 could apply to the project site if an unexpected find of contaminated soil is identified during works, refer to **Section 6.**

4.5. Other relevant NSW legislation

No other NSW legislation relevant to environmental aspects of this project has been identified.

4.6. Council laws and plans

4.6.1. Goulburn Mulwaree Local Environmental Plan 2009 (GM LEP) [29]

Part 2 Permitted and prohibited development

Under the *Goulburn Mulwaree Local Environmental Plan 2009* (GM LEP), the land adjoining and serviced by the project area is zoned rural landscape (RU2) and heavy industrial (E5). The development of roads is permitted without consent in these zones.

Part 5 Miscellaneous provisions

Under the various provisions of this Part, s 5.22 applies to species flood considerations, stating that development consent must not be granted unless the following consideration has been applied to the development:

> *(a) will it affect the safe occupation and efficient evacuation of people in the event of a flood,*
>
> *(b) incorporates appropriate measures to manage risk to life in the event of a flood, and*
>
> *(c) will it adversely affect the environment in the event of a flood.*

This clause applies to sensitive and hazardous development, such as caravan parks, emergency facilities, hazardous industries and hospitals. The clause further applies to developments that are not sensitive, but the consent authority considers that in the event of a flood may cause a particular risk to life or require the evacuation of people or other safety considerations.

[29] This content draws heavily on information accessed from the NSW register of legislation: Goulburn Mulwaree Local Environmental Plan 2009. State of New South Wales. (2023). (Accessed: 07/08/2024).

Relevance to this project

The application s 5.22 to the proposal, although are not a sensitive or hazardous development, in the event of a flood may cause risk to life or may require the evacuation of people or other safety considerations such as residents being isolated from services, as seen bellow in **Table 4** assessment.

TABLE 4: APPLICATION OF PART S 5.22 ON BOTH SITES

s 5.22	Assessment
(a) will it affect the safe occupation and efficient evacuation of people in the event of a flood.	The proposed activity will aim to improve the safe use to allow evacuation of people over infrastructure in minor flooding events and for the resilience of infrastructure to be maintained during major flooding events. The activity will likely have a positive effect on the safe occupation or efficient evacuation of people in the event of a flood.
(b) incorporates appropriate measures to manage risk to life in the event of a flood.	The proposed activity has incorporated multiple erosion protection measures to minimise risk to the infrastructure and surrounding banks from damage during flood events, this reduces risk of failure of infrastructure and risk of life.
(c) will it adversely affect the environment in the event of a flood.	The proposed activity has incorporated multiple erosion protection measures to minimise risk to the infrastructure and surrounding banks from damage during flood events.

Part 7 Additional local provisions

Many provisions of the GM LEP appear to be broadly consistent with Commonwealth and NSW laws on biodiversity. Within s 7.2 of the GM LEP, it states that development consent must not be granted for development on land identified as " Biodiversity" (mapped as Terrestrial Biodiversity on SEED portal[30]) unless the Council has considered the potential adverse impacts of the proposed development on any of the following:

(i) a native vegetation community,

(ii) the habitat of any threatened species, population, or ecological community,

(iii) a regionally significant species of plant, animal, or habitat,

(iv) a habitat corridor,

(v) a wetland,

(vi) the biodiversity values within a reserve, including a road reserve or a stock route.

Furthermore, development consent must not be granted unless the authority is satisfied that the development is designed to avoid potential impacts. If impacts cannot be avoided that they are minimised and that effective mitigation measures are incorporated to mitigate residual adverse impacts.

This report, which is based on an on-site field survey conducted by a qualified ecologist and detailed desktop research, serves as a reference for the Council to consider the potential impacts.

[30] The Central Resource for Sharing and Enabling Environmental Data in NSW. State of New South Wales. (2024).

Relevance to this project

The proposed activity includes works within areas that are mapped as "Environmentally Sensitive Land" on the Terrestrial Biodiversity Map, **Table 5** details the assessment of Part 7 s 7.2.

TABLE 5: APPLICATION OF PART S 7.2

s 7.2	Assessment
(i) a native vegetation community,	Impacts on a native vegetation community associated with the proposal are estimated to be minor in regard to the present vegetation within the surrounding landscape. The proposed activity will see the removal of 0.32 ha of the vegetation community PCT 3338 Goulburn Tableland Frost Hollow Grassy Woodland and 0.002 ha PCT 3744 Palerang Hills Peppermint Dry Shrub Forest. Where this vegetation occurs in the project area is primarily composed of regenerating native vegetation which has established following the past landslip events. PCT 3338 is associated with the TEC Werriwa Tablelands Cool Temperate Grassy Woodland in the South Eastern Highlands and South East Corner Bioregions (BC Act) (see **Appendix A2.2** Plant Community Type (PCT)). Its extent within the project area will be impacted through the proposed works. However, its condition and the proposed impacts are considered unlikely to significantly impact the extent of the community within the project area as well as it occurring as primarily regeneration within impacted areas.
(ii) the habitat of any threatened species, population, or ecological community,	A Test of Significance (ToS) for NSW-listed and Cwlth-listed threatened species, populations or ecological communities concludes that the proposed activity is not likely to have an adverse effect on habitat for the local threatened species and communities (see **Appendix A8** and **Section 4.1.1**). In addition, ToS for habitat modification concludes that the clearing of native vegetation associated with this proposed activity does not constitute "a sufficient proportion" of native vegetation in relation to the existing stand present across the project area and surrounding landscape.
(iii) a regionally significant species of plant, animal, or habitat,	Goulburn Mulwaree Biodiversity Strategy lists two regionally significant species: • Narrow-leaved Sally (*Eucalyptus moorei*), and • Privet-leaved Stringybark (*E. ligustrina*). Neither of the above species was observed during the on-site inspection for this report. Narrow-leaved Black Sallee grows in sandy soil in heath, sometimes on poorly drained sites or on exposed sandstone[31]. Privet-leaved Stringybark typically grows in dry sclerophyll woodland or heath environments on skeletal sandy soils on sandstone or acid granite[32]. Neither project area is situated within the soil landscape zones that offers suitable habitat for the above species; furthermore, it is not anticipated that the proposed activity will pose a significant threat to the survival of these species and their habitats.
(iv) a habitat corridor,	Habitat such as feeding trees, caves, wetlands, and roadside vegetation which enables migration, colonisation and interbreeding of species between areas are considered habitat corridors[33]. Within the project area feeding trees were identified and classed as roadside vegetation. These trees and those present directly surrounding the project area form part of a habitat corridor within the local landscape. While vegetation is present within the project area, particularly on the northern side of Bungendore Road, this vegetation is classed as regeneration and has established following past landslip events that have occurred in the approximated past 5-10 years. Habitat that directly surrounds the project area in areas unaffected by landslip events is substantially greater in maturity and as such, can be classified as feed trees of greater conservation value and resources for biodiversity. The proposed activity requires the removal of 0.32 ha of vegetation and includes an overstory containing species such as Silver Wattle, Snow Gum and Brittle Gum. Vegetation clearing and impacts are to be minimised within the riparian corridor, with rehabilitation efforts can restore the remaining areas of habitat for threatened species and enhance connectivity between the remnant vegetation within the project area and its surrounding landscape (see **Section 6**). Moreover, the removal of overstory vegetation from within the project area is to be activity re-established through planting efforts. Therefore, the proposed activity is considered unlikely to significantly impact on this habitat corridor.
(v) a wetland,	The closest wetland area to the proposed activity is Lake Bathurst ~ 6 km to the northeast, refer to **Figure 9**. There are no NSW Wetlands mapped by the NSW Department of Climate Change, Energy, the Environment and Water (DCCEEW) near the project area. Impact assessments conclude that it is unlikely that the proposed activity will have a significant impact on NSW wetlands provided that the rigorous mitigation measures outlined in **Section 6** are effectively implemented (see **Section 5.2**).

[31] Access profile of Narrow- leaved Sally. PlantNET, NSW Flora Online. (Accessed: 07/08/2024).
[32] Access profile of Privet-leaved Stringybark. PlantNET, NSW Flora Online. (Accessed: 07/08/2024).
[33] Goulburn Mulwaree Biodiversity Strategy. Eco Logical Australia Pty Ltd, prepared for Goulburn Mulwaree Council. (2007).

s 7.2	Assessment
(vi) the biodiversity values within a reserve, including a road reserve or a stock route.	Proposed activities will be occurring within a road reserved held by Council. The biodiversity values found within the project area and identified impacts of the projects include the: • removal of native riparian vegetation and habitat, • removal of minor habit features such some scattered surface rock and arboreal habitat features such as mistletoe, • minor disturbance of roadside degraded native grassland habitat, and • disturbance or otherwise degradation to the aquatic habitat or water quality within Mulwaree River. The impacts from the proposed activities are considered to be relatively small, with up to 0.32 ha of native vegetation removed within the road reserve. A focus of remediation within areas of works involve ongoing weed management for the area, and native plantings, which aim to minimise native vegetation loss, prevent erosion and combat weed invasion in the long-term (refer to **Section 6**).

FIGURE 9: NSW WETLANDS NEAR TO PROJECT AREA

5. Environmental Impact Assessment

This section of the report provides an assessment of the potential environmental impacts of the project. This chapter describes the existing characteristics, potential impacts for the following:

- landforms, geology, and soils,
- hydrology, flooding, groundwater, and water quality,
- biodiversity,
- aboriginal heritage,
- non-Aboriginal heritage,
- traffic and access,
- noise and vibration,
- air quality,
- visual amenity and landscape,
- waste and chemical management, and
- cumulative environmental impacts.

5.1. Landforms, geology, and soils

5.1.1. Existing environment

The assessment of landforms, geology and soils has been based on a review of published topographic and geologic information. A desktop search of NSW Government environmental planning information layers using the SEED Portal[34] did not identify any issues in or near the project site relating to:

- erodible soils,
- salinity, or
- erosion in or near the project site.

Desktop research via eSPADE Portal[35] revealed that the land and soil of the project area have a capacity of "Moderate to Severe Limitation" and "Very Severe Limitation" to sustain high impact land uses. However, the proposed activity does not involve changing the land use.

Mapping conducted by the NSW Department of Planning and Environment, accessed through the SEED Portal, designates certain areas as 'Not Steep' in the project area, while majority of the potential satellite compound site is classified as 'Not Steep' (**Figure 10**). A 'Steep' area is situated within the upgrade works but not within the proposed stockpile site. There should not be any additional implications for erosion within the stockpile site. The 'Steep' area occurs within the northwestern section of the upgrade works, which likely contributed to the occurrence of the landslip. The proposal intends to remediate the landslip and prevent further erosion.

The preparation of a site-specific CEMP and Erosion and Sediment Control Plan (ESCP), including installation of erosion fences is advised to prevent pollution into the Mulwaree River.

[34] The Central Resource for Sharing and Enabling Environmental Data in NSW. State of New South Wales. (2024).
[35] eSPADE 2.0. State of New South Wales. (2024).

FIGURE 10: NSW STEEP LAND (18°) MAPPING FOR PROJECT AREA

Topography

The project area is characterised by rolling to steep hills on volcanics, commonly with surface gravel. The topography and landscape features make these areas prone to seasonal waterlogging and flood hazard.

Geology[36]

The project site is located within the Lake George Complex Mitchell Landscape, characterised by Quaternary lakes and swamps as well as extensive Tertiary quartz gravel, sand and mud overlaying Silurian-Devonian gneissic granite and Silurian quartz sandstone and mudstone. No areas of geological significance (karsts, caves, crevices, or cliffs) are known or observed to be present within the project area.

Soils[37]

The project site is primarily located within the Sight Hill Soil Landscape, comprised predominately of extremely shallow to shallow well-drained Lithosols on crests and upper slopes. Shallow to moderately well-drained Shallow Earths on rocky mid-slopes. Furthermore, moderately deep and moderately well-drained Red Podzolic Soils and imperfectly drained Yellow Podzolic Soils on mid and lower slopes. The dominant soil material is yellowish massive light clay topsoil on older alluvium areas, with younger alluvial topsoils comprised of bright yellowish brown, fine sandy loam. This soil landscape makes up narrow creek flat areas and is prone to waterlogging, localised water erosion hazards and flood hazards.

Contaminated land and Acid Sulfate Soils

The project site has an extremely low probability of occurrence of Acid Sulfate Soils according to a desktop search of the CSIRO Atlas of Australian Acid Sulfate Soils and is considered unlikely to contain soils contaminated with acid sulfate[38].

A search conducted on the EPA Contaminated Land Record website for the Goulburn Mulwaree Council LGA indicated that no notices have been issued for the proposal area under the *Contaminated Land Management Act 1997*[39]. Furthermore, ecologists undertaking terrestrial survey work in and around the site in August and September 2024 reported no odours, staining, suspected asbestos-containing material, or other evidence of contaminated land.

[36] Information within this section sources Descriptions for NSW (Mitchell) Landscapes. Department of Environment & Climate Change NSW, (2002).
[37] eSPADE 2.0. State of New South Wales. (2024).
[38] Atlas of Australian Acid Sulphate Soils. v2. CSIRO. Data Collection. Fitzpatrick, Rob; Powell, Bernie; Marvanek, Steve. (2011).
[39] Access Contaminated Land – record of notices. State of New South Wales EPA. (2024). (Accessed: 12/08/2024)

5.1.2. Impact assessment

The project is not expected to result in any substantial changes to the topography of the project site. While the project site contains a moderate slope from north to south, prior earthworks for the establishment of Bungendore Road suggest that further substantial changes to the topography of the project site are unlikely but may occur on the northern side of the road as to establish slopes that are unlikely to become susceptible to future landslip events. New alignment will continue to follow the existing topography with some potential, however minor, localised levelling of the land.

The project will involve some clearing of vegetation and movement of soil, particularly for the construction works on the northern side of Bungendore Road. Soil disturbance during earthworks would result in the exposure of soils and stockpiling of materials which may erode throughout the construction period. This could result in increased sediment loads entering Mulwaree River which are located downslope of the all the proposed Bungendore Road works,

However, the plan is to avoid and minimise erosion by appropriate design and by implementing an Erosion and Sediment Control Plan (ESCP) and other safeguards/mitigation measures set out in **Section 6**. This is also important as any significant loss or movement of soil within or across the site could:

- generate dust emissions that impact on local air quality (**Section 5.7**),
- disperse into the creek and impact on local water quality (**Section 5.2**), and
- alter the site's ecological values and continued capacity to support biodiversity (**Section 5.3**).

The potential impact of contaminants such as asbestos-containing materials is unlikely due to the site's rural location and no known issues of contaminants in the locality. However, it is important that any fill that may need to be brought on site would be carefully chosen to ensure it is suitable and does not contain contaminants (see also **Section 5.8**).

An unexpected finds procedure (UFP) would also minimise potential impacts by specifying the procedures to follow if suspected contamination or acid sulphate soil is found on site. The procedure would include an immediate stop work for any and all works that may impact that material until:

- the situation has been assessed by a suitably qualified environmental consultant, and
- any mitigation measures recommended by that consultant are implemented.

5.1.3. Safeguards and mitigations

No significant or long-term impacts are likely to the directly impacted or surrounding landforms, geology or soils of the project area if the safeguards and mitigation measures outlined in **Table 6** are implemented. For the full list of recommended safeguards and mitigation measures, refer to **Section 6**.

TABLE 6: LANDFORMS, GEOLOGY AND SOILS SAFEGUARDS AND MITIGATIONS

Potential impact	Safeguards and mitigation measures
Non-compliance with this REF results in environmental damage	• Prepare a site-specific CEMP before any construction works commence that includes all the safeguards and mitigation measures set out in this REF. • Ensure all workers are made aware of site sensitivities and unexpected finds procedure/s as part of their site induction.
Earthworks and excavation may result increased erosion risk and sedimentation of downstream waterways	• Avoid and minimise erosion by appropriate design. • Minimise vegetation removal and soil disturbance within riparian zone. Ensure any disturbed soils within or near the riparian zone are stabilized immediately. • Implement an Erosion and Sediment Control Plan (ESCP), including strict sedimentation controls. • Utilise best practices such as those found in the *NSW Government's 2004 Managing Urban Stormwater: Soils and Construction Guidelines* (the Blue Book)[40]. • Undertake appropriate riparian and terrestrial vegetation rehabilitation works as soon as possible after completion of construction.
Chemicals are released that can cause serious damage to human health and the local environment	This impact is considered unlikely, however, be alert to the possibility that hazardous materials such as Acid Sulfate Materials and Asbestos-Containing Materials may be encountered during excavation work, and/or accidentally brought onto the site hidden in fill or other construction materials. • Ensure all workers are made aware of the unexpected finds procedure/s as part of their site induction. Do not hesitate to stop work if there are any unexpected finds of this nature and to seek advice from a suitably qualified environmental professional). • Avoid bringing contaminated materials onto site: source materials such as fill from Council quarries, companies selling material certified as clean fill or other reputable suppliers.

[40] "the Blue Book" Managing Urban Stormwater: soils and construction -Volume 1. New South Wales Government. (2004).

5.2. Hydrology, flooding, groundwater, and water quality

5.2.1. Existing environment

This proposed activity involves works in and around Crisps Creek and Mulwaree River. They are perennial watercourses that flows west to east through the project area, with Crisps Creek flowing into the Mulwaree River in the southwestern corner of the project area. The river then takes a northern trajectory where it adjoins the Wollondilly River in the Goulburn township. It forms part of the Lake Burragorang Catchment, which contains the Warragamba Dam system.

Both Crisps Creek and Mulwaree River are subject to flooding (as are most inland waterways in Australia) and are a part of the larger Palerang Hydrogeological Landscape (HGL)[41]. Groundwater flows in unconfined fractured rock and saprolite, with local systems loosely defined by topographic catchments. Groundwater salinity is negligible with depth of water table typically intermediate to deep.

A desktop search of NSW EPI did not find any known hazards in or near the project area with regards to:

- (severe) floods,
- salinity, or
- vulnerable groundwater resources (aquifers)[42].

At the time of inspection both Crisps Creek and Mulwaree River were flowing. For an assessment of aquatic biodiversity observed on site, see **Section 5.3**.

5.2.2. Impact assessment

The proposed works are situated within and directly adjacent to two perennial waterways, Crisps Creek and Mulwaree River. Consequently, it is likely that the proposed work could impact the water quality within each creek system and the downstream local water communities.

Given the range of matters that could impact on water quality (e.g., a failure of erosion controls, dust controls, chemicals management etc.), close monitoring of water quality especially turbidity and surface appearance will be required to ensure any problems are quickly identified and mitigated.

No significant or long-term impact is likely if the safeguards and mitigation measures recommended in the REF are implemented (refer to **Section 5.10**). Furthermore, the proposed works are likely to prevent impacts to water quality by remedying the landslip event and preventing further erosion.

Northern embankment works

The project will require the exposure of soil during vegetation removal, earthworks for drain construction and removal of current infrastructure as well as associated road works. Erosion and sedimentation have the potential to impact the proposed site and the Mulwaree River waterway. The development and implementation of strict CEMP and associated ESCP will ensure sedimentation of waterways is avoided (**Section 6**).

[41] Hydrogeological Landscapes of New South Wales and the Australian Capital Territory. State Government of NSW and NSW Department of Climate Change, Energy, the Environment and Water. (2016). Best accessed through eSpade. (Accessed: 12/08/2024)
[42] EPI Planning/Hazard Mapping. State Government of NSW and NSW Department of Planning, Housing and Infrastructure. (2017). Best accessed through SEED. (Accessed: 12/08/2024)

Impacts to water quality can also occur from spills and leaks of oils and other chemicals from plant and equipment operating in adjacent to the water bodies. As the proposed works will be upslope of waterways, should any pollution occur, this would migrate downstream. Impacts on water quality are to be mitigated through the implementation of safeguards and management measures to ensure spills are contained and removed. Incorrect storage of fuel, oils and other chemicals could also result in impacts on water quality. These impacts are considered manageable through the implementation of safeguards and management measures outlined in **Section 6**.

Furthermore, given the range of matters that could impact on local water quality (e.g., a failure of erosion controls, dust controls, chemicals management etc.), close monitoring of water quality especially turbidity and surface appearance will be required to ensure any problems are quickly identified and mitigated. No significant or long-term impact is likely if the safeguards and mitigation measures recommended in the REF are implemented (refer to **Section 6**).

Rock fill embankment

The project will require works on the northern bank of the Mulwaree River and may extend below the water level. The construction of the rock fill embankment will likely lead to water quality impacts, including the removal of the river bank and deposition of rock fill. Strict implementation of ESCP measures, particularly the use of a silt curtain to reduce sedimentation within the waterway will be required (refer to **Section 6**).

Potential stockpile site

The stockpile site is located within 60 m of Crisps Creek and has the potential to impact the aquatic water quality through stormwater runoff from stockpile areas entering the creek. The CEMP must include a strict plan to avoid potential impacts to water quality such as pollution and sedimentation of nearby waterways. This includes plans to manage stockpiling, spills, chemicals etc. and largely prevent any impacts to any area outside the established site stockpile areas.

5.2.3. Safeguards and mitigations

No significant or long-term impacts are likely to occur to the directly impacted area or downstream watercourses, groundwater or hydrology of the project area if the safeguards and mitigation measures outlined in **Table 7** are implemented. For the full list of recommended safeguards and mitigation measures, refer to **Section 6**.

TABLE 7: HYDROLOGY, FLOODING, GROUNDWATER, AND WATER QUALITY SAFEGUARDS AND MITIGATIONS

Potential impact	Safeguards and mitigation measures

Change in flow and water quality of unnamed creeks and hydro lines and due to degradation of riparian vegetation, pollution, or sedimentation.	• Utilise best practices such as those found in the Blue Book.
	• Implement an Erosion and Sediment Control Plan (ESCP).
	• Closely monitor water quality, especially turbidity and surface appearance to ensure any problems are quickly identified and mitigated.
	• Stockpiles should be appropriately contained by sediment fencing or other materials prescribed in the Blue Book to ensure sediments do not enter waterways.
	• Stockpiles should also be located 40 m away from adjacent riparian areas and waterways.
	• Where stockpiles are unavoidably located within 40 m of riparian areas these are to be managed as follows:
	  ▪ locate stockpiles at the furthest point from the waterway,
	  ▪ use bunding or other controls to divert storm water and clean water around stockpiles,
	  ▪ cover stockpiles when not in use, and
	• monitor weather and plan for potential high rainfall and flooding.

Potential impact	Safeguards and mitigation measures
Change in flow and water quality due to degradation of riparian vegetation, pollution, or sedimentation due to construction of rock fill embankment	• Construction of rock fill embankment will require the removal of material from and deposition of rock fill into the Mulwaree River bank, safeguards for this process should include: ▪ careful selection of clean materials for placement into the embankment, ▪ installation of strict erosion and sedimentation controls for the structure, including in water as works are occurring within the waterway, and ▪ returning flow and riparian area to pre-construction condition to minimise impacts to flow regimes.
Chemicals and/or waste are accidentally released from the site	Aim to locate the following facilities at least 50 m away from any drainage lines or water bodies (i.e. Mulwaree River): • fuel, oil, and other chemical stores. • refuelling, refilling, and maintenance areas. • wash down bays. Note: Any area where fuel or other chemicals are stored or transferred to/from containers must be placed in at least one impervious bund to manage the risk of spills.

5.3. Biodiversity inspection

A biodiversity inspection of the project was undertaken, which involved investigations of the terrestrial and aquatic ecology, and biodiversity values associated with the area, including desktop literature review, database searches and multiple site inspections.

The below sections discuss and summarise the results of the biodiversity inspection by providing detail about the existing environment and an assessment of biodiversity impacts associated with the project. Safeguards to mitigate biodiversity impacts are detailed in **Section 6**.

Supplementary details of the biodiversity inspection are presented in **Appendix A**, which includes:

- detailed methodology,
- details of observed existing environments,
- list of species observed on site,
- systematic flora survey data,
- likelihood of occurrence assessment, and
- NSW Test of Significance.

5.3.1. Existing environment

Flora

The vegetation with the proposed work area is composed of areas of exotic species dominance and native species dominance. The northern extent of the proposed work area to Bungendore Road primarily comprises native vegetation, with areas directly surrounding the road containing a high composition of exotic species. Proposed work areas of the Mulwaree River were observed to contain a mixed composition of species.

A total of 118 flora species were identified within the works area, consisting of 51 exotic species and 67 native species. Several weeds classified as Weeds of National Significance (WoNS) and High Threat Exotic (HTE)were identified within the works area - Blackberry complex (*Rubus fruticosus* sp. agg.), Serrated Tussock (*Nassella trichotoma*), Bridal Creeper (*Asparagus asparagoides*), Black Locust (*Robinia pseudoacacia*), Tree Lucerne (*Chamaecytisus palmensis*), Sweet Briar (*Rosa rubiginosa*), Umbrella Sedge (*Cyperus eragrostis*), African Lovegrass (*Eragrostis curvula*), Sheep Sorrel (*Acetosella vulgaris*) and St. John's Wort (*Hypericum perforatum*).

For further information on biodiversity inspection results, including information on stockpile areas, refer to **Appendix A2.1**.

A full list of the flora species detected during the field survey is contained in **Appendix A3.1**.

Plant Community Types

Plant Community Types (PCTs) present within the project area were determined through field inspections and data collection, as well as State Vegetation Type Map (SVTM) on-ground validation. PCT mapping followed relatively closely to that of the SVTM (**Figure 11**), however with some minor variations in PCTs and their extent within the project area (refer to **Figure 12**). PCTs determined to occur within the project area are:

- PCT 3338 – Southern Tableland Forest Hollow Grassy Woodland.

    - Most of the project area was determined to be aligned with PCT 3338, which is mapped by STVM as occurring across the majority of the area.
- PCT 3744 – Palerang Hills Peppermint Dry Shrub Forest
    - STVM does not identify this PCT as present within the project area, however, the floristic characteristics of the western section of the project area were assessed as aligning with the presence of this PCT.
- PCT 3932 – Central and Southern Tableland Swamp Meadow Complex.
    - STVM does not identify this PCT as present within the project area, however, floristic characteristics of the Mulwaree River that occur within the project area were assessed as aligning with the presence of this PCT.

For further discussion of PCT selection refer to **Appendix A2.2.**

PCTs 3338 and 3932 of the project area align with threatened ecological communities (TEC) listed under NSW or EPBC legislation. Further discussion of the presence of TECs and clearing condition thresholds can be found in **Appendix A7.2**.

While there are areas of primarily bare ground due to the landslip event, they may still be considered as aligning with a PCT due to the presence of minor vegetation regrowth in the form of understory species such as grasses and forbs.

FIGURE 11: STATE VEGETATION TYPE MAP FOR PROJECT SITE

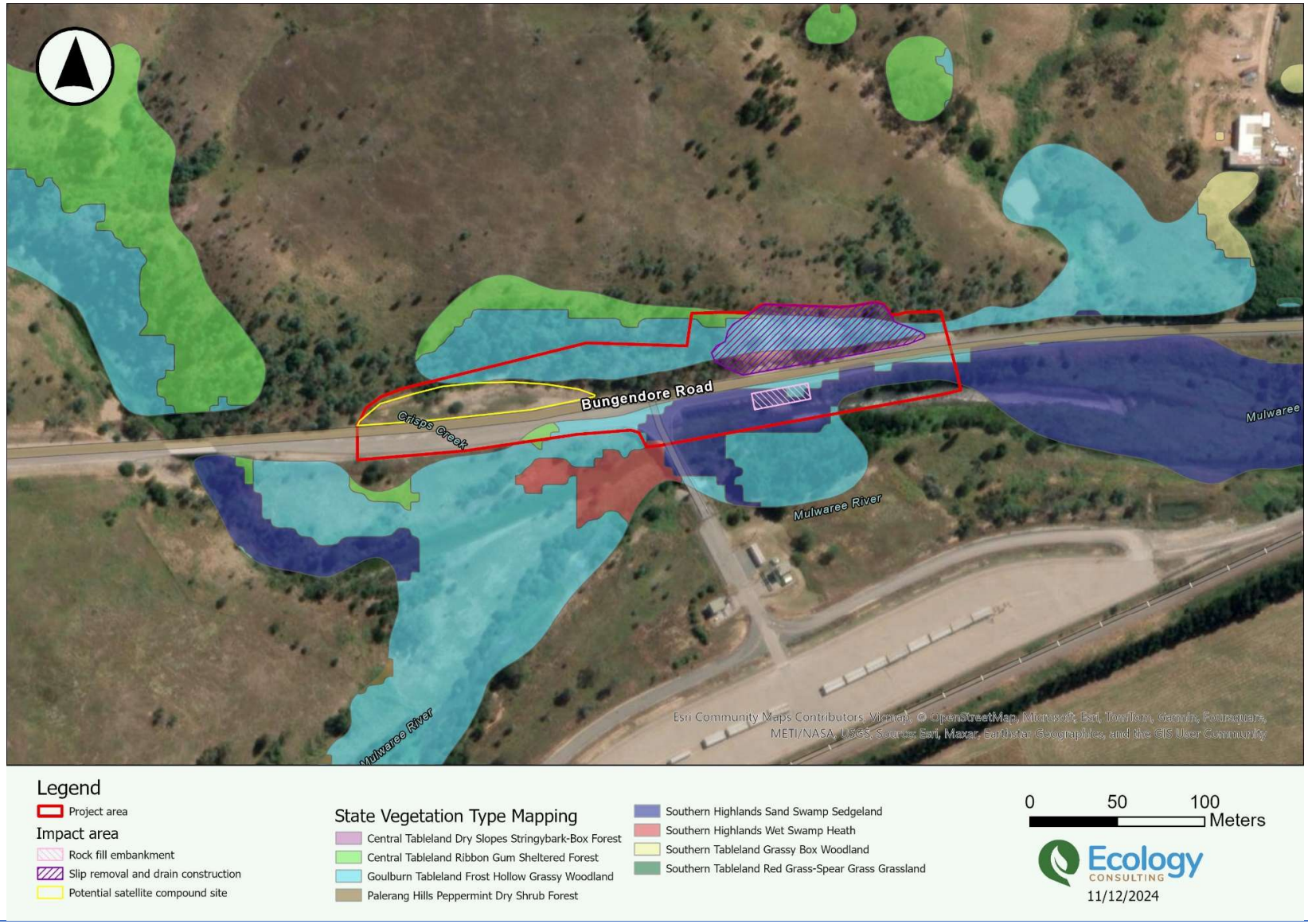
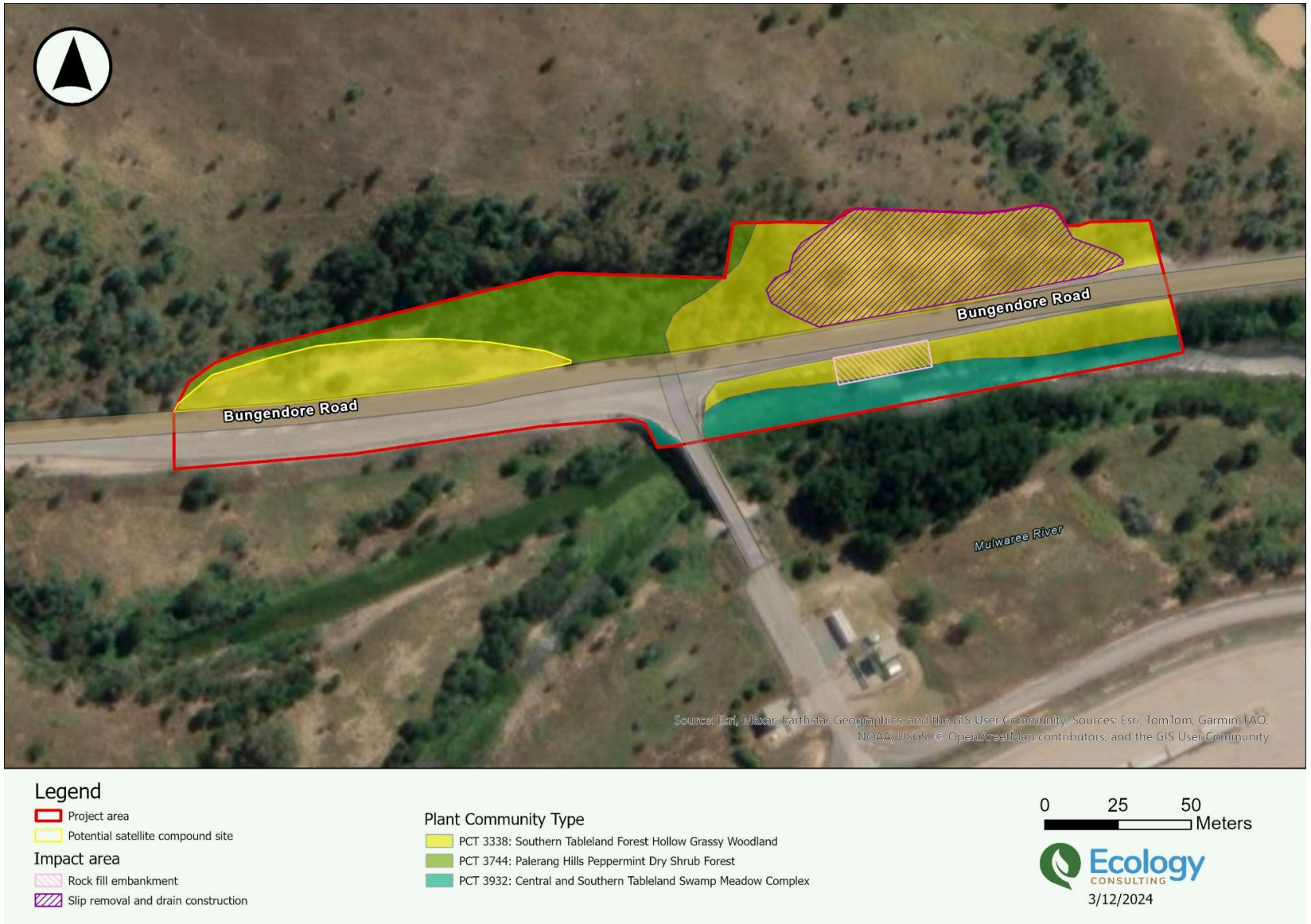


FIGURE 12: FIELD VALIDATED PCT MAPPING



Fauna and habitat

The project area and proposed stockpile site contain several habitats that are likely utilised by a range of native fauna species, including (**Figure 13**):

- native woodland providing some shelter for native fauna,
- native mistletoe and flowering overstory species that provide foraging habitat.,
- minor areas of rock habitat,
- riparian habitat within the Mulwaree River, and
- derived native grassland.

21 native bird, one native frog and one native invertebrate species were observed within the project area. The invertebrate species Key's Matchstick Grasshopper (*Keyacris scurra*) is listed as Endangered under the Commonwealth EPBC Act and NSW BC Act and was observed utilising derived native grassland in the northern section of the project area.

For a complete discussion on the habitat present refer to **Appendix A2.4** and a complete list of species observed see **Appendix A3.2**.

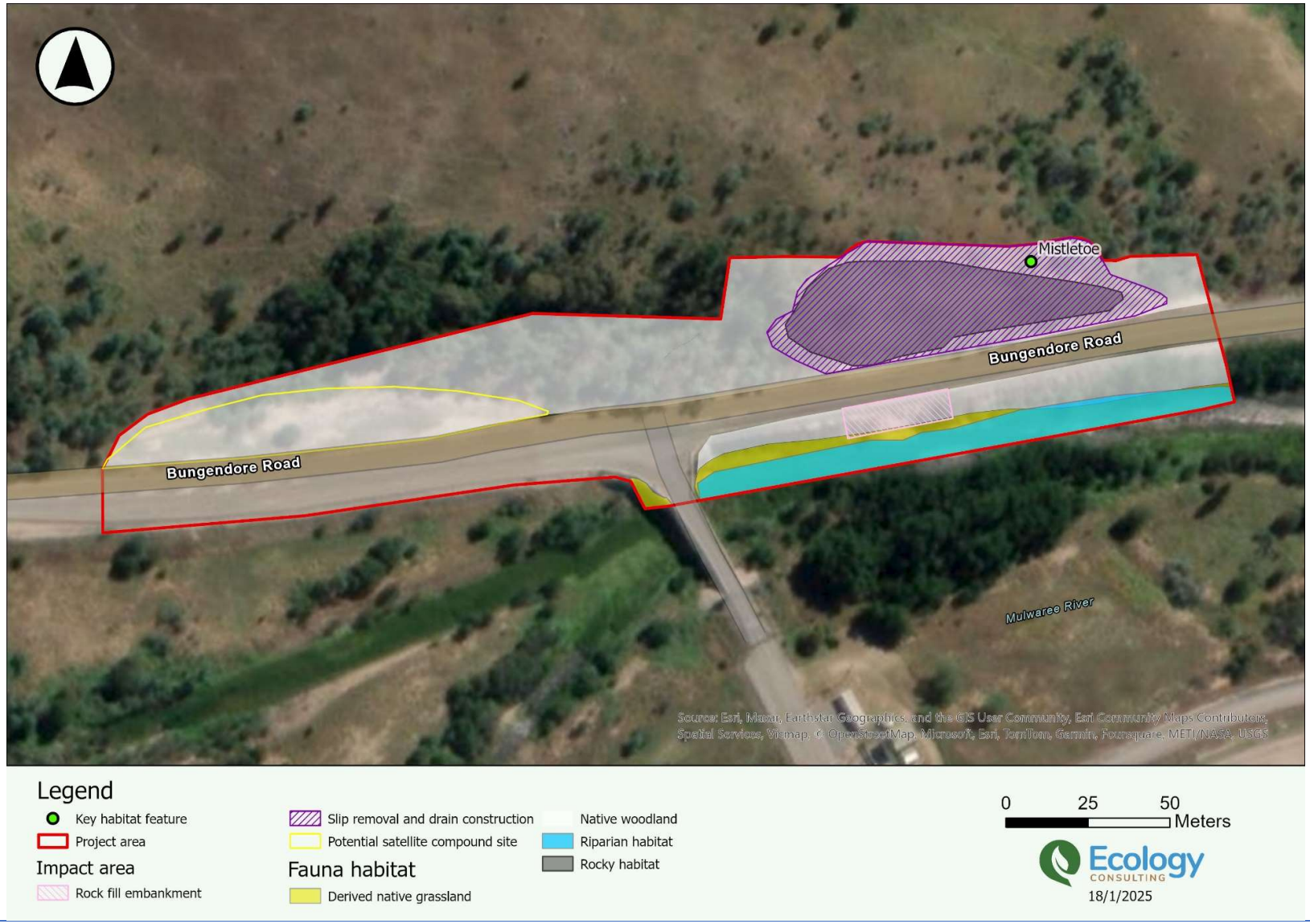
Aquatic biodiversity and habitat

Although both the Mulwaree River and sections of Crisps Creek are Biodiversity Values mapped as Biodiverse riparian land, Mulwaree River is mapped on NSW DPI Fisheries Freshwater Fish Community Status as "Very Poor" while Crisps Creek is not registered and therefore likely falling below "Very Poor" community status. The likelihood of occurrence assessment (**Appendix A7**) revealed that no threatened fish species listed under the FM Act are considered likely to be present on either site or immediately downstream.

At the time of inspection, riparian vegetation consisted primarily of groundstory species and was mixed with areas of high exotic dominance and areas of native dominance. Aquatic habitat in the form of submerged and emergent logs was limited to accumulations of flood debris on some banks and through exotic riparian trees. Mature native trees were not recorded along the banks of the river corridor within the study area. Aquatic vegetation and submerged rock were observed to likely form the majority of habitat features within the river. No invasive exotic fauna species such as European Carp (*Cyprinus carpio*) or Gambusia (*Gambusia holbrooki*) were recorded in the river at the times of inspection.

While the project area has been modified historically, they contain certain suitable habitats for various threatened species, particularly, flora, birds, bat and frog species as detailed in the sections below. For further details on each site's observed aquatic habitat refer to **Appendix A2.5**.

FIGURE 13: KEY HABITAT FEATURES AND NATIVE VEGETATION WITHIN PROJECT WORKS AREA



Threatened Ecological Communities (TECs)

A desktop search identified six threatened ecological communities (TECs) are known or predicted to occur within 10 km of the project area:

- *Box-Gum Woodland,*
- *Monaro Tableland Cool Temperate Grassy Woodland,*
- *Montane Peatlands and Swamps,*
- *Natural Temperate Grassland,*
- *Tableland Basalt Forest,* and
- *Werriwa Tablelands Cool Temperate Grassy Woodland.*

The results of the field survey indicate NSW listed TEC Werriwa Tablelands Cool Temperate Grassy Woodland is present within vegetation aligning with PCT 3338, and NSW listed TEC Montane Peatlands and Swamps is present within vegetation aligning with the NSW listed TEC Montane Peatlands and Swamps.

For discussion on the likelihood of these TEC being present within the project area, refer to **Appendix A7.1** and for further explanation of PCTs see **Appendix A2.6** Threatened Ecological Communities (TEC)**.**

Threatened populations

No endangered populations, as distinct from communities, listed under the BC Act were identified within the project area or surrounds (10 km radius).

Threatened species

Threatened flora

Desktop research identified a total of 22 threatened flora species potentially occurring within 10 km of the project site. No threatened flora species were identified within the project area during the field inspections. Based on the site's available habitat, including that within the Mulwaree River, the following threatened flora species were assessed to have a potential or higher likelihood of occurring within the project area (for details on each species, refer to **Appendix A7.2**).

- Dwarf Kerrawang (*Commersonia prostrata*),
- Creeping Hop-bush (*Dodonaea procumbens*),
- Black Gum (*Eucalyptus aggregata*),
- Hoary Sunray (*Leucochrysum albicans* subsp. *tricolor*), and
- Round-leaf Wilsonia (*Wilsonia rotundifolia*).

Threatened fauna

Desktop research identified a total of 53 threatened fauna species potentially occurring within 10 km of the project site.

During field inspection, the following threatened fauna species was identified utilising native woodland vegetation in the north of the project area:

- Key's Matchstick Grasshopper (*Keyacris scurra*), a single individual recorded.

Based the project site's available habitat, including that within the Mulwaree River, 24 threatened fauna species were assessed to have a potential or higher likelihood of occurring within the project area (for details on each species, refer to **Appendix A7.3.**

Threatened aquatic species

No threatened fish species listed under the Commonwealth EPBC Act, NSW BC Act or FM Act were assessed as likely to occur within the project area (see **Appendix A7.3**).

Threatened frogs

One threatened frog species was identified as potentially occurring within the vicinity of the project site, Green and Golden Bell Frog (*Litoria aurea*). For details on species inclusion, refer to **Appendix A2.8** and **Appendix A7.3** for likelihood assessment.

Threatened waterbirds

Based on the site's available habitat, including that within the Mulwaree River, a total of seven threatened waterbird species listed under the EPBC Act and NSW BC Act were assessed as having the potential or likely to occur within the project area (refer to **Appendix A2.8**). These include:

- Magpie Goose (*Anseranas semipalmata*),
- Australasian Bittern (*Botaurus poiciloptilus*),
- Sharp-tail Sandpiper (*Calidris acuminata*),
- Curlew Sandpiper (*Calidris ferruginea*),
- Latham's Snipe (*Gallinago hardwickii*),
- Blue-billed Duck (*Oxyura australis*), and
- Freckled Duck (*Stictonetta naevosa*).

The likelihood of potential impacts occurring to these waterbirds had a greater risk weighting due to the proximity of the project area to known quality habitat found at nearby inland lakes, The Morass and Lake Bathurst (see **Figure 9**). For details on species inclusion, refer to **Appendix A7**. For details into the impact assessment of each fauna species respectively, see **Appendix A8**.

5.3.2. Impact assessment

It is advised that if any clearing outside of the assessed areas outlined in this REF becomes necessary, or if other discoveries are encountered, that additional inspections and assessments will be required. Protocols for such situations are to be included in the project's CEMP.

Vegetation impacts

The proposed works would result in the direct impacts on up to 0.32 ha of predominantly bare ground with minor native vegetation to remove slip debris as well as construct a drain and rock fill embankment.

Upon release of this REF, the impacts on native vegetation have only been assessed for the above-mentioned areas. Due to the sensitive nature of the riparian habitat and the potential for fauna such as frogs and reptiles to be hidden within the dense grassy ground layer of the works area it is important that pre-clearing inspection is completed by a suitably qualified ecologist before any clearing occurs.

The work areas have been heavily disturbed and modified by the recent land slip event, consisting largely of bare ground with minor regeneration. The proposed works will aim to retain as much native

vegetation as possible within the works area, particularly those of shrub or tree habit, as their roots likely are providing support for the steep slopes. The removal or otherwise impact of described native vegetation would be minimised by appropriate site rehabilitation and weed management post-construction, refer to **Section 6.**

The proposed works may also result in potential indirect impacts on remaining vegetation within the project area and their surroundings through disturbance and edge effects. Such impacts are likely low as the site already consists of a disturbed roadside verge, and impacts would be minimised by appropriate site rehabilitation and weed management in line with Council's roadside vegetation management plan.

Due to the small-scale nature of the proposed works and the mostly disturbed nature of the project area, it is unlikely that the project will significantly or adversely impact the extent of native vegetation within the locality. In addition, the proposed works are unlikely to contribute to the loss of landscape connectivity or further fragmentation.

Weed impacts

Disturbance associated with vegetation clearing, vehicle traffic and general day-to-day operations during construction increases the potential for the spread, introduction, and establishment of weed and pest species. Some weed species can be highly invasive and have the potential to exclude native species and modify the composition and structure of vegetation communities.

Field investigations identified 10 weed species (including WoNS and HTE species, weeds declared noxious by GMC[43]) across the project area (for a full list of species observed, refer to **Appendix A3.1**). To mitigate potential disturbance to native vegetation, strict weed management, monitoring and control practices should be implemented to minimise the spread of exotic species as outlined in **Section 7.1**. Weeds that must be managed carefully are Blackberry (*Rubus fruticosus* sp. agg), Serrated Tussock (*Nassella trichotoma*) and Bridal Creeper (*Asparagus asparagoides*) which are highly invasive species found within and near the work areas of the site. Strict site hygiene, including the management, treatment or removal of weed-contaminated topsoils must be adhered to prevent the spreading of weeds throughout the site or down the waterways from disturbed soils and seeds.

It is highly likely that the project area will experience weed invasion, as the movement of vehicles and equipment during construction activities can spread seeds and disturb the soil, facilitating weed growth (refer to **Section 7.1**). As such, the project site is to be revisited post-construction for the purposes of weed management. Following construction, the works area, particularly embankment to the Mulwaree River waterway is to be remediated with native species local to the region and ideally, from the vegetation community removed to prevent exotic and weed species from taking hold (refer to native species found in **Appendix A3.1**).

There is a risk of construction activities spreading invasive weeds and potentially new weeds further into adjoining vegetation. Recommended management involves a range of weed management actions and mitigation measures, including the incorporation of a weed management sub-plan as part of the project CEMP (refer to **Section 6**).

Impacts on native fauna

The proposed activity is only expected to have a short-term, minor impact on native fauna during the construction phase.

[43] Local Weed Management Plan. Goulburn Mulwaree Council. (2019).

No key habitat features such as stick nests were observed within the project area. Loud machinery may cause temporary disturbances; however, few habitat features are present within the project site, and the impact is considered minor. Pre-clearing inspections are advised due to the sensitive nature of riparian habitats and the potential for hidden fauna to be within dense vegetation. In the case where an ecologist is not on site and an unexpected discovery is made, protocols for such situations should be included in the project's CEMP.

Diseases and pathogens

Construction activities within the project area may have the potential to introduce or spread pathogens such as Phytophthora (*Phytophthora cinnamomi*), Myrtle Rust (*Uredo rangelii*) and Chytrid fungus (*Batrachochytrium dendrobatidis*) into adjacent native vegetation through vegetation disturbance and increased site visitation. Phytophthora and Myrtle Rust may result in the dieback or modification of native vegetation and damage to fauna habitats. There is little available information about the distribution of these pathogens, however, records for Phytophthora can be found within the LGA[44]. No evidence of these pathogens was observed during surveys.

Diseases and pathogens can be introduced or spread to the sites via dirt or organic material attached to machinery, vehicles, equipment, and employees. The potential for significant or new impacts associated with these pathogens is relatively low, given the creation of exclusion zones to ensure limited access to areas outside the direct impact areas. To help mitigate the risk of pathogens being brought onto and/or spread through the sites all machinery brought to the sites should be washed down and inspected to be free of soils, seeds, and other organic material in accordance with **Section 5.10**.

Impacts to terrestrial habitat and wildlife corridors

Native canopy, shrubs and grasses within the proposal's work areas have the potential to provide foraging habitat for various native and threatened bird and mammal species. However, majority of the proposal occurs within areas that have already been disturbed by the landslip event. Furthermore, in the context of the remaining native vegetation surrounding the proposed sites, the proposal would only remove a small portion of available foraging resources for local populations of native fauna compared to the habitat present in the surrounding landscape.

Overall, there is no indication that the project will have a significant impact on terrestrial habitat and wildlife corridors for threatened species.

Aquatic impacts

There is an abundance of aquatic habitat in relatively good condition within and in the close vicinity of the project area. The proposal has the potential to adversely impact this area through erosion, spills, runoff, and increased visitation within the project area. Appropriate fencing, establishment of no-go zones and erosion and sediment controls are to be put in place to reduce any potential impacts to the surrounding aquatic environment.

Proposed works will require earthworks within the northern bank of the Mulwaree River, therefore sedimentation will be a high risk to the immediate and downstream aquatic habitats. Within the development of the project's ESCP, in water sedimentation controls should be used, such as silt curtains, as well as on ground controls. ESCP recommendations are outlined within **Section 6**.

[44] Accessed dataset: Phytophthora distribution. State Government of NSW and NSW Department of Climate Change, Energy, the Environment and Water. (2020). (Accessed: 27/08/2024)

Construction utilises machinery increasing the risk of chemical spills or leaks of construction materials, including fuels, lubricants and hydraulic oils from construction plant and equipment and increased sediment input into the project's waterways and further into the aquatic systems of the Hawkesbury-Nepean River catchment. These impacts have been considered as part of the water quality and chemicals assessments in **Section 5.2** with potential impacts considered manageable through the implementation of rigorous safeguards and management measures outlined in **Section 6**.

Overall, the project is unlikely to have an adverse impact on the aquatic environment provided mitigation measures designed around water quality, soil and chemical management are implemented as recommended in **Section 6**. Furthermore, the proposed works are likely to prevent impacts to water quality by remedying the landslip event and preventing further erosion.

Impacts to Biodiversity Values Mapped area

The proposed activity will involve the direct impacts such as removal of riparian vegetation, to small areas within Mulwaree River which is mapped as Biodiverse Riparian Land though the Biodiversity Values Map and Threshold Tool (see **Figure 7**).

Although the project will slightly directly impact Biodiversity Values mapped in the south of the project area, as Part 5 activities that have been assessed as not resulting in a significant impact on a threatened species, there are no specific requirements for entry into the Biodiversity Offset Scheme. Nevertheless, mitigation measures and rehabilitation efforts as outlined in **Section 6** are likely to ensure negligible impacts on Biodiversity Values mapped in areas within and surrounding the project area.

Impacts to Threatened Ecological Communities

The proposed works would result in the direct impacts on up to 0.32 ha of vegetation associated with Werriwa Tablelands Cool Temperate Grassland and 0.02 ha of Montane Peatlands and Swamps. The removal of this vegetation is considered have an adverse effect on the extent of the ecological communities, however, not to the extent that their local occurrence is likely to be placed at risk of extinction given their presence within the local landscape. Moreover, the proposed works are unlikely to modify the composition substantially and adversely such that its local occurrence is likely to be placed at risk of extinction given the disturbance caused by the landslip, small-scale of the proposed works and connectivity of this TEC within the local landscape. For more details, see **Appendix A8.2**.

Impacts to threatened species

Threatened flora species

Through removal of suitable habitat, the proposal has the potential to adversely impact five threatened flora species assessed as having a potential or greater likelihood of utilising the project area (see **Appendix A7**). The timing of inspection was suitable to allow the detection for all five species. Due to all species not being detected, the disturbance of the potential habitat is not considered likely to have a significant impact such that a local population of the species is to be placed at risk of extinction.

Threatened terrestrial fauna species

Through removal of suitable habitat, the proposal has the potential to adversely impact threatened fauna species assessed as having a potential or greater likelihood of utilising the project area (see **Appendix A7**). As discussed previously, the vegetation to be removed is to be a small area of predominantly disturbed vegetation with a mix of native and exotic species providing limited habitat features for terrestrial threatened species.

A threatened species Test of Significance for impacts of the project on threatened flora and fauna species determined that there is not likely to be a significant impact on the extent and viability of these species in the local area. This is grounded by the relatively small area of habitat to be impacted in comparison to available habitat in the surrounding landscape. For details on the impact assessment of each threatened species respectively, see **Appendix A8.1**.

Threatened aquatic species

No threatened fish species were considered likely to occur within the project area (**see Appendix A7.3**), however one threatened frog species was considered likely to occur within the project area, Green and Golden Bell Frog (*Litoria aurea*). No threatened aquatic species listed under the BC Act, FM Act and/or EPBC Act were observed within the project site during the field surveys.

A Test of Significance for the impacts of the proposed activity on threatened aquatic species concluded that there is unlikely to be a significant impact on the extent and viability of these species in the local area if strict mitigation measures outlined in **Section 6** are applied. This conclusion is supported by the relatively small area of habitat within the project area to be impacted compared to the available habitat in the surrounding landscape further up and downstream. Furthermore, the proposal seeks to remedy the landslip event, which will reduce erosion and impacts to water quality.

Overall, the project is considered unlikely to have significant adverse impacts on any listed aquatic threatened species, populations or communities.

5.3.3. Key Threatening Processes

Key threatening processes (KTPs) are listed under both Commonwealth and State legislation. There are 22 Commonwealth-listed KTPs, 38 NSW-listed KTPs and eight under the FM Act. The lists overlap and include broad threats that are not immediately relevant to the site, such as climate change and specific threats relating to Lord Howe Island, shark control programs on beaches and longwall mining.

A detailed assessment of the impacts of the project in relation to NSW-listed KTPs concludes that the proposed activity is unlikely to significantly contribute to any KTPs provided appropriate measures are implemented as recommended in **Section 6** and **Section 7.1** (see **Appendix A8.5**).

5.3.4. Safeguards and mitigations

No significant or long-term impacts are likely to occur to the directly impacted areas or on surrounding areas with biodiversity value if the safeguards and mitigation measures outlined in **Table 8** are implemented. For the full list of recommended safeguards and mitigation measures, refer to **Section 6**.

TABLE 8: BIODIVERSITY SAFEGUARDS AND MITIGATIONS

Potential impact	Safeguards and mitigation measures
Native vegetation removal	• Ensure the CEMP includes plans showing areas to be cleared and areas to be protected, including exclusion zones, protected habitat features and revegetation areas. • Prior to the commencement of any works, a physical clearing boundary is to be demarcated and implemented. The demarcation of the exclusion zone will be in accordance with TfNSW *Biodiversity Management Guideline*[45]. • All vegetation removal should be limited to the minimum extent necessary to establishment of construction area, new causeways and approaches.
Impacting native vegetation surrounding work sites	• Prior to the commencement of any works, a physical boundary is to be demarcated and implemented at work sites. The demarcation of the exclusion zone will be in accordance with TfNSW *Biodiversity Management Guideline*[46].
Introduction, spread and/or establishment of exotic species	Strict weed management, monitoring and control practices should be implemented to minimise the spread of exotic species as follows: • Follow appropriate guidelines on weed management within *South East Regional Strategic Weed Management Plan 2023 - 2027*[47]. • Undertake appropriate weed control measures within the project area prior to proposed works taking place. • All vehicles to be inspected and, if necessary, cleaned before their first entry to the proposal area. • All machinery should be cleaned of foreign soil and vegetative matter to avoid the spread of *Phytophthora cinnamomi* pathogenic fungus (Myrtle Rust) and dispersal of seeds of non-native plants. • Control the movement of vehicles, machinery, and workers to minimise the potential for spread of weeds within and outside the proposal area. • Control weeds prior to commencement of works. • Correct disposal of 'green waste' containing significant weeds.
Native fauna at the site may be inadvertently injured during the course of construction works.	• Utilise best practices such as those set out in the TfNSW *Biodiversity Management Guideline*[48]. • Suitably qualified ecologists are to undertake a pre-clearing process as a final check for any threatened flora or fauna species that may have moved into the area since undertaking previous site inspections. • Suitably qualified ecologists are to undertake a pre-clearing process as a final check of impacted riparian areas for residing fauna, such as frogs, turtles, lizards and snakes, immediately prior to clearing to remove any fauna present. • Suitably qualified ecologists are to undertake a pre-clearing process as a final check prior to clearing to identify and relocate any Key's Matchstick Grasshopper (*Keyacris scurra*) individuals that may be present within the impact area prior to clearing. • Be careful around fauna, especially large animals (e.g. wombats), venomous animals (e.g. snakes, feral bees) or bats. • If any native fauna becomes injured during the course of construction works, the NSW Wildlife Information, Rescue and Education Service (WIRES) should be contacted immediately. • Implement a stop-works procedure if threatened species are encountered during construction. • Implement a stop-works procedure if any fauna species are encountered and at risk of harm during construction. If a habitat feature (stick nest, tree, man-made structure with potential bat roosting habitat) needs to be cleared: • ensure appropriate equipment/operator is available to lower trees to the ground gently, • implement staged habitat clearing,

[45] Biodiversity Management Guideline – Protecting and managing biodiversity on Transport for NSW projects. State of New South Wales through Transport for NSW. (2024).
[46] Biodiversity Management Guideline – Protecting and managing biodiversity on Transport for NSW projects. State of New South Wales through Transport for NSW. (2024).
[47] South East Regional Strategic Weed Management Plan 2023 – 2027. State of New South Wales through Local Land Services. (2022).
[48] Biodiversity Management Guideline – Protecting and managing biodiversity on Transport for NSW projects. State of New South Wales through Transport for NSW. (2024).

Potential impact	Safeguards and mitigation measures
	• ensure preclearing inspections occur prior to undertaking clearing works to check for any residing fauna (e.g. using a pole camera to inspect cavities), • have a licensed wildlife carer vaccinated against Australian Bat Lyssavirus or ecologist on site to supervise clearing/habitat removal and check for residing fauna, • determine relocation point for displaced fauna and plan for the care of any injured, orphaned, or sick wildlife, and • maintain appropriate records of inspection processes and wildlife outcomes.

5.4. Aboriginal heritage

5.4.1. Existing environment

The Aboriginal custodians of the land within which the project lies within are the Ngunnawal people, a collection of tribal areas in south eastern New South Wales and the Australian Capital Territory. Their country extends from Goulburn to Yass and Boorowa southwards as far as Lake George to the east and Goodradigbee to the west.

The project area falls within the Pejar Local Aboriginal Land Council Boundary, which extends from Lake George in the south, Oberon to the north, Razorback Nature Reserve to the west and Morton National Park to the East. It is ~ 13 km west of the Nowra Local Aboriginal Land Council Boundary.

5.4.1. Due diligence and AHIMS

Desktop assessments were undertaken for the project, including searches of the NSW DCCEEW and Aboriginal Heritage Information Management System (AHIMS) database on 13 November 2024, to identify any heritage items near the site. One Aboriginal site was identified within the project site and one other identified nearby.

Due Diligence assessment

An archaeological and heritage consultant Past Traces Pty Ltd was engaged to perform a Due Diligence assessment for the project area in accordance with the NSW Due Diligence Code of Practice for the Protection of Aboriginal Objects[49] (**Attachment 2**).

A field survey was undertaken on 7 November 2024 in accordance with the Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW[50]. The field survey covered areas of open space areas surrounding the upgrade site and potential stockpile site. Ground visibility was low at the time of field survey, with dense vegetation coverage across most of the site although there were large areas of exposed soils. No heritage sites or areas of potential were identified during the field survey.

5.4.2. Impact assessment

One previously recorded heritage site was identified within the project area (57-3-0347) which was salvaged in 2000 by NOHC. A further nine sites occur within the wider search area. The recorded sites consisted of isolated artefacts with no camp sites, scarred trees or areas of Potential Archaeological Deposit (PAD) recorded within the search area. No new artefacts were identified during field survey.

No Aboriginal Heritage Impact Permit is legally required at this stage.

However, there is a risk that clearing and grubbing could uncover new finds. To avoid and minimise the risk of damage or loss of any such finds, the following procedures should be observed:

- an UFP should be implemented that incorporates the recommendations of the Due Diligence assessment. It should specify the procedures for workers to follow if they find human remains or potential Aboriginal finds (e.g. stone flakes or grinding stones), and

[49] Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW. State of New South Wales and the Department of Environment, Climate Change and Water NSW. (2010).
[50] Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales. State of NSW and the Department of Environment, Climate Change and Water NSW. (2010).

- further archaeological assessment should be conducted if the proposed activity extends beyond the area of the current investigation.

The proposed works are considered unlikely to have negative impacts on Aboriginal objects or places. Furthermore, no significant or long-term impacts are likely if the safeguards and mitigation measures recommended in this REF are implemented (refer to **Section 6**).

Note: Workers who handle or move a find may be guilty of an offence. Workers must leave suspected finds alone and report them immediately for professional investigation.

5.4.3. Safeguards and mitigations

No significant or long-term impacts are likely to occur to the areas of Aboriginal heritage if the safeguards and mitigation measures outlined in **Table 9** are implemented. For the full list of recommended safeguards and mitigation measures, refer to **Section 6**.

TABLE 9: ABORIGINAL HERITAGE SAFEGUARDS AND MITIGATIONS

Potential impact	Safeguards and mitigation measures
Unexpected and previously unidentified Aboriginal Heritage objects may be uncovered during construction.	• An unexpected heritage finds procedure should be developed prior to construction works taking place. • Ensure all workers are made aware of unexpected finds procedures and potential cultural sensitivities as part of their site induction. In the case of Aboriginal cultural heritage sites or material being discovered: • all work must cease in the vicinity of the find and project manager notified immediately, • a buffer zone of 10m should be fenced in all direction of the find and construction personnel made aware of the 'no go' zone, • NSW Heritage must be notified of the find and advice sought on the proper steps to be undertaken, and • after confirmation from NSW Heritage, a Cultural Heritage Consultant should be engaged to undertake assessment of the find and provide appropriate management recommendations to the proponent.
Unexpected and previously unidentified archaeological relics may be uncovered during construction	If any unexpected archaeological relics are uncovered during construction, excavation must cease. An excavation permit or an exception notification may be required under the *Heritage Act 1977*[51]. • Ensure all workers are made aware of unexpected finds procedures as part of their site induction.

[51] Heritage Act 1977. State of New South Wales. (2024).

5.5. Non-Aboriginal heritage

5.5.1. Existing environment

To ascertain the presence of heritage items and places within the project area, a search of relevant online heritage databases was undertaken on 12 November 2024. The statutory and non-statutory databases that were searched as part of the non-Aboriginal investigations include:

- State Heritage Register (SHR);
- Australian Heritage Database (AUSHD);
- Section 170 Heritage and Conservation Register,
- *Goulburn Mulwaree LEP 2009*[52], and
- *Queanbeyan-Palerang Regional LEP 2022*[53]

Heritage items listed on the AUSHD, SHR, Goulburn Mulwaree LEP and Queanbeyan-Palerang Regional registers and located in the broader locality were identified in proximity to the project area and are described in **Table 10**.

TABLE 10: NON-ABORIGINAL HERITAGE ITEMS WITHIN THE LOCALITY

Item	Location	Significance	Distance from Site
Tarago Railway Station	Bungendore Road—within GPS coordinates 35.073081°S, 149.649569°E, 35.072923°S, 149.649172°E, 35.069586°S, 149.651973°E, 35.069411°S, 149.651619°E	Local (Item No. 591 on Goulburn Mulwaree Council LEP 2009)	1.7 km
The Loaded Dog Hotel (formerly Lake Bathurst Hotel) and outbuildings (1848)	1 Wallace Street	Local (Item No. 592 on Goulburn Mulwaree Council LEP 2009)	2 km
WWII fuel storage tanks and associated buildings	2571 Braidwood Road	Local (Item No. 550 on Goulburn Mulwaree Council LEP 2009	6.3 km
St John's Anglican Church and Cemetery	2765 Braidwood Road	Local (Item No. 552 on Goulburn Mulwaree Council LEP 2009)	7.9 km
Former Lake Bathurst Public School	2769 Braidwood Road	Local (Item No. 551 on Goulburn Mulwaree Council LEP 2009)	8 km

5.5.2. Impact assessment

The proposed works are considered unlikely to have significant negative impacts on known heritage items or places as none of the items listed in **Table 10** are located within close proximity to the works. Furthermore, no significant or long-term impact is likely if the safeguards and mitigation measures recommended in the REF are implemented (refer to **Section 6**).

[52] Schedule 5. Goulburn Mulwaree Local Environmental Plan 2009. State of New South Wales, (2023). (Accessed: 12/11/2024)
[53] Schedule 5, Queanbeyan-Palerang Regional Local Environmental Plan 2022. State of New South Wales, (2024). (Accessed: 12/11/2024)

5.5.3. Safeguards and mitigations

No significant or long-term impacts are likely to occur to other objects or areas of heritage if the safeguards and mitigation measures outlined in **Table 11** are implemented. For the full list of recommended safeguards and mitigation measures, refer to **Section 6**.

TABLE 11: NON-ABORIGINAL HERITAGE SAFEGUARDS AND MITIGATIONS

Potential impact	Safeguards and mitigation measures
Unexpected and previously unidentified Aboriginal Heritage objects may be uncovered during construction.	• An unexpected heritage finds procedure should be developed prior to construction works taking place. • Ensure all workers are made aware of unexpected finds procedures and potential cultural sensitivities as part of their site induction.
Unexpected and previously unidentified archaeological relics may be uncovered during construction	If any unexpected archaeological relics are uncovered during construction, excavation must cease. An excavation permit or an exception notification may be required under the *Heritage Act 1977*[54]. • Ensure all workers are made aware of unexpected finds procedures as part of their site induction.

[54] Heritage Act 1977. State of New South Wales. (2024).

5.6. Noise and vibration

5.6.1. Existing environment

The project area is situated adjacent to a rail depot on the outskirts of a rural township, Tarago. The existing noise environment comprises intermittent road traffic noise from the current road network, intermittent railway noise from the current rail line and depot, general residential noise from nearby houses and natural sounds such as birds and wind which are typical for a semi-rural environment.

The nearest sensitive receptors to noise and vibration disturbances within each environment would be as follows:

- a residence located ~ 300 m northeast of the project area,
- a residence located ~ 430 m northeast of the project area,
- a residence located ~ 490 m northeast of the project area, and
- a residence located ~ 540 m northeast of the project area.

Ecologists undertaking biodiversity surveys in and around the road reported no significant noise and vibrations are generated by current infrastructure.

5.6.2. Impact assessment

In the short term, construction vehicles and machinery may increase in noise and vibrations in and around the project area, but lower speed limits for construction work may reduce the emissions from passing traffic. The increase in noise and vibrations may disrupt surrounding residential areas; to mitigate these impacts, construction works will be limited to normal working hours, as specified in **Section 2.3**.

The potential for a temporary increase in emissions will be also mitigated by limiting construction work to normal work hours as specified in **Section 2.3**. Other safeguards and mitigation measures will be used to minimise noise and vibration emissions as detailed in **Section 6**.

No significant or long-term impact is likely given upgraded surfacing and if the safeguards and mitigation measures recommended in the REF are implemented (refer to **Section 6**).

5.6.3. Safeguards and mitigations

No significant or long-term impacts are likely to occur to due to noise or vibration if the safeguards and mitigation measures outlined in **Table 12** are implemented. For the full list of recommended safeguards and mitigation measures, refer to **Section 6**.

TABLE 12: NOISE AND VIBRATION SAFEGUARDS AND MITIGATIONS

Potential impact	Safeguards and mitigation measures
Noise and vibration impacts affect the mental and physical health of nearby people and animals	Utilise best practices such as those found in TfNSW *Biodiversity Management Guideline*[55]. As part of this: • Engage with/notify the community early to manage expectations of residents etc. • Quantify the likely noise and vibration emissions of construction equipment/work. • Identify key stakeholders who may be affected by excessive noise and vibrations. • Do not work outside of approved work hours. • Wherever possible, give local residents at least 7 days' notice of very noisy activities e.g., through roadside signage, social media etc.

[55] Biodiversity Management Guideline – Protecting and managing biodiversity on Transport for NSW projects. State of New South Wales through Transport for NSW. (2024).

5.7. Air quality

5.7.1. Existing environment

The project area is located within a semi-rural area that is likely to have good air quality. The nearest accredited air quality monitoring station is ~ 40 km north at Goulburn, which consistently records 'Good' air quality index scores with rare 'Moderated' scores associated with elevated levels of PM2.5 pollution (elevated in winter months likely due to emissions from burning firewood for heating)[56]. However, the site is located directly adjacent to a rail depot and ~ 5.6 km southeast of the Woodlawn Eco Precinct, which has been subjected to numerous community complaints about ongoing odours in the Tarago area.

Air quality in the vicinity of the proposal is likely to be consistent with their rural localities and be of good quality. Considering the site's location within and next to a major road, it would be impacted by vehicle emissions to a small but likely varying degree from the low volume of passing vehicle and dust emissions.

A search of the National Pollutant Inventory on 12 November 2024 no facilities in close proximity to either proposal which reported the emission of pollutants, with the nearest facility being Woodlawn Mechanical Biological Facility ~ 4.2 km northwest of the project area outside of Tarago.

5.7.2. Impact assessment

The project is likely to result in a short-term increase in emissions from construction vehicles and machinery. The emissions are likely to reduce air quality within the immediate area, however, it is not likely to be a significant impact as air quality within the region is in good condition with the largely open nature of the rural landscape for dispersal of any increased emissions.

The project is likely to impact air quality through the generation of dust during construction through earthworks, vehicle movement over exposed soils and stockpiling of materials (particularly if clearing of grubbing is carried out in high wind conditions). This issue is discussed earlier under **Section 5.1**.

No significant or long-term impact is likely if the safeguards and mitigation measures recommended in the REF are implemented (refer to **Section 6**).

5.7.3. Safeguards and mitigations

No significant or long-term impacts are likely to occur to the local or surrounding air quality if the safeguards and mitigation measures outlined in **Table 13** are implemented. For the full list of recommended safeguards and mitigation measures, refer to **Section 6**.

TABLE 13: AIR QUALITY SAFEGUARDS AND MITIGATIONS

Potential impact	Safeguards and mitigation measures
Dust, smoke, or other potentially harmful emissions are generated on site	• Avoid/stop work during strong winds or in conditions where high levels of dust or air-borne particulates are likely (e.g., above 20 km/hr). • Areas of exposed surface are to be minimised through construction site planning and programming, to reduce the area of potential construction dust emission sources. • All working areas should be stabilised as soon as practicable in order to minimise the generation of dust. • Cover vehicles transporting fill, waste or other materials that may produce dust or odours.

[56] Air quality concentration date -Southern Tablelands. State of New South Wales. (2024). (Accessed:13/08/2024)

Potential impact	Safeguards and mitigation measures
Increased number of construction vehicles along local roads may impact on local air quality due to exhaust emissions	• Regular servicing of construction equipment is advised to help minimise exhaust emissions, and for the same reason, engines should not be left idling unnecessarily. • Where practicable, vehicles will be fitted with pollution reduction devices and switched off when not in use.

5.8. Waste and chemical management

5.8.1. Existing environment

The project area exists within a quiet rural landscape and consists of a roadway, agricultural land and a nearby railway. As such, there are currently no known issues with chemicals or waste within the project area.

During assessment of the project area, ecologists undertaking terrestrial survey work in and around the site in August and September 2024 reported no odours, staining, suspected asbestos-containing material, or other evidence of contaminated land.

5.8.2. Impact assessment

Waste will inevitably be created and will need to be contained to ensure it does not disperse across the site and into downstream/downwind areas. This waste may include:

- materials from removing existing causeways and associated infrastructures,
- waste and offcuts from construction of new culverts and associated infrastructure,
- surplus materials used during site establishment such as safety fencing and barriers which may include plastics and metal,
- excess fill/soil from works on the road approaches, including excess materials from deconstructing sidetrack,
- green waste from vegetation clearing,
- domestic waste including food scraps, aluminium cans, glass bottles, plastic and paper containers, and putrescible waste generated by site construction personnel, and
- fuel or other chemical spills on site.

Among other things, waste materials must be managed in accordance with relevant EPA guidelines and disposed of at an appropriate waste management facility. Waste produced during construction will be managed in accordance with the waste management hierarchy principles of the Waste Avoidance and Resource Recovery Act 2001, within which waste avoidance is a priority, followed by re-use and recycling/reprocessing, with disposal as a last resort[57].

Overall waste generated by the proposal is not expected to be in great volumes and no significant or long-term impact is expected if the safeguards and mitigation measures recommended in the REF are implemented (refer to **Section 6**).

[57] Waste Avoidance and Resource Recovery Act 2001. State of New South Wales. (2022). (Accessed: 13/08/2024)

5.8.3. Safeguards and mitigations

No significant or long-term impacts are likely to occur to due to impacts from chemical or waste management attributed to the project if the safeguards and mitigation measures outlined in **Table 14** are implemented. For the full list of recommended safeguards and mitigation measures, refer to **Section 6**.

TABLE 14: CHEMICAL AND WASTE MANAGEMENT SAFEGUARDS AND MITIGATIONS

Potential impact	Safeguards and mitigation measures
Chemicals and/or waste are accidentally released from the site	Aim to locate the following facilities at least 50 m away from any drainage lines or water bodies (i.e. Crisps Creek and Mulwaree River): • fuel, oil, and other chemical stores. • refuelling, refilling, and maintenance areas. • wash down bays. Note: Any area where fuel or other chemicals are stored or transferred to/from containers must be placed in at least one impervious bund to manage the risk of spills.
Waste material would be generated during construction activities	• A resource and waste management plan will be prepared and implemented as part of the CEMP. • All waste should be assessed, classified, managed, and disposed of in accordance with the EPA's Waste Classification Guidelines . • All waste materials removed from the site directed to a waste management facility lawfully permitted to accept the materials. • Reuse and recycling options should be identified for materials generated during construction. • An unexpected finds protocol should be established and included in management plans for the construction phase to address risks posed by fill or other potentially contaminated materials which may be encountered during construction works. **DO NOT:** • Burn waste on site as this may create air quality and other hazards. • Contaminate green "waste" with weeds, brambles, willows, or other materials that are likely to prevent it being used as mulch/spread weeds post-construction. • Leave any waste on the site on the completion of works.

5.9. Traffic and access

5.9.1. Existing environment

Bungendore Road is a sealed rural road connecting Tarago to Bungendore, providing access to the rural areas between the two townships. It is approximately 14.2 km long, connecting Tarago Road 15 km southwest of Tarago to Goulburn Road in Tarago. It primarily services Tarago residents, rural residents and agricultural properties.

The road is currently impeded by the landslip event, with one lane closed and portal traffic lights in place to control traffic.

5.9.2. Impact assessment

In the short term, the project will have some unavoidable adverse impacts on local traffic movement due to an increase in construction and staff vehicles entering the site. However, safeguards/mitigation measures set out in **Section 6**, and the preparation of a TMP would minimise delays/disruptions where possible.

In the longer term the project will remediate the landslip, thus restoring two lane access on Bungendore Road and reducing the likelihood of further landslip events.

No adverse or significant impact to traffic and access is likely if the safeguards and mitigation measures recommended in the REF are implemented (refer to **Section 6**).

5.9.3. Safeguards and mitigations

No significant or long-term impacts are likely to occur to due to changed traffic conditions attributed to the project if the safeguards and mitigation measures outlined in **Table 15** are implemented. For the full list of recommended safeguards and mitigation measures, refer to **Section 6**.

TABLE 15: TRAFFIC SAFEGUARDS AND MITIGATIONS

Potential impact	Safeguards and mitigation measures
Road works create traffic delays, hazards, and community complaints	A Traffic Management Plan (TMP) will be prepared and will address measures to limit the potential of extended delays to road users during construction. Ensure the TMP is developed and implemented so that it enables: • road workers to work safely, • road users to travel around, past or through the work site safely, • separation of road workers and road users wherever possible, • timely notification of changed arrangements to road users, including freight operators e.g., through Live Traffic, social media etc, • inspect temporary traffic management arrangements at least weekly to ensure the work site is operating safely and efficiently, and • where residents may be temporarily isolated by works the TMP should have measures in place to ensure that residents needs are meet if accessibility is restricted for longer than expected.
Non-compliance with this REF results in environmental damage	• Include a community complaints procedure and register in the CEMP and ensure a response to all complaints within a reasonable timeframe.

5.10. Visual amenity and landscape

5.10.1. Existing environment

The landscape in which the project area is situated is composed of primarily agricultural landscapes, areas of residential housing and some areas of industry. There are areas bounded by native forest with varying degrees of disturbance and modification, with some areas exhibiting a native structure and composition while other areas are being cleared for agriculture. Exotic overstory species are also present above the riparian corridor of the Mulwaree River, particularly along the southern side of Bungendore Road. The road runs alongside the Mulwaree River, which has a relatively high water quality.

Key receivers include:

- road users, and
- residences.

5.10.2. Impact assessment

In the short term, the project will involve setting up a construction site, setting up stockpile areas, and the removal of native vegetation. These have the potential to temporarily affect views for residents and road users within the vicinity of the project area.

Minimal vegetation clearing will be required and planned construction is largely limited to remediating areas of landslip, therefore the majority of works occurring within the current roadway and areas of disturbance, resulting in minimising changes to the natural amenity. Impacts to native vegetation, and potential erosion from soil exposure, will be mitigated through rehabilitation of each area disturbed by proposed activities.

The proposal may improve visual amenity by remediating the areas of landslip and exposed soil.

Overall, no significant or long-term impact is likely if the safeguards and mitigation measures recommended in the REF are implemented (refer to **Section 6**).

5.10.3. Safeguards and mitigations

No significant or long-term impacts are likely to occur to the visual amenity or landscape of the project if the safeguards and mitigation measures outlined in **Table 16** are implemented. For the full list of recommended safeguards and mitigation measures, refer to **Section 6**.

TABLE 16: VISUAL AMENITY SAFEGUARDS AND MITIGATIONS

Potential impact	Safeguards and mitigation measures
Works create an eyesore and community complaints	• Construction activities should be undertaken during the day. Outside of construction hours, all machinery/ equipment should be removed from the embankments and housed in temporary laydown areas. • The site should be kept neat and clean of general litter for the duration of works. • Rehabilitate and revegetate the site as appropriate. **DO NOT** • use exotic (pasture) grass seed in areas dominated by native grasses unless they are sterile – invasion of native plant communities by exotic perennial grasses is a Key Threatening Process under NSW law. Check with project Ecologist prior to using any non-local/native seed.

5.11. Socio-economic considerations

5.11.1. Existing environment

The proposal aims to remediate a landslip which currently impedes traffic on a major road providing access to Tarago township (see **Section 1.3**). Bungendore Road provides services to Tarago township and rural areas south of Tarago. Not remediating the situation will have negative consequences for residents, local businesses, industries and visitors, and impair the capacity of emergency services to respond effectively to incidents such as motor vehicle accidents, bushfire or health emergencies.

5.11.2. Impact assessment

The proposal may result in minor access and amenity impacts on the local community, tourists and freight servicing varying industries which include the following:

- Approximately 12 weeks of impeded access through Bungendore Road,
- potential increase in construction traffic due to the delivery of plant, materials, and construction personnel,
- increases in noise due to the operation of construction plant and equipment,
- visual impacts associated with construction work, and
- potential dust disturbance due to exposed soils.

However, the magnitude of such impacts is likely to be low compared to the long-term community benefits of remediating the landslip which has caused closure of the south lane, impeding local traffic flow through a major road that connects residents to their properties, local businesses and industries. Impacts would be localised, minor, coordinated and temporary and would be managed through the relevant mitigation measures provided in **Section 6**.

5.11.3. Safeguards and mitigations

No significant or long-term socio-economic impacts are likely to attributed to the project if the following safeguards and mitigation measures outlined in **Table 17** are implemented. For the full list of recommended safeguards and mitigation measures, refer to **Section 6**.

TABLE 17: SOCIO-ECONOMIC SAFEGUARDS AND MITIGATIONS

Potential impact	Safeguards and mitigation measures
Isolating residents on Bungendore Road	• Coordination of construction activities with impacted residents to allow for preparation for closed roads, • Construction and road closure subject to appropriate conditions, i.e. road closures will not be instated around potentially hazardous weather events such as 'extreme' or higher fire danger rating periods.

5.12. Cumulative environmental impacts

5.12.1. Existing environment

An activity may not have a significant impact in its own right but, when combined with similar activities over a broader scale, can create significant cumulative impacts on one or more environmental matters. Both existing and likely future activities need to be considered under clause 171 (2) of the EP&A Regulation.

5.12.2. Impact assessment

As part of the Goulburn Mulwaree Council (GMC) LGA road infrastructure system, the remediation of the landslip of Bungendore is included in Council's maintenance and construction of roads. Road maintenance and construction might have cumulative impacts due to the works involved on multiple roads in the areas. Such impacts might include:

- increased traffic including heavy vehicles,
- noise emissions and air quality impacts, and
- vegetation clearance.

The temporary increase in traffic, noise emissions and air quality impacts would be localised and limited to the project sites.

No other road maintenance projects have been identified within close proximity.

Cumulative vegetation impacts

The project will require the removal or disturbance of up to 0.32 ha of mixed native and exotic vegetation, contributing to the cumulative impacts of road construction and maintenance throughout Goulburn Mulwaree Council LGA. This clearance of vegetation results in a reduction in the amount of native vegetation within the locality, however, is not considered to contribute to the cumulative impacts in any substantial way due to the relatively small area and existing disturbance due to the landslip event.

Two TECs were identified within the project area, Montane Peatlands and Swamps as well as Werriwa Tablelands Cool Temperate Grassy Woodland. The removal or disturbance of vegetation belonging to these communities will contribute to the cumulative impacts on them, however it is not considered to be substantial due to the relatively small area and disturbed nature of the area due to the landslip.

The impact of vegetation and other habitat within the project area would result in a cumulative decrease in habitat for threatened fauna. However, as with the clearance of native vegetation, the proposal is not considered to contribute significantly to the loss of habitat within the broader Tarago locality due to its modified nature and small scale compared to the available habitat within the surrounding landscape.

6. Environmental safeguards and mitigation measures

A range of environmental safeguards and mitigation measures are recommended and required to avoid, minimise, and mitigate the project's short and long-term environmental impacts.

6.1. Key stakeholders

Key stakeholders for the project will include:

- Project Manager,
- Site Supervisor, and
- individual construction workers, who will need to be inducted into the actions that are appropriate or necessary on this site.

6.2. Key documents

Key documents for the project will include the following site-specific plans:

- Construction Environmental Management Plan (CEMP), and
- Traffic Management Plan (TMP).

An Unexpected Finds Procedure (UFP), which can be of a more general nature, is also required to ensure a timely and effective response to matters including:

- suspected contaminated soils and Acid Sulfate Soils,
- chemical spills,
- threatened species or habitat, and
- the discovery of human remains, or suspected Aboriginal heritage finds.

All of these documents will need to:

- align with, and be incorporated into this REF,
- be put in place before work begins, and
- inform induction training for construction workers.

6.3. Key safeguards and mitigation measures

Safeguards and mitigation measures are required to avoid, minimise, and mitigate the short and long-term environmental impacts from the project.

Mitigation measures for the project are presented in **Table 18** and are structured around the categories of environmental impact in **Section 5** of this REF, with additional actions required before works commence presented in **Section 7**.

TABLE 18: SAFEGUARDS AND MITIGATION MEASURES

Impact type	Potential impact	Safeguards and mitigation measures
General 	Non-compliance with this REF results in environmental damage	• Prepare a site-specific CEMP before any construction works commence that includes all the safeguards and mitigation measures set out in this REF. • Include a community complaints procedure and register in the CEMP and ensure a response to all complaints within a reasonable timeframe. • Ensure all workers are made aware of site sensitivities and unexpected finds procedure/s as part of their site induction.
Landforms, Geology and Soils (Erosion) 	Earthworks and excavation may result increased erosion risk and sedimentation of downstream waterways	• Avoid and minimise erosion by appropriate design. • Minimise vegetation removal and soil disturbance within riparian zone. Ensure any disturbed soils within or near the riparian zone are stabilized immediately. • Implement an Erosion and Sediment Control Plan (ESCP), including strict sedimentation controls, such as silt curtains for the Mulwaree River. • Utilise best practices such as those found in the *NSW Government's 2004 Managing Urban Stormwater: Soils and Construction Guidelines* (the Blue Book)[58]. • Undertake appropriate riparian and terrestrial vegetation rehabilitation works as soon as possible after completion of construction.
Contaminated Land/ Acid Sulfate Soils 	Chemicals are released that can cause serious damage to human health and the local environment	This impact is considered unlikely, however, be alert to the possibility that hazardous materials such as Acid Sulfate Materials and Asbestos-Containing Materials may be encountered during excavation work, and/or accidentally brought onto the site hidden in fill or other construction materials. • Ensure all workers are made aware of the unexpected finds procedure/s as part of their site induction. Do not hesitate to stop work if there are any unexpected finds of this nature and to seek advice from a suitably qualified environmental professional). • Avoid bringing contaminated materials onto site: source materials such as fill from Council quarries, companies selling material certified as clean fill or other reputable suppliers.
Water Quality/ Hydrology 	Change in flow and water quality of unnamed creeks and hydro lines and due to degradation of riparian vegetation, pollution, or sedimentation.	• Utilise best practices such as those found in the Blue Book. • Implement an Erosion and Sediment Control Plan (ESCP). • Closely monitor water quality, especially turbidity and surface appearance to ensure any problems are quickly identified and mitigated. • Stockpiles should be appropriately contained by sediment fencing or other materials prescribed in the Blue Book to ensure sediments do not enter waterways. • Stockpiles should also be located 40 m away from adjacent riparian areas and waterways. • Where stockpiles are unavoidably located within 40 m of riparian areas these are to be managed as follows: ▪ locate stockpiles at the furthest point from the waterway, ▪ use bunding or other controls to divert storm water and clean water around stockpiles, ▪ cover stockpiles when not in use, and ▪ monitor weather and plan for potential high rainfall and flooding. • Construction of rock fill embankment will require the removal of material from and deposition of rock fill into the Mulwaree River bank, safeguards for this process should include: ▪ Careful selection of clean materials for placement into the embankment, ▪ Installation of strict erosion and sedimentation controls for the structure, including in water as works are occurring within the waterway, and ▪ Returning flow and riparian area to pre-construction condition to minimise impacts to flow regimes.

[58] "the Blue Book" Managing Urban Stormwater: soils and construction -Volume 1. New South Wales Government. (2004).

Impact type	Potential impact	Safeguards and mitigation measures
	Chemicals and/or waste are accidentally released from the site	Aim to locate the following facilities at least 50 m away from any drainage lines or water bodies (i.e. Mulwaree River): • fuel, oil, and other chemical stores. • refuelling, refilling, and maintenance areas. • wash down bays. • Note: Any area where fuel or other chemicals are stored or transferred to/from containers must be placed in at least one impervious bund to manage the risk of spills.
Biodiversity – aquatic 	Degradation of instream and riparian vegetation	• Minimise disturbance to instream and riparian vegetation during construction by appropriate design and planning. • Establish exclusion zones within aquatic habitats and riparian zones in accordance with TfNSW *Biodiversity Management Guideline*[59]. • Undertake appropriate aquatic and riparian vegetation rehabilitation works as soon as possible after construction. • Council is in contact with NSW DPI Fisheries to apply for a permit to carry out construction within an area mapped as Key Fish Habitat.
	Obstruction to fish passage	• Council to install silt curtains within the Mulwaree River waterway to protect the downstream area from sedimentation, • Minimise instream works by appropriate design and construction methods. • If unavoidable, obtain permit to obstruct fish passage under NSW FM Act.
Biodiversity —terrestrial 	Native vegetation removal	• Ensure the CEMP includes plans showing areas to be cleared and areas to be protected, including exclusion zones, protected habitat features and revegetation areas. • Prior to the commencement of any works, a physical clearing boundary is to be demarcated and implemented. The demarcation of the exclusion zone will be in accordance with TfNSW *Biodiversity Management Guideline*[60]. • All vegetation removal should be limited to the minimum extent necessary to establishment of construction area, new causeways and approaches.
	Impacting native vegetation surrounding work sites	• Prior to the commencement of any works, a physical boundary is to be demarcated and implemented at work sites. The demarcation of the exclusion zone will be in accordance with TfNSW *Biodiversity Management Guideline*[61].
	Introduction, spread and/or establishment of exotic species	Strict weed management, monitoring and control practices should be implemented to minimise the spread of exotic species as follows: • Follow appropriate guidelines on weed management within *South East Regional Strategic Weed Management Plan 2023 - 2027*[62]. • Undertake appropriate weed control measures within the project area prior to proposed works taking place. • All vehicles to be inspected and, if necessary, cleaned before their first entry to the proposal area. • All machinery should be cleaned of foreign soil and vegetative matter to avoid the spread of *Phytophthora cinnamomi* pathogenic fungus (Myrtle Rust) and dispersal of seeds of non-native plants. • Control the movement of vehicles, machinery, and workers to minimise the potential for spread of weeds within and outside the proposal area. • Control weeds prior to commencement of works. • Correct disposal of 'green waste' containing significant weeds.

[59] Biodiversity Management Guideline – Protecting and managing biodiversity on Transport for NSW projects. State of New South Wales through Transport for NSW. (2024).
[60] Biodiversity Management Guideline – Protecting and managing biodiversity on Transport for NSW projects. State of New South Wales through Transport for NSW. (2024).
[61] Biodiversity Management Guideline – Protecting and managing biodiversity on Transport for NSW projects. State of New South Wales through Transport for NSW. (2024).
[62] South East Regional Strategic Weed Management Plan 2023 – 2027. State of New South Wales through Local Land Services. (2022).

Impact type	Potential impact	Safeguards and mitigation measures
	Native fauna at the site may be inadvertently injured during the course of construction works.	• Utilise best practices such as those set out in the TfNSW *Biodiversity Management Guideline*[63]. • Suitably qualified ecologists are to undertake a pre-clearing process as a final check for any threatened flora or fauna species that may have moved into the area since undertaking previous site inspections. • Suitably qualified ecologists are to undertake a pre-clearing process as a final check riparian areas for residing fauna, such as frogs, turtles, lizards and snakes, immediately prior to clearing to remove any fauna present. • Suitably qualified ecologists are to undertake a pre-clearing process as a final check prior to clearing to identify and relocate any Key's Matchstick Grasshopper (*Keyacris scurra*) individuals that may be present within the impact area prior to clearing. • Be careful around fauna, especially large animals (e.g. wombats), venomous animals (e.g. snakes, feral bees) or bats. • If any native fauna becomes injured during the course of construction works, the NSW WIRES should be contacted immediately. • Implement a stop-works procedure if threatened species are encountered during construction. • Implement a stop-works procedure if any fauna species are encountered and at risk of harm during construction. If a habitat feature (stick nest, tree, man-made structure with potential bat roosting habitat) needs to be cleared: • ensure appropriate equipment/operator is available to lower trees to the ground gently, • implement staged habitat clearing, • ensure preclearing inspections occur prior to undertaking clearing works to check for any residing fauna (e.g. using a pole camera to inspect cavities), • have a licensed wildlife carer vaccinated against Australian Bat Lyssavirus or ecologist on site to supervise clearing/habitat removal and check for residing fauna, • determine relocation point for displaced fauna and plan for the care of any injured, orphaned, or sick wildlife, and • maintain appropriate records of inspection processes and wildlife outcomes.
Heritage (both Aboriginal & Shared)	Unexpected and previously unidentified Aboriginal Heritage objects may be uncovered during construction.	• An unexpected heritage finds procedure should be developed prior to construction works taking place. • Ensure all workers are made aware of unexpected finds procedures and potential cultural sensitivities as part of their site induction. In the case of Aboriginal cultural heritage sites or material being discovered: • all work must cease in the vicinity of the find and project manager notified immediately, • a buffer zone of 10m should be fenced in all direction of the find and construction personnel made aware of the 'no go' zone, • NSW Heritage must be notified of the find and advice sought on the proper steps to be undertaken, and • after confirmation from NSW Heritage, a Cultural Heritage Consultant should be engaged to undertake assessment of the find and provide appropriate management recommendations to the proponent.
	Unexpected and previously unidentified archaeological relics may be uncovered during construction	If any unexpected archaeological relics are uncovered during construction, excavation must cease. An excavation permit or an exception notification may be required under the *Heritage Act 1977*[64]. • Ensure all workers are made aware of unexpected finds procedures as part of their site induction.

[63] Biodiversity Management Guideline – Protecting and managing biodiversity on Transport for NSW projects. State of New South Wales through Transport for NSW. (2024).
[64] Heritage Act 1977. State of New South Wales. (2024).

Impact type	Potential impact	Safeguards and mitigation measures
Noise and Vibration 	Noise and vibration impacts affect the mental and physical health of nearby people and animals	Utilise best practices such as those found in TfNSW *Biodiversity Management Guideline*[65]. As part of this: • Engage with/notify the community early to manage expectations of residents etc. • Quantify the likely noise and vibration emissions of construction equipment/work. • Identify key stakeholders who may be affected by excessive noise and vibrations. • Do not work outside of approved work hours. • Wherever possible, give local residents at least 7 days' notice of very noisy activities e.g., through roadside signage, social media etc.
Air Quality 	Dust, smoke, or other potentially harmful emissions are generated on site	• Avoid/stop work during strong winds or in conditions where high levels of dust or air-borne particulates are likely (e.g., above 20 km/hr). • Areas of exposed surface are to be minimised through construction site planning and programming, to reduce the area of potential construction dust emission sources. • All working areas should be stabilised as soon as practicable in order to minimise the generation of dust. • Cover vehicles transporting fill, waste or other materials that may produce dust or odours.
	Increased number of construction vehicles along local roads may impact on local air quality due to exhaust emissions	• Regular servicing of construction equipment is advised to help minimise exhaust emissions, and for the same reason, engines should not be left idling unnecessarily. • Where practicable, vehicles will be fitted with pollution reduction devices and switched off when not in use.
Chemical and waste management 	Chemicals and/or waste are accidentally released from the site	Locate the following facilities at least 50 m away from any drainage lines or water bodies (i.e. Mulwaree River): • fuel, oil, and other chemical stores. • refuelling, refilling, and maintenance areas. • wash down bays. Note: Any area where fuel or other chemicals are stored or transferred to/from containers must be placed in at least one impervious bund to manage the risk of spills.
	Waste material would be generated during construction activities	• A resource and waste management plan will be prepared and implemented as part of the CEMP. • All waste should be assessed, classified, managed, and disposed of in accordance with the EPA's Waste Classification Guidelines . • All waste materials removed from the site directed to a waste management facility lawfully permitted to accept the materials. • Reuse and recycling options should be identified for materials generated during construction. • An unexpected finds protocol should be established and included in management plans for the construction phase to address risks posed by fill or other potentially contaminated materials which may be encountered during construction works. **DO NOT:** • Burn waste on site as this may create air quality and other hazards. • Contaminate green "waste" with weeds, brambles, willows, or other materials that are likely to prevent it being used as mulch/spread weeds post-construction. • Leave any waste on the site on the completion of works.
Traffic 	Road works create traffic delays, hazards, and community complaints	A Traffic Management Plan (TMP) should be prepared and should address measures to limit the potential of extended delays to road users during construction. Ensure the TMP is developed and implemented so that it enables: • road workers to work safely, • road users to travel around, past or through the work site safely, • separation of road workers and road users wherever possible, and • timely notification of changed arrangements to road users, including freight operators e.g., through Live Traffic, social media etc.

[65] Biodiversity Management Guideline – Protecting and managing biodiversity on Transport for NSW projects. State of New South Wales through Transport for NSW. (2024).

Impact type	Potential impact	Safeguards and mitigation measures
		• inspect temporary traffic management arrangements at least weekly to ensure the work site is operating safely and efficiently.
Visual Amenity/ Landscape 	Works create an eyesore and community complaints	• Construction activities should be undertaken during the day. Outside of construction hours, all machinery/ equipment should be removed from the embankments and housed in temporary laydown areas. • The site should be kept neat and clean of general litter for the duration of works. • Rehabilitate and revegetate the site as appropriate. **DO NOT** • use exotic (pasture) grass seed in areas dominated by native grasses unless they are sterile – invasion of native plant communities by exotic perennial grasses is a Key Threatening Process under NSW law. Check with project Ecologist prior to using any non-local/native seed.
Socio-Economic Factors 	Isolating residents on Bungendore Road	• Coordination of construction activities with impacted residents to allow for preparation for closed roads, • Construction and road closure subject to appropriate conditions, i.e. road closures will not be instated around potentially hazardous weather events such as 'extreme' or higher fire danger rating periods.

6.4. Additional remediation activities

6.4.1. Works area remediation

On completion of construction and decommissioning of the project site, remediation of the work areas that have experienced clearing and have not been subject to permanent installation of a scour protection area will be carried out to further protect against erosion and weed establishment. A site rehabilitation plan is to be prepared and includes measures such as initial and ongoing weed management, installation of native upper, mid and groundcover plantings, and ongoing monitoring to ensure efforts are suitable to mitigate the overall short and long-term impacts of the works.

Remediation of the project area is to return impacted areas to previously native condition or better, this will involve the establishment of native indigenous tree species, midstory species and local grass species through direct seeding, seed-bearing hay, and/or planting of tube stock. It is recommended that trees and shrubs to be planted be aligned with the riparian landscape of the project area, and in any areas of disturbance on the north side of Bungendore Road woodland species are utilised.

The site should include canopy and midstory species such as:

- Ribbon Gum (*Eucalyptus viminalis*),
- Snow Gum (*E. pauciflora*),
- Brittle Gum (*E. mannifera*),
- Candlebark (*E. rubida*),
- Silver Wattle (*Acacia dealbata*),
- Black Wattle (*A. mearnsii*).
- Sticky Hop-bush (*Dodonaea viscosa*), and
- Blunt-lead Bitter-pea (*Daviesia mimosoides*).

It is recommended that native grasses, rushes and sedges be utilised throughout all impacted areas of the riparian corridor and woodland, species include:

- Spiny-headed Mat-rush (*Lomandra longifolia*),
- Weeping Grass (*Microlaena stipoides*),

- Kangaroo Grass (*Themeda triandra*),
- Wallaby Grass (*Rytidosperma* spp.),
- River Tussock (*Poa labillardierei* var. *labillardierei*),
- Tall Sedge (*Carex appressa*), and
- Rushes (*Juncus* spp.).

7. Action required before work commences

This is a working document and has been prepared based on information available at the time. Final concurrence from NSW DPI Fisheries is required. The REF may require amendment subject to advice and may be modified on receival of the project contractor's CEMP. For example, where a specific safeguard or mitigation measure is not achievable, an update to the impact assessment may be required.

7.1. Weed management

As discussed in **Section 6**, prior to any construction works being undertaken, the site should be managed to control invasive plants (e.g., Goulburn Mulwaree Council priority weeds[66], WoNS, HTEs, and other invasive plant species). Specific attention and care should be focussed on any areas containing the following invasive weeds:

- Blackberry complex (*Rubus fruticosus* sp. agg.),
- Serrated Tussock (*Nassella trichotoma*),
- Briar Rose (*Rosa rubiginosa*),
- African Lovegrass (*Eragrostis curvula*),
- St John's Wort (*Hypericum perforatum*),
- Black Locust (*Robinia pseudoacacia*),
- Tree Lucerne (*Chamaecytisus palmensis*),
- Bridal Creeper (*Asparagus asparagoides*),
- Sheep Sorrel (*Acetosella vulgaris*), and
- Umbrella Sedge (*Cyperus eragrostis*).

As the work area includes a riparian area, there are a limited number of herbicides registered for use around waterways due to the requirements to minimise impacts on water quality. Therefore, where possible physical/mechanical removal of weeds is likely better suited.

7.2. Conditions of approval to be checked/monitored

7.2.1. Fisheries permit

Council will contact NSW DPI Fisheries on possible issues regarding the application for a permit to carry out construction within areas mapped as Key Fish Habitat for the project area. Council has initiated application of a Part 7 Fisheries Permit, for the project which includes applications for dredging, reclamation works and obstruction to fish passage at Mulwaree River. No construction works are to be conducted until a permit for the project is received, and conditions incorporated into the contractor's CEMP.

Consultation with NSW DPI Fisheries will commence and will continue throughout the design and construction process for the project site, with any advice and conditions of permit/s incorporated into the contractor's CEMP.

[66] Local Weed Management Plan. Goulburn Mulwaree Council. (2019).

7.2.2. Additional conditions

Provided the safeguards and mitigation measures recommended in **Section 6** are implemented, no other permits or licenses appear to be required. This situation is, however, subject to change if, for example:

- relevant laws and policies change, or
- the project design undergoes significant change, or
- there are significant unexpected finds on site during the construction process.

If there are significant delays in the approval of the REF or commencement of construction work, this REF should be reviewed to ensure that it remains complete and accurate.

Please contact Ecology Consulting if this REF needs to be updated. You must not alter any report or plan we provide without our prior written consent.

8. REF determination

This Review of Environmental Factors has assessed the likely environmental impacts of a proposal by Goulburn Mulwaree Council for the proposed landslip remediation on Bungendore Road, Tarago, NSW.

Council has considered the potential environmental effects of the proposal and the effectiveness and feasibility of measures for reducing or preventing detrimental effects. It is determined that:

1. The proposed mitigation measures will be adopted and implemented;
2. Implementation of these mitigation measures will reduce the potential environmental impact of the proposed activity; and
3. An Environmental Impact Statement is not required for the proposed works if all mitigation measures in this REF are implemented by Council and its contractors.

8.1. Assessor declaration

This REF provides a true and fair review of the project in relation to its likely effects on the environment. It fully addresses all possible matters affecting or likely to affect the environment as a result of the project and provides sufficient information to determine whether there is likely to be a significant impact on the environment as a result of the project.

I have considered all environmental impacts and safeguards to the best of my knowledge and have sought advice where required.

Project name	Bungendore Road (Tarago) Upgrade
REF approved for release to client by Principal Ecologist Lesley Peden, Accredited Biodiversity Assessor NSW licence BAAS19005 Ecology Consulting Pty Ltd Lesley@ecologyconsulting.au	Signature: Date: 5/02/2025 
REF endorsed by Contractor Project Manager (Ben Lyons) Bungendore Road (Tarago) upgrade Capital 2 Coast Management ben.lyons@capital2coast.com.au	Signature:  Date: 06/02/2025

8.2. Determiner declaration and approval

I have reviewed this REF. This document will remain a working document until the CEMP and Fisheries report, mitigation measures and recommendations are incorporated. I consider that the project will not have a significant impact and can proceed subject to the controls outlined in this REF.

Determiner *Director of Assets and Operations* Goulburn Mulwaree Council	Signature:  Date: 11 February 2025

Appendix A: Biodiversity Inspection Report

A1 Methodology

This report was prepared based on a biodiversity inspection, which involved investigations of the terrestrial and aquatic ecology, and biodiversity values associated with the project area, including a desktop literature review, database searches (accessed August 2024 to January 2025) and site inspections for data collection (August and September 2024).

A1.1 Desktop assessment

Desktop research involved the search of relevant databases, including the following resources:

- Commonwealth EPBC Act Protected Matters Search Tool;
- National Atlas of Living Australia;
- Atlas of NSW Wildlife;
- NSW Threatened Biodiversity Profile tool;
- NSW Biodiversity Values Map;
- Fisheries NSW Spatial Data Portal;
- NSW eSpade soil and land information database;
- NSW SEED environmental data portal; and
- eBird hotspots in Lake Bathurst, Tarago Village, and Duck Flat Travelling Stock Reserve (southern section).

All marine species and listed marine habitats were excluded from the search results as the project site does not contain any marine habitat.

A1.2 Site inspection

In order to assess the impacts of the proposed works, the project area was visited on 21 August 2024 and 4 September 2024 (see Table A 1). While on-site, the following were completed:

- full floristic and vegetation integrity plot (BAM plot) in accordance with the NSW Government's BAM method to assess the vegetation integrity of the plant community type/s (PCTs) that is proposed to be impacted by the project (with the exception of aquatic communities),
- collection of vegetation data from rapid vegetation validation points (rapid BAMs),
- random meander search for threatened flora and threatened ecological communities (TECs),
- recording of opportunistic diurnal fauna observations, and
- data collection on key habitat features and a habitat suitability assessment for threatened fauna.

TABLE A 1: WEATHER CONDITIONS BEFORE AND DURING THE FIELD INSPECTION

Data from Bureau of Meteorology for the nearest weather station to the project area (30 km away), at Goulburn Airport {station 070330}. Fieldwork dates are in bold.

Date	Specific Survey	Min Temp °C	Max Temp °C	Rainfall (mm)	Max Wind Gust (km/h)
16 August 2024	-	5.1	17.5	0.2	57
17 August 2024	-	2.7	13.1	1.0	56
18 August 2024	-	5.4	14.5	1.4	37
19 August 2024	-	6.0	14.4	1.8	20
20 August 2024	-	1.0	18.3	0	44
21 August 2024	**Preliminary site inspection**	**9.3**	**16.1**	**0**	**65**
30 August 2024	-	7.1	20.0	0	78
31 August 2024	-	8.0	15.2	0	81
1 September 2024	-	9.8	17.6	0	87
2 September 2024	-	11.2	13.1	0	96
3 September 2024	-	1.1	14,4	0	50
4 September 2024	**Follow up biodiversity inspection**	**-2.7**	**19.7**	**0**	**44**

A1.3 Survey limitations

The ecological dataset provided for the site was restricted to what was observed during site assessments.

The timing of the survey may not have coincided with the emergence times of some species of flora and fauna, such as seasonally flowering herbs, seasonal migratory fauna, or nocturnal fauna. Conditions at the time of fieldwork were suitable to enable most plant species in the project area to be identified with confidence. However, the results of fieldwork may not be complete because some plants and animals are only detectable during certain times of year or after weather events, and some species can only be identified to species when in flower. Surveys were completed during winter and early spring and therefore were not completed at the most opportune time to observe seasonal flowering herbs or migratory fauna. Nevertheless, survey work was considered appropriate given the modified nature of the proposed works area of the site and unseasonal wet conditions allowing a greater than usual detection of native grasses and forbs.

For fauna, it should also be noted that fieldwork was not intended to provide a comprehensive survey of all the animal species that may utilise the site over time. However, habitat surveys were undertaken for the quantity and quality of habitat that may be suitable for different species within the project site.

TABLE A 2: OPTIMAL SURVEY PERIODS FOR KEY THREATENED FLORA SPECIES

Species name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Comments
Dwarf Kerrawang (*Commersonia prostrata*)	O	O	O	O	O	O	O	**O**	**O**	O	O	O	A low spreading shrub that forms a ground-hugging mat which is identifiable through its leaves and flower morphology (when in flower).
Creeping Hop-bush (*Dodonaea procumbens*)	O	O	O	O	O	O	O	**O**	**O**	O	O	O	A low spreading shrub that forms a ground-hugging mat which is identifiable through its leaves and 'hop' shaped fruits.
Black Gum (*Eucalyptus aggregata*)	O	O	O	O	O	O	O	**O**	**O**	O	O	O	Identifiable throughout year by a number of features such as epicormic growth or juvenile foliage.
Hoary Sunray (*Leucochrysum albicans* subsp. *tricolor*)	O	O	O	O	S	S	S	**S**	**O**	O	O	O	*Leucochrysum albicans* subsp. *tricolor* is distinguished from the other subspecies within *L. albicans* by its white involucre bracts and narrow, linear-oblanceolate leaves.
Round-leaf Wilsonia (*Wilsonia rotundifolia*)	O	O	O	O	O	O	O	**O**	**O**	O	O	O	Prostrate forb that can be identified by its leaf morphology.

Threatened flora species were targeted based on those with a potential to likely likelihood of occurrence (see **A7.2**). Site inspection and targeted survey period is indicated by solid box and bold letters.

Legend

O = optimal survey period

S = sporadic flowering/other identifiable features

U = unsuitable for most survey work (species may be dormant or not identifiable)

A2 Existing environment

A2.1 Vegetation

Work area

The vegetation with the proposed work area is composed of areas of exotic species dominance and native species dominance. The northern extent of the proposed work area to Bungendore Road is composed primarily of native vegetation, with areas directly surrounding the road containing a high composition of exotic species. Proposed work areas of the Mulwaree River were observed to contain a mixed composition of species.

Where present within the proposed work area, overstory vegetation is primarily native, but also includes exotic trees which line the Mulwaree River corridor. Exotic species in this area include Black Locust (*Robinia pseudoacacia*), Elm (*Ulmus* sp.) and a host of exotic fruit trees. Native overstory species, which primarily occur on the northern side of Bungendore Road include mostly regenerating species. This area is surrounded by mature native vegetation, primarily to the west of the proposed work area. Native overstory species recorded include:

- Snow Gum (*Eucalyptus pauciflora*),
- Brittle Gum (*E. mannifera*),
- Broad-leaved Peppermint (*E. dives*), and
- Silver Wattle (*Acacia dealbata*).

Midstory vegetation is sparse-moderate within the proposed work area. It has a variable cover which is mostly present within areas affected by the landslip and directly surrounding. These species are primarily native within these areas. Native midstory vegetation is sparse to absent in the Mulwaree River corridor and included one individual of regenerating Bottlebrush (*Callistemon* sp.) and few Silver Wattle. Exotic midstory vegetation composes the greatest cover surrounding the Mulwaree River and includes primarily the species Tree Lucerne (*Chamaecytisus palmensis*). Native midstory species that form the highest cover within the project area, primarily on the northern side of Bungendore Road include:

- Black Wattle (*Acacia mearnsii*),
- Cassinia (*Cassinia* spp.),
- Sticky Hop-bush (*Dodonaea viscosa*),
- Blunt-lead Bitter-pea (*Daviesia mimosoides*),
- Common Star-hair (*Astrotricha ledifolia*), and
- Hoary Guinea Flower (*Hibbertia obtusifolia*).

Groundlayer vegetation is variable in composition within the proposed work area, with areas surrounding and south of the Bungendore Road recording a greater exotic species cover than north of the road which is primarily native in composition. The Mulwaree River corridor similarly recorded a mixed composition of native and exotic groundlayer species. Native species which were recorded to have the greatest cover within the proposed work area include:

- Spear Grasses (*Austrostipa* spp.),
- Kangaroo Grass (*Themeda triandra*),
- Wallaby Grasses (*Rytidosperma* spp.),
- Purple Wiregrass (*Aristida ramosa*),

- Mat-rushes (*Lomandra* spp.),
- River Tussock (*Poa labillardierei* subsp. *labillardierei*)
- Weeping Grass (*Microlaena stipoides*),
- Common Couch (*Cynodon dactylon*)
- Kidney Weed (*Dichondra repens*), and
- Native Geranium (*Geranium solanderi*).

Several weeds classified as Weeds of National Significance (WoNS), High Threat Exotic (HTE) and priority weed species were identified within the proposed work area, such as:

- Blackberry complex (*Rubus fruticosus* sp. agg.),
- Serrated Tussock (*Nassella trichotoma*),
- Briar Rose (*Rosa rubiginosa*),
- African Lovegrass (*Eragrostis curvula*),
- St John's Wort (*Hypericum perforatum*),
- Black Locust (*Robinia pseudoacacia*),
- Tree Lucerne (*Chamaecytisus palmensis*),
- Bridal Creeper (*Asparagus asparagoides*),
- Sheep Sorrel (*Acetosella vulgaris*), and
- Umbrella Sedge (*Cyperus eragrostis*).

Of these species, Blackberry was recorded as the most abundant and occurs in large infestations throughout sections of the proposed work area, particularly along the banks of the Mulwaree River and surrounding the landslip on the northern side of Bungendore Road. St John's Wort is present in minor to moderate patches on the northern side of Bungendore Road. Species such as Briar Rose, African Lovegrass, Sheep Sorrel, Umbrella Sedge, Serrated Tussock, Tree Lucerne and Black Locust primarily occur surrounding the Bungendore Road verge.

For a complete list of the recorded species within the project area and their legislative status see **Section A3.1**.

A2.2 Plant Community Type (PCT)

The project area is situated on the northern side of Mulwaree River, with the northern bank and minor areas within the river also included in the project area. The project area exhibits floristic composition characteristics that align with the presence of an open woodland, dry sclerophyll forest and montane bogs. The NSW State Vegetation Type Map (SVTM) mostly aligns with the determined present PCTs, which are:

- PCT 3338 – Southern Tableland Forest Hollow Grassy Woodland,
- PCT 3744 – Palerang Hills Peppermint Dry Shrub Forest, and
- PCT 3932 – Central and Southern Tableland Swamp Meadow Complex.

THESE PCTS DESCRIPTIONS AND JUSTIFICATIONS ARE LISTED BELOW IN TABLE A 3 AND TABLE A 4

. Of these PCTs, 3338 and 3932 are associated with TECs. Further discussion of the presence of TECs can be found in **Appendix A7.1**.

TABLE A 3: PCT (3338) DETERMINATION AND DESCRIPTION

PCT filter input and determination		
Observed vegetation formation	Grassy Woodlands	
Vegetation class	Tableland Clay Grassy Woodlands	
IBRA Region	South East Highlands	
IBRA Sub-region	Monaro	
Species used for PCT justification	**Species name**	**Estimated percentage cover (%)**
	Snow Gum (*Eucalyptus pauciflora*)	< 5
	Brittle Gum (*E. mannifera*)	< 10
	Broad-leaved Peppermint (*E. dives*)	1
	Silver Wattle (*Acacia dealbata*)	< 15
	Common Cassinia (*Cassinia aculeata*)	< 5
	Kangaroo Grass (*Themeda triandra*)	< 5
	Purple Wiregrass (*Aristida ramosa*)	< 10
	Wallaby Grass (*Rytidosperma* spp.)	< 5
	Tall Stipa (*Austrostipa bigeniculata*)	< 3
	Spiny-headed Mat-rush (*Lomandra longifolia*)	< 10
	Wattle Mat-rush (*Lomandra filiformis*)	< 2
PCT filter outputs	The project area's associated bioregion and the remnant understory and overstory species that are listed above were entered into the BioNet vegetation classification database and the top five results are listed below: • PCT 3374 – Goulburn Tableland Peppermint Grassy Forest, • PCT 3375 – Monaro-Queanbeyan Rolling Hills Grassy Forest, • PCT 3376 – Southern Tableland Grassy Box Woodland, • PCT 3338 – Southern Tableland Forest Hollow Grassy Woodland, and • PCT 3370 – Central Tableland Red Stringybark Grassy Forest. Of the above listed PCTs, PCT 3338 was assessed as mostly closely aligning with the communities' recorded features including, floristic composition, landscape position and described geology. This community is also mapped by the STVM as occurring within the project area. The other four filtered PCTs mostly do not contain an overstory composition that closely aligns with the project area.	
State Vegetation Type Mapping	The STVM identifies the following PCTs as present within 1 km or occurring within the project area: • PCT 3303 – Central Tableland Ribbon Gum Sheltered Forest, • PCT 3949 – Southern Highlands sand Swamp Sedgeland, • PCT 3338 – Southern Tableland Forest Hollow Grassy Woodland, • PCT 3919 – Southern Highlands Wet Swamp Heath, • PCT 3744 – Palerang Hills Peppermint Dry Shrub Forest, • PCT 3376 – Southern Tableland Grassy Box Woodland, • PCT 3734 – Central Tableland Dry Slopes Stringybark-Box Forest, • PCT 3415 – Southern Tableland Red Grass – Spear Grass Grassland, • PCT 3747 – Southern Tableland Western Hills Scribbly Gum Forest, and • PCT 3347 – Southern Tableland Creekflat Ribbon Gum Forest. Several PCTs have been identified by the STVM as occurring within 1 km of the project area. Of these PCTs identified, PCT 3338 most closely matches the floristic composition of where this PCT occurs. The BioNet description of this PCT identifies Snow Gum as the dominant overstory species and Kangaroo Grass as one of the dominant groundcover species. Both align with the presence of this PCT across sections of the project area. This PCT occurs on lower slopes and broad valley floors, characteristics that also align with the presence of this PCT within the project area.	
Justification	It has been determined that PCT 3338 - Southern Tableland Forest Hollow Grassy Woodland, most appropriately meets the observed characteristics of the community recorded within the project area. This was determined by: • Matching vegetation formation, • Occurrence within IBRA region and IBRA sub-region, and	

	• Matching overstory and understory composition.	
Determined PCT		
Vegetation type	**PCT ID**	3338
	Common community name	Southern Tableland Forest Hollow Grassy Woodland
	Vegetation formation	Grassy Woodlands
	Vegetation class	Tableland Clay Grassy Woodlands
Percentage cleared (in NSW)	96.44 %	
PCT Description (BioNet)	This community is characterised as a mid-high to tall sclerophyll grassy woodland to open forest that occurs on gentle lower slopes and broad valley floors of undulating tableland landscapes in north-east parts of the Southern Tablelands. The known distribution is from Queanbeyan east to Braidwood and Charleyong, and north to Laggan, Taralga and Uringalla Creek. A sparse to mid-dense tree canopy very frequently includes Snow Gum (*Eucalyptus pauciflora*), occasionally with Candlebark (*E. rubida*). A distinct shrub layer is often absent, and the most common shrub species are occasional small sub-shrubs Curved Rice-flower (*Pimelea curviflora*) and Creeping Bossiaea (*Bossiaea prostrata*), with Native Cranberry (*Astroloma humifusum*), Urn Heath (*Melichrus urceolatus*), or the taller Black Wattle (*Acacia mearnsii*) recorded rarely. The ground layer is characteristically grassy, almost always dominated by Kangaroo Grass (*Themeda triandra*), very frequently with other grasses Weeping Grass (*Microlaena stipoides*) and Snow Grass (*Poa sieberiana*), commonly with Native Wheatgrass (*Elymus scaber*) and occasionally Purple Wiregrass (*Aristida ramosa*), Fine-leaved Snow Grass (*Poa meionectes*), Short-hair Plume Grass (*Dichelachne micrantha*) or various wallaby Grass species (*Rytidosperma caespitosum, R. pilosum, R. racemosum* or *R. laeve*). The daisies Common Everlasting (*Chrysocephalum apiculatum*), Scaly Buttons (*Leptorhynchos squamatus*) and Lemon Beauty-heads (*Calocephalus citreus*) are also common to occasional components of this community, along with a diverse suite of forbs that commonly include Small St John's Wort (*Hypericum gramineum*), Poverty Raspwort (*Gonocarpus tetragynus*), Stinking Pennywort (*Hydrocotyle laxiflora*), Wattle Mat-rush (*Lomandra filiformis*) and Yellow Rush-lily (*Tricoryne elatior*), and occasionally Common Woodruff (*Asperula conferta*), Variable Plaintain (*Plantago varia*), Two-flowered Knawel (*Scleranthus biflorus*) or Kidney Weed (*Dichondra repens*).	
Condition (zones)	This community occurs as a single vegetation zone within the project area. This being predominately composed of native vegetation and containing a semi-mature overstory with low-moderate amounts of regeneration. Understory vegetation has a mixed composition, with areas displaying both exotic and native dominance.	
TEC status (BC Act)	Werriwa Tablelands Cool Temperate Grassy Woodland in the South Eastern Highlands and South East Corner Bioregions.	
TEC status (EPBC Act)	No associated TEC.	

TABLE A 4: PCT (3744) DETERMINATION AND DESCRIPTION

PCT filter input and determination		
Observed vegetation formation	Dry Sclerophyll Forests (Shrubby sub-formation)	
Vegetation class	Southern Tableland Dry Sclerophyll Forests	
IBRA Region	South East Highlands	
IBRA Sub-region	Monaro	
Species used for PCT justification	**Species name**	**Estimated percentage cover (%)**
	Broad-leaved Peppermint (*Eucalyptus dives*)	< 15
	Brittle Gum (*E. mannifera*)	< 10
	Snow Gum (*Eucalyptus pauciflora*)	< 5
	Silver Wattle (*Acacia dealbata*)	< 3
	Shiny Cassinia (*Cassinia longifolia*)	< 5
	Common Cassinia (*Cassinia aculeata*)	< 3
	Broad-leaved Hickory (*Acacia falciformis*)	< 3
	Weeping Grass (*Microlaena stipoides*)	< 10
	Spiny-headed Mat-rush (*Lomandra longifolia*)	< 15
	Native Geranium (*Geranium solanderi*)	< 2
	Wallaby Grass (*Rytidosperma racemosum*)	< 2
PCT filter outputs	The project area's associated bioregion and the remnant understory and overstory species that are listed above were entered into the BioNet vegetation classification database and the top five results are listed below: • PCT 3747 – Southern Tableland Western Hills Scribbly Gum Forest, • PCT 3742 – Monaro Mountains Snow Gum Shrub Forest, • PCT 3739 – Monaro Hills Brittle Gum Exposed Forest, • PCT 3744 – Palerang Hills Peppermint Dry Shrub Forest, and • PCT 3730 – Bondo Slopes Dry Stringybark Forest. Of the above listed PCTs, PCT 3744 was assessed as mostly closely aligning with the communities' recorded features. include, floristic composition, landscape position and described geology. This community is also mapped by STVM as occurring within the project area. The other four filtered PCTs mostly do not contain an overstory composition that closely aligns with the project area.	
State Vegetation Type Mapping	The STVM identifies the following PCTs as present within 1 km or occurring within the project area: • PCT 3303 – Central Tableland Ribbon Gum Sheltered Forest, • PCT 3949 – Southern Highlands sand Swamp Sedgeland, • PCT 3338 – Southern Tableland Forest Hollow Grassy Woodland, • PCT 3919 – Southern Highlands Wet Swamp Heath, • PCT 3744 – Palerang Hills Peppermint Dry Shrub Forest, • PCT 3376 – Southern Tableland Grassy Box Woodland, • PCT 3734 – Central Tableland Dry Slopes Stringybark-Box Forest, • PCT 3415 – Southern Tableland Red Grass – Spear Grass Grassland, • PCT 3747 – Southern Tableland Western Hills Scribbly Gum Forest, and • PCT 3347 – Southern Tableland Creekflat Ribbon Gum Forest. Several PCTs have been identified by the STVM as occurring within 1 km of the project area. Of these PCTs identified, PCT 3744 most closely matches the floristic composition of where this PCT occurs. The BioNet description of this PCT identifies Broad-leaved Peppermint as the dominate overstory species and Weeping Grass and Mat-rush species as some of the dominant groundcover species, both of which align with the presence of this PCT across sections of the project area.	
Justification	It has been determined that PCT 3744 – Palerang Hills Peppermint Dry Shrub Forest, most appropriately meets the observed characteristics of the community recorded within the project area. This was determined by: • Matching vegetation formation, • Occurrence within IBRA region and IBRA sub-region, and • Matching overstory and understory composition.	

Determined PCT		
Vegetation type	**PCT ID**	3744
	Common community name	Palerang Hills Peppermint Dry Shrub Forest
	Vegetation formation	Dry Sclerophyll Forests (Shrubby sub-formation)
	Vegetation class	Southern Tableland Dry Sclerophyll Forests
Percentage cleared (in NSW)	70.77 %	
PCT Description (BioNet)	This community is characterised as a tall dry grassy sclerophyll open forest that is restricted to areas of relatively shallow rocky soils on moderately high, cool plateaus of the Oberon and Crookwell subregions of the South Eastern Highlands. It predominantly on Lachlan Orogen sedimentary rocks and occasionally on other adjacent geologies. Its overstory vegetation is characterised by a sparse to mid-dense canopy that almost always includes Broad-leaved Peppermint (*Eucalyptus dives*), with occasional associates Mountain Gum (*Eucalyptus dalrympleana*) or Red Stringybark (*Eucalyptus macrorhyncha*). The shrub layer is often sparse to very sparse and commonly includes scattered Hoary Guinea Flower (*Hibbertia obtusifolia*) and Urn Heath (*Melichrus urceolatus*), occasionally with Silver Wattle (*Acacia dealbata*) or Hop Bitter-pea (*Daviesia latifolia*). The grassy ground layer almost always includes Snow Grass (*Poa sieberiana*), commonly with Weeping Grass (*Microlaena stipoides*), Redanther Wallaby Grass (*Rytidosperma pallidum*), Kangaroo Grass (*Themeda triandra*) and occasional Wallaby Grass (*Rytidosperma racemosum*). Common forbs include Poverty Raspwort (*Gonocarpus tetragynus*), Wattle Mat-rush (*Lomandra filiformis*), Stinking Pennywort (*Hydrocotyle laxiflora*), Small St John's Wort (*Hypericum gramineum*), Two-flower Knawel (*Scleranthus biflorus*), False Sarsaparilla (*Hardenbergia violacea*), Arrowhead Violet (*Viola betonicifolia*), and the small subshrub Hovea (*Hovea linearis*).	
Condition (zones)	This community occurs as a single vegetation zone within the project area. This being predominately composed of native vegetation and containing a mostly mature overstory with moderate amounts of regeneration. Understory vegetation has a mixed composition, with areas displaying both exotic and native dominance.	
TEC status (BC Act)	No associated TEC.	
TEC status (EPBC Act)	No associated TEC.	

TABLE A 5: PCT (3932) DETERMINATION AND DESCRIPTION

PCT filter input and determination		
Observed vegetation formation	Freshwater Wetlands	
Vegetation class	Montane Bogs and Fens	
IBRA Region	South East Highlands	
IBRA Sub-region	Monaro	
Species used for PCT justification	**Species name**	**Estimated percentage cover (%)**
	A Rush (*Juncus* spp.)	< 20
	Tall Sedge (*Carex appressa*)	< 5
	Broadleaf Cumbungi (*Typha orientalis*)	< 2
	Common Couch (*Cynodon dactylon*)	< 5
	Swamp Foxtail (*Pennisetum alopecuroides*)	< 3
	Purple Loosestrife (*Lythrum hyssopifolia*)	< 1
	River Buttercup (*Ranunculus inundatus*)	< 1
	A Water Milfoil (*Myriophyllum* sp.)	< 2
	Creeping Knotweed (*Persicaria prostrata*)	< 1
PCT filter outputs	The project area's associated bioregion and the remnant understory and overstory species that are listed above were entered into the BioNet vegetation classification database and the top five results are listed below: • PCT 3347 – Southern Tableland Creekflat Ribbon Gum Forest, • PCT 3377 – Southwest Foothills Apple Box Grassy Forest, • PCT 3930 – Bondo Montane Flats Swamp Woodland, • PCT 4085 – Southwest Tableland Gorges Riparian Shrubland, and • PCT 3932 – Central and Southern Tableland Swamp Meadow Complex. Of the above listed PCTs, PCT 3932 was assessed as mostly closely aligning with the communities' recorded features. include, floristic composition, landscape position and described geology. This community is also mapped by STVM as occurring within areas of the surrounding landscape. The other four filtered PCTs mostly occur as different vegetation formations or are primarily located within a different IBRA sub-region, such as PCT 3930.	
State Vegetation Type Mapping	The STVM identifies the following PCTs as present within 1 km or occurring within the project area: • PCT 3303 – Central Tableland Ribbon Gum Sheltered Forest, • PCT 3949 – Southern Highlands sand Swamp Sedgeland, • PCT 3338 – Southern Tableland Forest Hollow Grassy Woodland, • PCT 3919 – Southern Highlands Wet Swamp Heath, • PCT 3744 – Palerang Hills Peppermint Dry Shrub Forest, • PCT 3376 – Southern Tableland Grassy Box Woodland, • PCT 3734 – Central Tableland Dry Slopes Stringybark-Box Forest, • PCT 3415 – Southern Tableland Red Grass – Spear Grass Grassland, • PCT 3747 – Southern Tableland Western Hills Scribbly Gum Forest, and • PCT 3347 – Southern Tableland Creekflat Ribbon Gum Forest. Several PCTs have been identified by STVM as occurring within 1 km of the project area. None of these listed PCTs were found to align with the vegetation formation and landscape position of the recorded project area's community. As such, PCT 3932 was determined to be the most closely aligned recognised PCT. This PCT does not occur within 1 km of the project area but does however occur approximately 2.3 km to the west. The BioNet description of this PCT lists it as being characterised by a dense ground layer of tall sedges, grasses and forbs, which aligns with the presence of this PCT across vegetated sections of the Mulwaree River within project area.	
Justification	It has been determined that PCT 3932 – Central and Southern Tableland Swamp Meadow Complex, most appropriately meets the observed characteristics of the community recorded within the project area. This was determined by: • Matching vegetation formation, • Occurrence within IBRA region and IBRA sub-region, and • Matching overstory composition.	
Determined PCT		

Vegetation type	**PCT ID**	3932
	Common community name	Central and Southern Tableland Swamp Meadow Complex
	Vegetation formation	Freshwater Wetlands
	Vegetation class	Montane Bogs and Fens
Percentage cleared (in NSW)	67.69 %	
PCT Description (BioNet)	This community is characterised as a dense swampy forbland with scattered shrubs and fringing trees, sampled from permanently waterlogged fertile alluvial deposits on eastern parts of the South Eastern Highlands and high western parts of the Sydney Basin and South East Corner bioregions. This community is characterised by a dense ground layer of tall sedges, grasses and forbs, which is almost always dominated by Fen Sedge (*Carex gaudichaudiana*) and includes Soft Twig Rush (*Machaerina rubiginosa*). Other common tall species include swampy grasses Swamp Millet (*Isachne globosa*), Common Reed (*Phragmites australis*) and River Tussock (*Poa labillardierei* var. *labillardierei*), the large mat-rush Spiky-headed Mat-rush (*Lomandra longifolia*), sedges and rushes such as Broom Rush (*Juncus sarophorus*), Slender Spikerush (*Eleocharis gracilis*) and Broom Scale-rush (*Lepyrodia anarthria*), the water fern Soft Water Fern (*Blechnum minus*), and tall forbs Australia Gipsywort (*Lycopus australis*) and Purple Loosestrife (*Lythrum salicaria*). A range of smaller wetland forbs grow between and through these, commonly including Shield Pennywort (*Hydrocotyle sibthorpioides*), Swamp Crane's-bill (*Geranium neglectum*), Austral Brooklime (*Gratiola peruviana*), Small St John's Wort (*Hypericum japonicum*), River Buttercup (*Ranunculus inundatus*) and Matted Starwort (*Stellaria angustifolia*). Shrubs are sparse to patchy and commonly include scattered River Teatree (*Leptospermum obovatum*) or Prickly Teatree (*Leptospermum juniperinum*) or rarely Woolly Teatree (*Leptospermum lanigerum*). Trees are generally absent, however may rarely include swamp margin species such as Swamp Gum (*Eucalyptus ovata*), Black Gum (*Eucalyptus aggregata*) or Paddy's River Box (*Eucalyptus macarthurii*), or species from adjacent drier footslopes.	
Condition (zones)	This community occurs as a single vegetation zone within the project area. This being composed of both native and exotic vegetation within the understory, including a moderate diversity of forbs and grass and grass-like species. It was not recorded to contain overstory or midstory vegetation.	
TEC status (BC Act)	Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands and Australian Alps bioregions	
TEC status (EPBC Act)	Temperate Highland Peat Swamps on Sandstone. However, this TEC does not occur on the Southern Tablelands. As such, while this PCT is associated with this community, it has been assessed as not occurring within the project area due to the geographic limitations of this community.	

A2.3 BAM plot results

BAM plot data was used to determine PCTs and as a measure for impacts attributed to the development. As presented in **Table A 6**, data collected from BAM_1 and BAM_2 reflect similar findings. This being that vegetation is moderately disturbed but retains a moderate to high composition of native species and cover as well as low to moderate cover of functional habitat features (e.g. leaf litter and course woody debris). Both plots calculated a similar vegetation integrity score (VIS) of 54.1 and 51 respectively.

BAM plots were used to inform and describe vegetation zones and PCT mapping within the project area, in PCTs 3338 and 3744. However, it was not possible to conduct a plot in PCT 3932 due to the small area of this community as well as presence of water. Nevertheless, three condition classes (vegetation zones) were defined based on the broad conditions described below:

- **Zone 1**. PCT 3338: Moderate condition, containing a sparse to moderate semi-mature overstory with a mixed understory of both native and exotic species that is grassy in formation.
- **Zone 2.** PCT 3744: Moderate condition, containing a mostly moderate cover of overstory vegetation including some mature trees. Understory vegetation is composed of a mix of exotic and native vegetation and is grassy in formation.
- **Zone 3.** PCT 3932: Moderate condition, not containing overstory or midstory vegetation and a groundlayer that is composed of both exotic and native species, primarily grass and grass-like species.

Details on BAM plots, rapid BAMs, supporting data and photos for project area can be found in **A4** and **A6,** respectively.

TABLE A 6: BAM PLOT CALCULATIONS

Zone	Plots	Composition condition score	Structure condition score	Function condition score	Vegetation integrity score
1	BAM_1	68.6	79.4	29.1	54.1
2	BAM_2	40.6	74.8	43.5	51

A2.4 Fauna and Habitat

The project area contains several habitats that are likely utilised by a range of native fauna species. These primarily occur within native open woodlands and dry sclerophyll forests vegetation. These areas contain scatterings of native mistletoe (*Amyema* sp.) growing in overstory eucalypts and wattles and are likely utilised as a foraging resource of arboreal native animals. These areas also offer foraging resources in the form of flowering resources, with Silver Wattles (*Acacia dealbata*) in flower at the time of surveys. Exotic overstory vegetation in the form of fruit trees and Black Locust (*Robinia pseudoacacia*) may also be utilised by fauna species for foraging resources, however, at the time of inspection these species were not in fruit.

Coarse woody habitat is also present, primarily not in the direct proposed work areas but on adjacent land. Minor areas of rocky habitat are also present. This is mostly present within the landslip area, and its presence most likely aligns with the landslip event give the rocks locality, size and other recorded geological features still embedded within the landslip area.

No mature hollow-bearing trees or stick nests were found to occur within the proposed work area, however, they very likely occur within surrounding vegetation, particularly to the west given its mostly intact nature.

Areas of scattered woodland and derived native grassland, which mostly occur in the north of the project area may be utilised by a number of native fauna species. At the time of inspection, this habitat was observed to be utilised by the threatened invertebrate species Key's Matchstick Grasshopper (*Keyacris scurra*). There is potential that these native grassy areas also provide habitat and foraging resources to a range of native species including marsupials, birds, reptiles and invertebrates.

Within the project area a total of 21 native birds, one native frog and one threatened native invertebrate species were recorded. Noting that surveys were conducted outside the optimal survey time to observe many species by call and that there are likely many more common native species utilising the area. A complete list of species observed from the project area is provided in **A3.2** Fauna species observed.

Overall key habitat features observed in project area include:

- riparian habitats in the Mulwaree River corridor, including some native reeds and rushes (**Figure A 1** and **Figure A 2**),
- native mistletoe (*Amyema* sp.) and flowering overstory species that provide foraging resources,
- course wooden debris/fallen tree providing habitat for reptiles and small birds,
- native woodland and derived native grasslands providing habitat for native fauna, and
- scatterings of surface rock that may be utilised by native reptiles and invertebrates.

A2.5 Aquatic biodiversity and habitat

Where present, riparian mid and overstory vegetation consists of exotic species, most of which are deciduous. Groundlayer vegetation is mixed, containing areas dominated by exotic species such as Blackberry and pasture grasses, while other areas contain a predominantly native composition of native rush, sedge, grass and forb species.

Submergent and emergent aquatic vegetation is largely restricted to the west of the Mulwaree River bank landslip where the river shallows and accumulations of rock and sediment have allowed for vegetation to establish in periodically dry areas. Vegetation consists of both native and exotic grasses and forbs. The northern and southern sides of the river within the study area contain sparse emergent and submergent vegetation cover comparatively to the west.

A high density and cover of benthic algae was observed throughout the river during field inspections on the shallower waters of the banks, as well as through the central deeper section of the river. Despite this, water clarity was relatively high and turbidity low. Algal formations were not observed through mid or surface waters, suggesting that it is unlikely that the benthic algal formations reflect eutrophication.

At the time of inspection, aquatic habitat in the form of submerged and emergent logs was limited to accumulations of flood debris on some banks and through exotic riparian trees. Mature native trees were not recorded along the banks of the river corridor within the study area. Aquatic vegetation and submerged rock were observed to likely form the majority of habitat features within the river.

No invasive exotic fauna species such as European Carp (*Cyprinus carpio*) or Gambusia (*Gambusia holbrooki*) were recorded in the river at the times of inspection. The clarity of the water, mostly shallow depth and sparsity of refuge in many areas mean that aquatic vertebrates and invertebrates have an increased likelihood of predation.

A2.6 Threatened Ecological Communities (TEC)

A desktop search identified six threatened ecological communities (TECs) are known or predicted to occur within 10 km of the project area:

- Monaro Tableland Cool Temperate Grassy Woodland,
- Montane Peatlands and Swamps,
- Natural Temperate Grassland,
- Tableland Basalt Forest,
- Werriwa Tablelands Cool Temperate Grassy Woodland, and
- Box-Gum Woodland.

The results of the field survey indicate that the vegetation types and their condition align with the presence of the following NSW-listed TEC communities:

- Montane Peatlands and Swamps, and
- Werriwa Tablelands Cool Temperate Grassy Woodland.

0.17 ha of the endangered ecological community (EEC) Montane Peatlands and Swamps is present within vegetation determined as PCT 3932 - Central and Southern Tableland Swamp Meadow Complex, while 0.83 ha of the critically endangered ecological community (CEEC) Werriwa Tablelands Cool Temperate Grassy Woodland is present within vegetation determined as PCT 3338 - Southern Tableland Forest Hollow Grassy Woodland.

For a detailed discussion on the likelihood of the presence of a TEC within the project area, please refer to **A7.1** Threatened Ecological Communities (TECs).

A2.7 Threatened populations

No endangered populations, as distinct from communities, listed under the BC Act were identified within either site or surrounds (10 km radius).

A2.8 Threatened entities

Threatened flora

Desktop research found that the following threatened flora are known or may occur within 10 km of the project area:

- Dwarf Kerrawang (*Commersonia prostrata*),
- Creeping Hop-bush (*Dodonaea procumbens*),
- Black Gum (*Eucalyptus aggregata*),
- Hoary Sunray (*Leucochrysum albicans* subsp. *tricolor*), and
- Round-leaf Wilsonia (*Wilsonia rotundifolia*).

No threatened flora species were observed during the inspections of the project area, however, given the present vegetation types and available habitat features the species listed above are considered to have the potential to occur (for details on each species, refer to **A7.2**).

Threatened fauna

Desktop research found that 53 threatened fauna species are known to, likely to, or may occur within 10 km of the project area. One species of threatened fauna was observed during field inspection, this being the Key's Matchstick Grasshopper. The habitat may be further utilised by a range of threatened fauna species.

Based on the project area's available habitat, a total of 27 of the 53 potential threatened fauna species listed under the EPBC Act, BC Act and/or the FM Act were assessed to have a potential or higher likelihood of occurring within the project area (for details on each species, refer to **A7.3**).

Threatened birds

There is potential that the following smaller woodland and grassland birds may utilise habitat (e.g., eucalypt trees and grasslands) within the project area:

- Southern Whiteface (*Aphelocephala leucopsis*),
- Dusky Woodswallow (*Artamus cyanopterus*),
- Varied Sittella (*Daphoenositta chrysoptera*),
- White-fronted Chat (*Epthianura albifrons*),
- Scarlet Robin (*Petroica boodang*),
- Flame Robin (*Petroica phoenicea*), and
- Diamond Firetail (*Stagonopleura guttata*).

Most larger birds require mature and hollow-bearing trees for roosting and nesting, as well as large areas of woodland and forest to hunt/forage. While these habitat features were not observed within the project area, present exotic and native vegetation may be used use on a transient basis by the following species:

- Gang-gang Cockatoo (*Callocephalon fimbriatum*), and
- South-eastern Glossy Black-Cockatoo (*Calyptorhynchus lathami lathami*).

The project area offers utilisable habitat for threatened raptors, primarily in the form of native overstory vegetation and somewhat open areas for perching and hunting. Raptors that may, or are likely to utilise these habitats include:

- Spotted Harrier (*Circus assimilis*),
- White-bellied Sea-eagle (*Haliaeetus leucogaster*),
- Little Eagle (*Hieraaetus morphnoides*).

Wetland and aquatic species may utilise areas of the Mulwaree River corridor for nesting or foraging. Species that may utilise these aquatic and riparian habitats include:

- Magpie Goose (*Anseranas semipalmata*),
- Australasian Bittern (*Botaurus poiciloptilus*),
- Sharp-tail Sandpiper (*Calidris acuminata*),
- Curlew Sandpiper (*Calidris ferruginea*),
- Latham's Snipe (*Gallinago hardwickii*),
- Blue-billed Duck (*Oxyura australis*), and
- Freckled Duck (*Stictonetta naevosa*).

For details and the individual assessment of each species, refer to

A7.3 Threatened .

Threatened fish

No threatened fish species listed under the Commonwealth EPBC Act, NSW BC Act or FM Act were assessed as likely to occur within the project area (see

A7.3 Threatened).

A search of the EPBC PMST (10 km radius) identified Macquarie Perch (*Macquaria australasica*) as potentially occurring within the vicinity of the project site. There are no records within 10 km of project area.

Threatened frogs

A search of the EPBC PMST (10 km radius) identified Green and Golden Bell Frog (*Litoria aurea*) as potentially occurring within the vicinity of the project area. There is one known record of Green and Golden Bell Frog within 10 km of the project area.

Although the project area has been modified, it contains suitable habitat in the form of reeds, emergent vegetation and pooling water for this species. The Green and Golden Bell Frog has been known to utilise disturbed environments that contain suitable vegetation in and around water, such as abandoned quarries, and as such the project area may provide suitable habitat.[67]

Threatened invertebrates

Desktop research found that two threatened invertebrate species are known to, likely to, or may occur within 10 km of the project area. Of these two species, the Key's Matchstick Grasshopper (*Keyacris scurra*) was observed within the project area during inspections and likely occurs to the north of the project area where the utilised native grass habitat is more plentiful.

Threatened bats

Desktop research found that two threatened bat species known to, likely to, or may occur within 10 km of the project area. Despite this, the project area has been assessed as not containing habitat features considered suitable to support the presence of these threatened bat species.

Threatened mammals other than bats

Desktop research found that seven threatened mammal species are known to, likely to, or may occur within 10 km of the project area, however the project area does not contain suitable habitat features known to support these threatened mammal species.

Threatened reptiles

Desktop research found that two threatened reptile species are known to, likely to, or may occur within 10 km of the project area, however the project area does not contain suitable habitat features known to support these threatened reptile species.

Threatened waterbirds

A total of seven waterbirds listed under the EPBC Act and/or NSW BC Act were assessed as having the potential or likely to occur within the project area (refer to

A2.8 Threatened entities). The likelihood of potential impacts occurring to these waterbirds had a greater risk weighting due to the proximity of the project area to known quality habitat found at nearby inland lakes, The Morass and Lake Bathurst (see **Figure 9**). For details on species inclusion, refer to **A7**.

[67] Best practice guidelines Green and Golden Bell Frog habitat. State of NSW and Department of Environment and Climate Change NSW. (2008).

In addition, the listing of threatened species under the FM Act was reviewed. Based on known/predicted ranges of threatened aquatic species, and characteristics of the project area, no threatened species, populations or communities listed under the FM Act is considered likely to occur at the site.

FIGURE A 1: RIPARIAN HABITAT WITHIN ROCK FILL EMBANKMENT WORK AREA

FIGURE A 2: RIPARIAN HABITAT WEST OF ROCK FILL EMBANKMENT WORK AREA

A3 Species observed during field work

A3.1 Flora species observed on site

The following codes denote the status of a species:

N	Native
P	Protected species (not listed as a threatened species but subject to special protections)
T	Threatened species (may be Vulnerable, Endangered or Critically Endangered)
W	Weed of National Significance
H	High Threat Exotic (NSW)
X	Other exotic species

*Species recorded in conducted BAM plots

TABLE A 7: FLORA SPECIES OBSERVED ON SITE

Scientific name	Common name	Family	Status
Trees			
*Acacia dealbata**	Silver Wattle	Fabaceae (Mimosoideae)	N
Cupressus sp.	A Cypress	Cupressaceae	X
Cydonia oblonga	Quince	Malaceae	X
*Eucalyptus dives**	Broad-leaved Peppermint	Myrtaceae	N
*Eucalyptus mannifera**	Brittle Gum	Myrtaceae	N
*Eucalyptus pauciflora**	White Sally	Myrtaceae	N
Robinia pseudoacacia	Black Locust	Fabaceae (Faboideae)	H
Ulmus sp.	Elm	Ulmaceae	X
Shrubs			
Acacia falciformis	Broad-leaved Hickory	Fabaceae (Mimosoideae)	N
Acacia mearnsii	Black Wattle	Fabaceae (Mimosoideae)	N
Astrotricha ledifolia	Common Star-hair	Araliaceae	N
Callistemon sp.	A Bottlebrush	Myrtaceae	N
*Cassinia aculeata**	Dolly Bush	Asteraceae	N
*Cassinia arcuata**	Sifton Bush	Asteraceae	N
Cassinia longifolia	Shiny Cassinia	Asteraceae	N
Chamaecytisus palmensis	Tree Lucerne	Fabaceae (Faboideae)	H
*Daviesia mimosoides**	Blunt-leaf Bitter-pea	Fabaceae (Faboideae)	N
Dodonaea viscosa	Sticky Hop-bush	Sapindaceae	N
Exocarpos cupressiformis	Cherry Ballart	Santalaceae	N
*Hibbertia obtusifolia**	Hoary Guinea Flower	Dilleniaceae	N
Melichrus urceolatus	Urn Heath	Ericaceae	N
Rosa rubiginosa	Sweet Briar	Rosaceae	H
Grasses and Grasslike			
*Aristida ramosa**	Purple Wiregrass	Poaceae	N
*Austrostipa bigeniculata**	Tall Stipa	Poaceae	N
Austrostipa densiflora	Foxtail Speargrass	Poaceae	N

Scientific name	Common name	Family	Status
Austrostipa scabra	Speargrass	Poaceae	N
Bothriochloa macra	Red Grass	Poaceae	N
Briza maxima	Quaking Grass	Poaceae	X
Carex appressa	Tall Sedge	Cyperaceae	N
Carex inversa	Knob Sedge	Cyperaceae	N
Cynodon dactylon	Common Couch	Poaceae	N
Cyperus eragrostis	Umbrella Sedge	Cyperaceae	H
Dactylis glomerata	Cocksfoot	Poaceae	X
Eragrostis brownii	Brown's Lovegrass	Poaceae	N
Eragrostis curvula	African Lovegrass	Poaceae	H
Festuca elatior	Tall Fescue	Poaceae	X
Hemarthria uncinata	Matgrass	Poaceae	N
Holcus lanatus	Yorkshire Fog	Poaceae	X
Juncus fockei	-	Juncaceae	N
Lomandra filiformis	Wattle Matt-rush	Lomandraceae	N
*Lomandra longifolia**	Spiny-headed Mat-rush	Lomandraceae	N
Lomandra multiflora subsp. *multiflora*	Many-flowered Mat-rush	Lomandraceae	N
Microlaena stipoides	Weeping Grass	Poaceae	N
Nassella trichotoma	Serrated Tussock	Poaceae	W
*Panicum effusum**	Hairy Panic	Poaceae	N
Pennisetum alopecuroides	Swamp Foxtail	Poaceae	N
Phalaris aquatica	Phalaris	Poaceae	X
Poa annua	Winter Grass	Poaceae	X
Poa labillardierei var. *labillardierei**	Tussock	Poaceae	N
Rytidosperma racemosum	Wallaby Grass	Poaceae	N
Rytidosperma sp.*	A Wallaby Grass	Poaceae	N
Setaria sp.	A Pigeon Grass	Poaceae	X
*Themeda triandra**	Kangaroo Grass	Poaceae	N
Typha orientalis	Broadleaf Cumbungi	Typhaceae	N
Vulpia myuros	Rat's Tail Fescue	Poaceae	X
Forbs			
*Acaena novae-zelandiae**	Bidgee-widgee	Rosaceae	N
*Acaena ovina**	Acaena	Rosaceae	N
Acetosella vulgaris	Sheep Sorrel	Polygonaceae	H
Bidens pilosa	Cobbler's Pegs	Asteraceae	X
Capsella bursa-pastoris	Shepherd's Purse	Brassicaceae	X
Cardamine hirsuta	Common Bittercress	Brassicaceae	X
Centaurium erythraea	Common Centaury	Gentianaceae	X
Cirsium vulgare	Spear Thistle	Asteraceae	X
Conyza bonariensis	Flaxleaf Fleabane	Asteraceae	X
*Dianella revoluta**	Blueberry Lily	Phormiaceae	N
*Dichondra repens**	Kidney Weed	Convolvulaceae	N

Scientific name	Common name	Family	Status
*Einadia nutans**	Climbing Saltbush	Chenopodiaceae	N
Epilobium billardierianum	Willowherb	Onagraceae	N
*Euchiton japonicus**	Creeping Cudweed	Asteraceae	N
*Euchiton sphaericus**	Star Cudweed	Asteraceae	N
Galium aparine	Goosegrass	Rubiaceae	X
Gamochaeta sp.	A Cudweed	Asteraceae	X
*Geranium solanderi**	Native Geranium	Geraniaceae	N
Goodenia pinnatifida	Scrambles Eggs	Goodeniaceae	N
*Gonocarpus tetragynus**	Poverty Raspwort	Haloragaceae	N
Haloragis heterophylla	Variable Raspwort	Haloragaceae	N
Hirschfeldia incana	Buchan Weed	Brassicaceae	X
Hovea linearis	-	Fabaceae (Faboideae)	N
Hydrocotyle laxiflora	Stinking Pennywort	Apiaceae	N
Hypericum perforatum	St. John's Wort	Clusiaceae	H
Hypochaeris glabra	Smooth Catsear	Asteraceae	X
Hypochaeris radicata	Catsear	Asteraceae	X
Lactuca serriola	Prickly Lettuce	Asteraceae	X
Lysimachia arvensis	Scarlet Pimpernel	Myrsinaceae	X
Lythrum hyssopifolia	Hyssop Loosestrife	Lythraceae	N
Modiola caroliniana	Red-flowered Mallow	Malvaceae	X
Myriophyllum sp.	A Water Milfoil	Haloragaceae	N
Oenothera stricta subsp. *stricta*	-	Onagraceae	X
Opercularia sp.	-	Rubiaceae	N
*Oxalis perennans**	Yellow Wood-sorrel	Oxalidaceae	N
Oxalis sp.	-	Oxalidaceae	X
Persicaria prostrata	Creeping Knotweed	Polygonaceae	N
Plantago lanceolata	Lamb's Tongues	Plantaginaceae	X
Plantago varia	Variable Plantain	Plantaginaceae	N
Prunella vulgaris	Self-heal	Lamiaceae	X
Ranunculus inundatus	River Buttercup	Ranunculaceae	N
Rumex crispus	Curled Dock	Polygonaceae	X
Sanguisorba minor subsp. *muricata*	Sheep's Burnet	Rosaceae	X
Sonchus oleraceus	Common Sowthistle	Asteraceae	X
Stellaria media	Common Chickweed	Caryophyllaceae	X
*Stellaria pungens**	Prickly Starwort	Caryophyllaceae	N
Stellaria sp.	A Starwort	Caryophyllaceae	X
Taraxacum officinale	Dandelion	Asteraceae	X
Trifolium campestre	Hop Clover	Fabaceae (Faboideae)	X
Trifolium repens	White Clover	Fabaceae (Faboideae)	X
Trifolium subterraneum	Subterranean Clover	Fabaceae (Faboideae)	X
Verbascum thapsus subsp. *thapsus*	Great Mullein	Scrophulariaceae	X
Veronica persica	Creeping Speedwell	Plantaginaceae	X
Vicia sativa	Common vetch	Fabaceae (Faboideae)	X
Vittadinia muelleri	A Fuzzweed	Asteraceae	N

Scientific name	Common name	Family	Status
*Xerochrysum viscosum**	Sticky Everlasting	Asteraceae	N
Ferns			
*Adiantum aethiopicum**	Common Maidenhair	Adiantaceae	N
*Cheilanthes sieberi**	Rock Fern	Pteridaceae	N
Pteridium esculentum	Bracken	Dennstaedtiaceae	N
Others			
Amyema sp.*	Mistletoe	Loranthaceae	N
Asparagus asparagoides	Bridal Creeper	Asparagaceae	W
Hardenbergia violacea	False Sarsaparilla	Fabaceae (Faboideae)	N
Rubus fruticosus sp. agg.	Blackberry complex	Rosaceae	W

A3.2 Fauna species observed on site

The following codes denote the status of a species:

K	Species that is associated with a Key Threatening Process
P	Protected species (not listed as a threatened species but subject to special protections)
T	Threatened species (may be Vulnerable, Endangered or Critically Endangered)
X	Other exotic species

TABLE A 8: FAUNA SPECIES OBSERVED ON SITE

Scientific name	Common name	Family	Status	Observation type
Birds				
Acanthiza nana	Yellow Thornbill	Acanthizidae	P	Aural
Aquila audax	Wedge-tailed Eagle	Accipitridae	P	Visual
Dacelo novaeguineae	Laughing Kookaburra	Alcedinidae	P	Aural
Anas superciliosa	Pacific Black Duck	Anatidae	P	Visual
Chenonetta jubata	Australian Wood Duck		P	Aural
Egretta novaehollandiae	White-faced Heron	Ardeidae	P	Visual
Cracticus torquatus	Grey Butcherbird	Artamidae	P	Aural
Gymnorhina tibicen	Australian Magpie		P	Visual
Strepera graculina	Pied Currawong		P	Visual
Cacatua galerita	Sulphur-crested Cockatoo	Cacatuidae	P	Aural
Eolophus roseicapilla	Galah		P	Visual
Cormobates leucophaea	White-throated Treecreeper	Climacteridae	P	Aural
Corvus mellori	Little Raven	Corvidae	P	Aural
Hirundo neoxena	Welcome Swallow	Hirundinidae	P	Visual
Malurus cyaneus	Superb Fairy-wren	Maluridae	P	Aural
Anthochaera carunculata	Red Wattlebird	Meliphagidae	P	Visual
Grallina cyanoleuca	Magpie-lark	Monarchidae	P	Aural
Colluricincla harmonica	Grey Shrike-thrush	Pachycephalidae	P	Visual
Platycercus elegans	Crimson Rosella	Psittaculidae	P	Visual
Platycercus eximius	Eastern Rosella		P	Visual

Scientific name	Common name	Family	Status	Observation type
Gallinula tenebrosa	Dusky Moorhen	Rallidae	P	Visual
Rhipidura albiscapa	Grey Fantail	Rhipiduridae	P	Aural
Frogs				
Crinia signifera	Common Eastern Froglet	Myobatrachidae	P	Aural
Invertebrates				
Keyacris scurra	Key's Matchstick Grasshopper	Morabidae	T	Visual

A4 Systematic flora survey data

This section summarises the results of systematic flora survey work within the project area.

A4.1 BAM plot

As the proposed activity does not trigger the NSW Biodiversity Offsets Scheme, there was no formal requirement to set up and survey using BAM plots. However, two BAM plots were conducted across the project area for the purposes of determining baseline vegetation integrity scores to monitor impacts. Furthermore, in these two plots were conducted in the interests of calculating accurate PCTs and assuring Council of potential significant biodiversity values within the project area. As part of this process:

- the attributes of the plot were surveyed in accordance with the NSW Government's BAM method;
- the plot was assigned a Plant Community Type (PCT) based on the native species present; and
- plot data was entered into the NSW Government's Biodiversity Offsets Calculator to enable calculation of vegetation integrity.

The plant community types (PCT) observed in the BAM plots were as follows:

- PCT 3338: Goulburn Tableland Frost Hollow Grassy Woodland (BAM_1), and
- PCT 3744: Palerang Hills Peppermint Dry Shrub Forest (BAM_2).

These two PCTs were selected based on the State Vegetation Type Map (SVTM) and PCT filtering within the BioNet PCT Filter Tool. The BioNet PCT Filter Tool and field validation allowed for determination of PCT 3338 and PCT 3744 through the alignment of observed floristic composition, landscape position and the surrounding composition and structure of the continued vegetation community outside of the floristic plot. PCT 3932 was not able to be sampled through the completion of a BAM plot. This is due to the small area of this community with and surrounding the project area as well as the prevalence of water within the location of this community.

TABLE A 9: DETAILS OF BAM PLOTS

	BAM_1	BAM_2
Date of survey	4 September 2024	4 September 2024
Location		
Easting (UTM 55H)	740487	740383
Northing (UTM 55H)	6114607	6114586
Aspect	73	249
BAM attribute - 10x40m plot		
Species richness (count)		
Native tree	1	4
Native shrub	4	1
Native forb	8	5
Native grass and grasslike species	7	3
Native fern	1	1
Other native vascular plant	1	1
Total native vascular plants	22	15
Cover abundance %		
Native tree	30	45
Native shrub	5.9	0.5
Native forb	2.4	1.3
Native grass and grasslike species	40.9	25.5
Native fern	0.1	0.3
Other native vascular plant	0.2	0.2
Total native vascular plants	79.5	72.8
High Threat Exotics	0.5	3.5
BAM attributes - 1x1m quadrats		
Litter cover %		
5m	10	15
15m	3	10
25m	1	45
35m	2	3
45m	1	12
Average	3.4	17
Bare ground cover (%)		
5m	1	0
15m	0	0
25m	0	1
35m	0	3
45m	1	0
Average	0.4	0.8

Cryptogam cover %		
5m	0	0
15m	0	30
25m	0	7
35m	0	0
45m	10	0
Average	2	7.4
Rock cover %		
5m	10	3
15m	2	1
25m	3	4
35m	0	80
45m	20	2
Average	7	18

FIGURE A 3: BAM_1 PHOTOS

Start transect line

Plot BAM_1-1 (5m)

Plot BAM_1-2 (15m)

Plot BAM_1-3 (25m)

Plot BAM_1-4 (35m)

Plot BAM_1-5 (45m)

FIGURE A 4: GOULBURN TABLELAND FROST HOLLOW GRASSY WOODLAND (PCT 3338) WITHIN PROJECT AREA.

Top: Silver Wattle (*A. dealbata*), Spiny-headed Mat-rush (*Lomandra longifolia*) and a mixed groundlayer in the east of the project area. Bottom: Snow Gum (*Eucalyptus pauciflora*), Spiny-headed Mat-rush and a mixed groundlayer in the west of the project area.

FIGURE A 5: BAM_2 PHOTOS

Start transect line

Plot BAM_2-1 (5m)

Plot BAM_2-2 (15m)

Plot BAM_2-3 (25m)

Plot BAM_2-4 (35m)

Plot BAM_2-5 (45m)

FIGURE A 6: PALERANG HILLS PEPPERMINT DRY SHRUB FOREST (PCT 3744) WITHIN PROJECT AREA

Top: Brittle Gum (*Eucalyptus mannifera*) and a scattering of Common Star-hair (*Astrotricha ledifolia*) with sparse and predominately native groundlayer in northeast of project area. Bottom: Cherry Ballart (*Exocarpos cupressiformis*) in overstory and midstory of mixed *Cassinia* spp. in the northeast of project area.

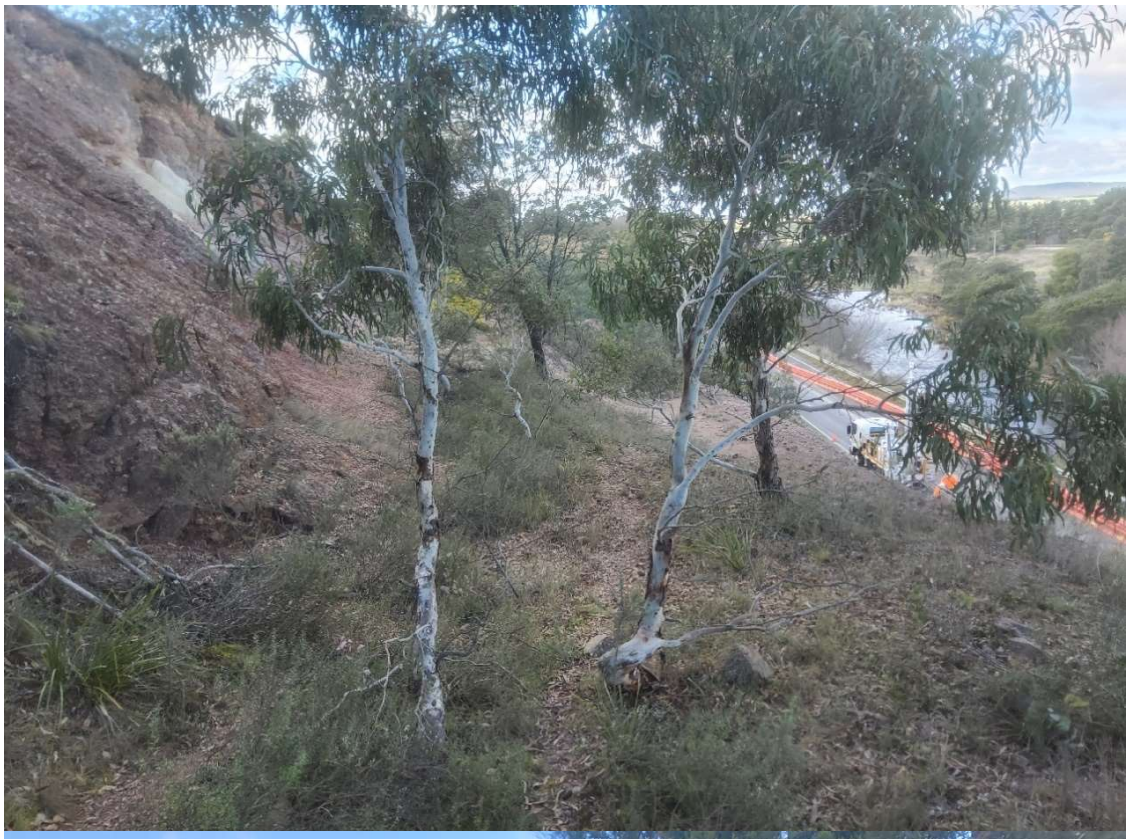


FIGURE A 8: CENTRAL AND SOUTHERN TABLELAND SWAMP MEADOW COMPLEX (PCT 3932) WITHIN PROJECT AREA

Top: Rushes (*Juncus* spp.), sedges (*Carex* spp.) and Narrow-leaved Cumbungi (*Typha domingensis*) in river. Groundlayer contains a moderate cover of exotic grasses in the south of the project area. Bottom: Aerial view of PCT 3932 and its distribution within the Mulwaree River and southern project area.

A7 Likelihood of Occurrence Assessment

The following analysis works through threatened species and ecological communities listed as under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), NSW *Biodiversity Conservation Act 2016* (BC Act) and/or the *Fisheries Management Act 1994* (FM Act). For ease of reference, the following acronyms are used to indicate the status of a community or species according to each jurisdiction:

CE	Critically Endangered
E	Endangered
V	Vulnerable
M	Listed Migratory (EPBC Act only)
–	Not listed

The following analysis also incorporates data accessed (9 January 2025) from a variety of sources including:

- threatened community/species profiles published by the NSW Department of Climate Change, Energy, the Environment and Water,
- Atlas of Living Australia (ALA) records for the area within a 10 km buffer of the study area
- BioNet Atlas of NSW Wildlife records for the area within a 10 km buffer of the study area, and
- Reference sites including international birding site eBird for three hotspots:
    - Lake Bathurst, Tarago Village and Duck Flat Travelling Stock Reserve (southern section).

The terms for likelihood of occurrence are defined below:

- Known = the species was or has been observed on the site.
- Likely = a medium to high probability that a species uses the site.
- Potential = suitable habitat for a species occurs on the site, but there is insufficient information to categorise the species as likely to occur, or unlikely to occur.
- Unlikely = a very low to low probability that a species uses the site.
- No = only applicable to Threatened Ecological Communities.

A7.1 Threatened Ecological Communities (TECs)

TABLE A 10: LIKELIHOOD OF OCCURRENCE FOR THREATENED ECOLOGICAL COMMUNITIES

Scientific name	Common name	BC Act Status	EPBC Act Status	Distribution and characteristics	Likelihood of Occurrence
Monaro Tableland Cool Temperate Grassy Woodland in the South Eastern Highlands Bioregion	Monaro Tableland Cool Temperate Grassy Woodland	CE	—	This TEC occurs between Captains Flat in the north and Bombala in the south, as far east as the crest of the Great Dividing Range and west towards Adaminaby. The TEC is characterised by a sparse to very sparse tree layer dominated by Snow Gum (*Eucalyptus pauciflora*), either as a single species or in a mix with any of these species as co-dominants: • Blackwood (*Acacia melanoxylon*), • Candlebark (*E. rubida*), • Black Sallee (*E. stellulata*), and • Ribbon Gum (*E. viminalis*). The TEC is also characterised by a certain grass and forb species that tend to persist on sites even if the tree canopy is removed. Such derived native grassland may still be protected under relevant laws and can regenerate to woodland under the right conditions.	**No.** This community was not identified within the site during field surveys. The site is north of Captains Flat.
Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands, and Australian Alps bioregions	Montane Peatlands and Swamps	E	—	This TEC grows on the peaty or organic-mineral sediments that accumulate on poorly drained flats in the headwaters of streams and is extremely distinctive. It occurs on undulating tablelands and plateaux, above 400-500 m elevation.	**Present.** This community was identified within the site during field surveys. It is associated with the presence of PCT 3932-Central and Southern Tableland Swamp Meadow Complex.
Natural Temperate Grassland of the South Eastern Highlands	Natural Temperate Grassland	—	CE	Confined to the Southern Tablelands, a region bounded by the ACT, Yass, Boorowa, the Abercrombie River, Goulburn, the Great Eastern Escarpment, the Victorian border, and the eastern boundary of Kosciusko National Park. It is a naturally treeless grassland community dominated by a range of perennial grass species and, in highly intact sites, containing a large range of herbaceous species in many plant families. Particular condition criteria must be met for an area of grassland to be considered natural temperate grassland.	**No.** This community was not identified within the site during field surveys. The site does not contain highly intact perennial grassland characteristic associated with this community.
Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregions	Tableland Basalt Forest	E	—	This TEC is currently found in the Eastern Highlands and Southern and Central Tablelands. It occurs on loam or clay soils associated with basalt, but sometimes on other substrates that produce relatively fertile soils. It occurs at elevations of 600 – 900 m above sea level and is characterised by an open	**No.** This community was not identified within the site during field surveys. The site does not contain

Scientific name	Common name	BC Act Status	EPBC Act Status	Distribution and characteristics	Likelihood of Occurrence
				forest dominated by pure stands or varying combinations of the following eucalypt species: • Ribbon Gum (*Eucalyptus viminalis*), • Narrow-leaved Peppermint (*E. radiata*), • Mountain Gum or Broad-leaved Ribbon Gum (*E. dalrympleana* subsp. *dalrympleana*), and/or • Snow Gum.	characteristic of open forest associated with this community.
Werriwa Tablelands Cool Temperate Grassy Woodland in the South Eastern Highlands and South East Corner Bioregions	Werriwa Tablelands Cool Temperate Grassy Woodland	CE	—	This TEC occurs on the eastern slopes of the Great Dividing Range, between Golspie in the north and Majors Creek in the south and between Carwoola in the west and Marulan in the east. It is characterised by a sparse to very sparse tree layer dominated by Snow Gum, sometimes with Candlebark as a co-dominant. The TEC is also characterised by a certain grass and forb species that tend to persist on sites even if the tree canopy is removed. Such derived native grassland may still be protected under relevant legislation and can regenerate to woodland under the right conditions.	**Present.** This community was identified within the site during field surveys. It is associated with the presence of PCT 3338-Southern Tableland Forest Hollow Grassy Woodland.
White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions	Box Gum Woodland	CE	CE	Found from the Queensland border in the north, to the Victorian border in the south. It occurs in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions. This TEC is characterised by the presence or prior occurrence of White Box (*Eucalyptus albens*), Yellow Box (*E. melliodora*) and/or Blakely's Red Gum (*E. blakelyi*) and a generally grassy understory. Legal definitions of this TEC vary slightly by jurisdiction. The Commonwealth listing for this TEC is slightly different to the NSW listing, in that either the tree layer or the ground layer must be intact to quality for Commonwealth protection. Both definitions have been considered for the purposes of this report.	**No.** This community was not identified within the site during field surveys. The site does not contain the characteristic grassy woodland associated with this community.
EEC count		**5**	**2**	**6 TECs across all jurisdictions**	

A7.2 Threatened flora

TABLE A 11: LIKELIHOOD OF OCCURRENCE FOR THREATENED FLORA

Scientific name	Common name	Cwlth EPBC Act	NSW Law	ALA records within 10 km	BioNet records within 10km	Comment about species preferences and habitat in the project area	Likely presence
Caladenia tessellata	Thick-lipped Spider-orchid	V	E	No	No	Orchid known from the Sydney area (old records), Wyong, Ulladulla, and Braidwood in NSW. Generally found in grassy sclerophyll woodland on clay loam or sandy soils, though the population near Braidwood is in low woodland with stony soil. The single leaf regrows each year.	**Unlikely.** No records within 10 km and very limited potential habitat is present in the project area.
Calochilus pulchellus	Pretty Beard-orchid	E	E	No	No	Terrestrial orchid with a single upright sublinear leaf which sheaths the flowering stem. This species is endemic to NSW. It is known from the Sydney Basin Bioregion, where a total of less than 30 adult plants have been recorded in three sites over a 40 km range between altitudes 20-560 m above sea level.	**Unlikely.** No records within 10 km and very limited potential habitat is present in the project area.
Calotis glandulosa	Mauve Burr-daisy	V	V	No	No	Found on Monaro and Kosciuszko regions. There are three known sites in the upper Shoalhaven catchment, Kybeyan-Gourock, Monaro and Oberon. Occurs in subalpine grassland and montane or natural temperate grassland and Snow Gum Woodlands on the Monaro and Shoalhaven area. Appears common on roadside in colonises though it does not persist for long.	**Unlikely.** No records within 10 km and very limited potential habitat is present in the project area.
Commersonia prostrata	Dwarf Kerrawang	E	E	**Yes (10)**	**Yes (4)**	Known in the Southern Highlands and Southern Tablelands. Population was found near the Corang, at Rowes Lagoon, at Thirlmere Lakes, on the North Coast, and in Victoria. Occurs on sandy, sometimes peaty soils in a wide variety of habitat. Appears to respond positively to some forms of disturbance, however, there are conflicting reports about the species response to fire.	**Potential.** Records within 10 km and potential habitat is present along the banks of the Mulwaree River. Not identified in conducted surveys during optimal survey period.

Scientific name	Common name	Cwlth EPBC Act	NSW Law	ALA records within 10 km	BioNet records within 10km	Comment about species preferences and habitat in the project area	Likely presence
Diuris aequalis	Buttercup Doubletail	E	E	**Yes (5)**	**Yes (21)**	Known in Kanangra-Boyd National Park, Gurnang State Forest, towards Wombeyan Caves, the Taralga - Goulburn area, and the ranges between Braidwood, Tarago, and Bungendore. Populations tend to contain few, scattered individuals. Only about 200 plants in total, from 20 populations are known. Not always detectable in unfavourable years. Best months to survey are October and November. Occurs in forest, low open woodland with grassy understory and secondary grassland on the higher parts of the Southern and Central Tablelands.	**Unlikely.** Records within 10 km, however limited suitable habitat due to recent disturbance events and modification of understory within project area.
Dodonaea procumbens	Trailing Hopbush	V	V	**Yes (30)**	**Yes (14)**	Found in the dry areas of the Monaro, between Michelago and Dalgety. One population was found at Lake Bathurst. Grows on sandy-clay soils, on or near vertically-tilted shale outcrops. Occurs in Natural Temperate Grassland or fringing eucalypt woodland of Snow Gum. Often occurs in disturbed or exposed locations such as roadsides or outcrops of rocks.	**Potential.** Records within 10 km and potential habitat is present in the project area. Not identified in conducted surveys during optimal survey period.
Eucalyptus aggregata	Black Gum	V	V	**Yes (12)**	**Yes (8)**	Known to occur in the NSW Central and Southern Tablelands, with small, isolated populations occurring in ACT and VIC. Grows in the lowest parts of the landscape, on alluvial soils in poorly drained flats and hollows near creeks and small rivers.	**Potential.** Records within 10 km and potential habitat is present in the project area. Not identified in conducted surveys during optimal survey period.
Lepidium aschersonii	Spiny Peppercress	V	V	No	No	Occurs in the marginal central-western slopes and north-western plains regions of NSW (and potentially the south western plains). Found on ridges of gilgai clays dominated by Brigalow, Belah, Buloke and Grey Box. In the south has been recorded growing in Bull Mallee. Found on ridges of gilgai clays dominated by Brigalow (*Acacia harpophylla*), Belah (*Casuarina cristata*), Buloke (*Allocasuarina luehmannii*) and Grey Box (*Eucalyptus microcarpa*). The species grows in where vegetation structure varies open to dense with sparse grassy understory dominated by introduced plants and occasional heavy litter.	**Unlikely.** No records within 10 km and very limited potential habitat is present in the project area.

Scientific name	Common name	Cwlth EPBC Act	NSW Law	ALA records within 10 km	BioNet records within 10km	Comment about species preferences and habitat in the project area	Likely presence
Lepidium hyssopifolium	Aromatic Peppercress	E	E	No	No	Only known from three areas (Bathurst, Bungendore, and Crookwell) in NSW. Medium perennial forb recorded in a variety of native habitats as well as heavily modified, weed-infested areas such as roadsides, suggesting it may require disturbance to establish. Similar in appearance to other species of related exotic peppercress, easiest to identify when in flower (optimal survey months: October to December).	**Unlikely.** No records within 10 km and very limited potential habitat is present in the project area.
Leucochrysum albicans var. *tricolor*	Hoary Sunray	E	E	**Yes (4)**	**Yes (1)**	Endemic to south-eastern Australia, where it is currently known from three geographically separate areas in Tasmania, Victoria and south-eastern NSW and ACT. 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. Small clump-forming forb that grows well in disturbed roadside verges. Occurs in a wide variety of grassland, woodland, and forest habitats, generally on relatively heavy soils. Can occur in modified habitats such as semi-urban areas and roadsides. It does not tolerate heavy competition.	**Potential.** Records within 10 km and potential habitat is present in the project area. Not identified in conducted surveys during optimal survey period.
Pelargonium sp. *Striatellum*	Omeo Storksbill	E	E	**Yes (35)**	**Yes (17)**	Tufted perennial forb with leaves in basal rosettes which arise from a fleshy, often extensively branched rhizomes. Known from only 4 locations in NSW, with three on lake-beds on the basalt plains of the Monaro and one at Lake Bathurst. Has a narrow habitat range, occurring just above the high-water level of irregularly inundated ephemeral lakes, in the transition zone between surrounding grasslands or pasture and wetland or aquatic communities.	**Unlikely.** Records within 10 km, however, the project area contains sub-optimal habitat.
Pomaderris cotoneaster	Cotoneaster Pomaderris	E	E	No	No	Known from the Nungatta area, northern Kosciuszko National Park, the Tantawangalo area in South-East Forests National Park and adjoining freehold land, Badgery's Lookout near Tallong, Bungonia State Conservation Area, the Yerranderie area, Kanangra-Boyd National Park, the Canyonleigh area and Ettrema Gorge in Morton National Park. Little known about its ecology, habitat recorded is predominantly forested with deep, friable soil, amongst rock beside a creek, on rocky slopes and in steep gullies between sandstone cliffs.	**Unlikely.** No records within 10 km and sub-optimal habitat is present in the project area.
Pomaderris delicata	Delicate Pomaderris	CE	CE	No	No	Only known from two sites between Goulburn and Bungonia and south of Windellama (Cullula). Grows in dry open forest dominated by Silvertop Ash (Eucalyptus sieberi) with a dense she-oak understory. Soils are shallow and derived from sandstone and siltstone.	**Unlikely.** No records within 10 km and sub-optimal habitat is present in the project area.

Scientific name	Common name	Cwlth EPBC Act	NSW Law	ALA records within 10 km	BioNet records within 10km	Comment about species preferences and habitat in the project area	Likely presence
Pomaderris pallida	Pale Pomaderris	V	V	No	No	Has been recorded from near Kydra Trig, Tinderry Nature Reserve, the Queanbeyan River, the Shoalhaven River (between Bungonia and Warri), the Murrumbidgee River west of the ACT and the Byadbo area in Kosciuszko National Park. Usually growing in shrub communities surrounded by Brittle Gum and Red Stringybark or *Callitris* spp. woodland.	**Unlikely.** No records within 10 km and sub-optimal habitat is present in the project area.
Prasophyllum petilum	Tarengo Leek Orchid	E	E	No	No	Natural populations are known from a total of five sites in NSW: near Boorowa, Queanbeyan area, Ilford, Delegate, and a newly recognised population 10 km west of Muswellbrook. Grows in grassy woodland, highly susceptible to grazing and only known on little grazed sites. Not visible outside flowering period (October–December).	**Unlikely.** No records within 10 km and sub-optimal habitat is present in the project area.
Rhizanthella slateri	Eastern Underground Orchid	E	V	No	No	In NSW, currently known from near Bulahdelah, the Watagan Mountains, the Blue Mountains, Wiseman's Ferry area, Agnes Banks and near Nowra. Flowers from September to November. Little known about its habitat requirements as it almost grows below the soil surface and only found when the soil is disturbed.	**Unlikely.** No records within 10 km and sub-optimal habitat is present in the project area.
Rutidosis leptorhynchoides	Button Wrinklewort	E	E	No	No	In the Canberra - Queanbeyan region Button Wrinklewort primarily occurs in the ecotone between the treeless Kangaroo Grass, Poa tussocks, and Spear Grass (*Austrostipa* spp.) dominated grasslands and the open grassy Yellow Box (*Eucalyptus melliodora*) - Blakely's Red Gum (*E. blakelyi*) woodlands. Flowers between December and April. Grows on soils that are usually shallow, stony red-brown clay loams; tends to occupy areas where there is relatively less competition from herbaceous species.	**Unlikely.** No records within 10 km and sub-optimal habitat is present in the project area.
Senecio macrocarpus	Large-fruit Fireweed	V	—	No	No	In NSW, it occurs in partly cleared dry forests and box-gum woodlands which transition to Brittle Gum Forest with a relatively undisturbed understory of native grasses, forbs and subshrubs.	**Unlikely.** No records within 10 km and sub-optimal habitat is present in the project area.
Swainsona recta	Small Purple-pea	E	E	No	No	Erect perennial herb growing in association with understorey dominants that include Kangaroo Grass, Poa tussocks and Spear-grasses.	**Unlikely.** No records within 10 km and sub-optimal habitat is present in the project area.

Scientific name	Common name	Cwlth EPBC Act	NSW Law	ALA records within 10 km	BioNet records within 10km	Comment about species preferences and habitat in the project area	Likely presence
Swainsona sericea	Silky Swainson-pea	—	V	**Yes (2)**	**Yes (2)**	Found in Natural Temperate Grassland and Snow Gum Woodland on the Monaro. Also found in Box-Gum Woodland in the Southern Tablelands and South-West Slopes.	**Unlikely.** Records within 10 km, however, the project area contains sub-optimal habitat.
Thesium australe	Austral Toadflax	V	V	No	No	Found in very small populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. It is also found in Tasmania and Queensland and in eastern Asia. Grows in grassland on coastal headlands or grassland and grassy woodland away from the coast. Often found in association with Kangaroo Grass.	**Unlikely.** No records within 10 km and sub-optimal habitat is present in the project area.
Wilsonia rotundifolia	Round-leaf Wilsonia	—	E	**Yes (33)**	**Yes (25)**	This species is known from several sites in the Royal National Park, Jervis Bay area, near Deniliquin and on the lakebeds of Lake George and Lake Bathurst during draught periods. Prostrate in growth form and perennial with succulent leaves the species is typically found in muddy habitats, inhabiting coastal saltmarshes and inland saline or brackish lake beds. Flowering takes place mainly in spring and summer leading to the production small fruits containing a single black seed.	**Potential.** Records within 10 km and potential habitat is present along the banks of the Mulwaree River. Not identified in conducted surveys during optimal survey period.
	Species count	19	21			22 species across all jurisdictions	

A7.3 Threatened fauna

TABLE A 12: LIKELIHOOD OF OCCURRENCE FOR THREATENED FAUNA

Scientific name	Common name	Cwlth EPBC Act	NSW Law	ALA records within 10 km	BioNet records within 10km	eBird hotspot	Comment about species preferences and habitat in the project area	Likely presence
Birds								
Anseranas semipalmata	Magpie Goose	—	V	**Yes (3)**	**Yes (1)**	No	Common in the Australian northern. Increasing number of records in central and northern NSW since 1980s. Mainly found in wetlands less than 1 m deep with dense growth rushes or sedges. Often seen in trios or flocks on shallow wetlands, dry ephemeral swamps, wet grasslands, and floodplains. Nests in trees over deep water. Breeding is strongly influenced by water level and unlikely in south-eastern NSW.	**Potential.** Records within 10 km and suitable foraging habitat present within the project area; however, the species is unlikely to breed within the area. Records within 10 km.
Anthochaera phrygia	Regent Honeyeater	CE	CE	No	No	No	Found in inland slopes of south-east Australia and drier coastal area. In NSW, the distribution is very patchy and mainly confined to the Capertee Valley and the Bundarra-Barraba region. Very distinctive woodlands specialist that inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River She-oak (*Casuarina cunninghamiana*). Displays preference for old growth sites with abundant mistletoe.	**Unlikely.** No records within 10 km and few suitable habitat features are present, i.e. flowering eucalypts or mistletoe as an available foraging resource.
Aphelocephala leucopsis	Southern Whiteface	V	V	**Yes (27)**	**Yes (3)**	**Yes (4)**	Occurs across most of mainland Australia south of the tropics, from the northeastern edge of the Western Australian wheatbelt, east to the Great Dividing Range. Occurs in a wide range of open woodlands and shrublands where there is an understory of grasses or shrubs, or both. Almost exclusively forage and feeds on the ground.	**Potential**. Records within 10 km and some suitable foraging habitat present within the project area.
*Arenaria interpres**	Ruddy Turnstone	V (M)	—	**Yes (3)**	No	**Yes (1)**	During Australian summer, the species is widespread for its non-breading season. Found mostly in coastal regions, preferring rocky shores, beaches and occasionally recorded in inland populations.	**Unlikely.** Few records within 10 km and sub-optimal habitat present within the project area.

Scientific name	Common name	Cwlth EPBC Act	NSW Law	ALA records within 10 km	BioNet records within 10km	eBird hotspot	Comment about species preferences and habitat in the project area	Likely presence
Artamus cyanopterus	Dusky Woodswallow	—	V	**Yes (50)**	**Yes (3)**	**Yes (2)**	Widespread in eastern, southern, and south western Australia. The species occurs throughout most of New South Wales. Primarily inhabit dry, open eucalypt forests and woodlands, including mallee associations, with an open or sparse understory of eucalypt saplings, acacias and other shrubs, and groundcover of grasses or sedges and fallen woody debris. It has also been recorded in shrublands, heathlands and very occasionally in moist forest or rainforest. Also found in farmland, usually at the edges of forest or woodland.	**Likely**. Records within 10 km and some suitable foraging habitat present within the project area.
Botaurus poiciloptilus	Australasian Bittern	E	E	No	No	No	Widespread but uncommon over south-eastern Australia. In NSW they may be found over most of the state except for the far north-west. Wetland specialist that favours permanent freshwater wetlands with tall, dense vegetation especially Bullrushes (*Typha* spp.) and Spikerushes (*Eleocharis* spp.).	**Potential**. No records within 10 km, however, some suitable foraging habitat present within the project area.
Calidris acuminata	Sharp-tailed Sandpiper	V (M)	—	**Yes (61)**	**Yes (1)**	**Yes (53)**	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. Prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh, or other low vegetation.	**Potential**. Records within 10 km and some suitable foraging habitat present within the project area.
Calidris canutus	Red Knot	V (M)	—	**Yes (3)**	No	**Yes (3)**	Species typically inhabits intertidal mud and sandflats, sandy beaches of sheltered coasts, estuaries as well as a range of other aquatic and marine habitats. Species mostly has a coastal distribution within NSW but is at times recorded inland.	**Unlikely.** Few records within 10 km and sub-optimal habitat present within the project area.
Calidris ferruginea	Curlew Sandpiper	CE (M)	E	**Yes (12)**	**Yes (1)**	**Yes (2)**	Annual migratory shorebird to and from Siberia. Recorded in all states in Australia during non-breeding seasons as well as breeding season when many one-year-old birds remain in Australia. Most often found around the coasts and widespread inland with small numbers. Mainly occur in littoral and estuarine habitats. Sometimes found in inland swamps and lakes during annual migration.	**Potential**. Records within 10 km and some suitable foraging habitat present within the project area.

Scientific name	Common name	Cwlth EPBC Act	NSW Law	ALA records within 10 km	BioNet records within 10km	eBird hotspot	Comment about species preferences and habitat in the project area	Likely presence
Calidris tenuirostris	Great Knot	V (M)	V	**Yes (2)**	No	**Yes (1)**	Annual migratory bird from Siberia arriving in Australia from August to early September, occasionally between October-November. It has a scattered distribution along the coastal habitats of NSW, sometimes also being recorded inland. Occurs within sheltered, coastal habitats containing large, intertidal mudflats or sandflats, including inlets, bays, harbours, estuaries and lagoons.	**Unlikely**. Few records within 10 km and sub-optimal habitat present within the project area.
Callocephalon fimbriatum	Gang-Gang Cockatoo	E	E	**Yes (40)**	**Yes (5)**	**Yes (1)**	Distinctive parrot found from southern Victoria through south- and central-eastern New South Wales. In Spring and summer, generally found in tall mountain forests and woodlands especially wet sclerophyll forests. In autumn and winter often moves to lower altitudes in drier and more open forests and woodlands. Prefers to roost in old growth forests and to nest in hollows with a 10+ cm diameter at least 9 m above ground level.	**Potential**. Records within 10 km and utilisable habitat present within the project area.
Calyptorhynchus lathami lathami	South-eastern Glossy Black-Cockatoo	V	V	**Yes (39)**	**Yes (52)**	No	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. Inhabits open forest and woodlands of the coast and the Great Dividing Range where stands of She-oak occur. Black She-oak (*Allocasuarina littoralis*) and Forest She-oak (*A. torulosa*) are important foods.	**Potential**. Records within 10 km and utilisable habitat present within the project area.
Chthonicola sagittata	Speckled Warbler	—	V	**Yes (7)**	No	No	The species has a patchy distribution throughout south-eastern Queensland, the eastern half of NSW and into Victoria, as far west as the Grampians. Ground-dwelling bird living in a wide range of Eucalyptus dominated communities with a grassy understory, 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. The diet consists of seeds and insects, with most foraging taking place on the ground around tussocks and under bushes and trees.	**Potential**. Records within 10 km and some suitable foraging habitat present within the project area.

Scientific name	Common name	Cwlth EPBC Act	NSW Law	ALA records within 10 km	BioNet records within 10km	eBird hotspot	Comment about species preferences and habitat in the project area	Likely presence
Circus assimilis	Spotted Harrier	—	V	**Yes (13)**	**Yes (1)**	**Yes (1)**	Occurs throughout the Australian mainland, except in densely forested or wooded habitats of the coast, escarpment, and ranges. Individuals disperse widely in NSW and comprise a single population. Occurs in grassy open woodland. Most commonly found in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands. Builds a stick nest in a tree. Preys on terrestrial mammals (e.g. bandicoots, bettongs, and rodents), birds and reptile, occasionally insects and rarely carrion.	**Potential**. Records within 10 km and utilisable habitat present within the project area.
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	V	V	No	No	No	Endemic to eastern Australia and occurs in eucalypt forests and woodlands of inland plains and slopes of the Great Dividing Range. It is less commonly found on coastal plains and ranges. Mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understory, Hollows in standing dead or live trees and tree stumps are essential for nesting.	**Unlikely.** No records within 10 km and sub-optimal habitat present within the project area.
Daphoenositta chrysoptera	Varied Sittella	—	V	**Yes (5)**	**Yes (2)**	No	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. Acrobatic woodland specialist that lives in eucalypt forests and woodland, mallee, and Acacia woodland. Feeds on slaters and other arthropods extracted from crevices in bark and dead wood.	**Potential**. Records within 10 km and some suitable foraging habitat present within the project area.
Epthianura albifrons	White-fronted Chat	—	V	**Yes (103)**	**Yes (19)**	**Yes (6)**	Found across the southern half of Australia, from southernmost Queensland to southern Tasmania, and across to Western Australia as far north as Carnarvon. Found mostly in temperate to arid climates and very rarely sub-tropical areas, it occupies foothills and lowlands up to 1000 m above sea level. Usually found foraging on bare or grassy ground in wetland areas, singly or in pairs. They are insectivorous, feeding mainly on flies and beetles caught from or close to the ground.	**Potential**. Records within 10 km and some suitable foraging habitat present within the project area.

Scientific name	Common name	Cwlth EPBC Act	NSW Law	ALA records within 10 km	BioNet records within 10km	eBird hotspot	Comment about species preferences and habitat in the project area	Likely presence
Falco hypoleucos	Grey Falcon	V	V	No	No	No	Medium-sized raptor sparsely distributed in NSW, chiefly throughout the Murray-Darling Basin, with the occasional vagrant east of the Great Dividing Range. Usually restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions. Sometimes found in open woodlands near the coast and near wetlands where surface water attracts prey.	**Unlikely.** No records within 10 km and sub-optimal habitat present within the project area.
Falco subniger	Black Falcon	—	V	**Yes (6)**	**Yes (3)**	No	Widely, but sparsely, distributed in New South Wales, mostly occurring in inland region. Habitat is usually in the arid and semi-arid zones. Inhabits woodland, shrubland and grassland in the arid and semi-arid zones, especially wooded watercourses, and agricultural land with scattered remnant trees. It hunts over open wooded grasslands, saltbush plains, bluebush plains and other low vegetation.	**Unlikely.** Few records within 10 km and sub-optimal habitat present within the project area.
Gallinago hardwickii	Latham's Snipe	V (M)	V	**Yes (10)**	No	**Yes (3)**	Non-breeding visitor to south-eastern Australia and is a passage migrant through northern Australia. Occurs in permanent and ephemeral wetlands up to 2000 m above sea-level, usually inhabiting open, freshwater wetlands with low, dense vegetation. However, they can also occur in habitats with saline or brackish water, in modified or artificial habitats, and in habitats located close to humans or human activity.	**Potential**. Records within 10 km and some suitable foraging habitat present within the project area.
Grantiella picta	Painted Honeyeater	V	V	No	No	No	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. Distinctive nomadic species that is a specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias especially *Amyema* species.	**Unlikely.** No records within 10 km and sub-optimal habitat present within the project area.
Haliaeetus leucogaster	White-bellied Sea-eagle	—	V	**Yes (36)**	**Yes (7)**	**Yes (2)**	Large eagle distributed around the Australian coastline, including Tasmania, and well inland along rivers and wetlands of the Murray Darling Basin. Habitats are characterised by the presence of large areas of open water including larger rivers, swamps, lakes, and the sea. Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, and forest (including rainforest).	**Potential**. Records within 10 km and utilisable habitat present within the project area.

Scientific name	Common name	Cwlth EPBC Act	NSW Law	ALA records within 10 km	BioNet records within 10km	eBird hotspot	Comment about species preferences and habitat in the project area	Likely presence
Hieraaetus morphnoides	Little Eagle	—	V	**Yes (19)**	**Yes (4)**	**Yes (1)**	Found throughout the Australian mainland excepting the most densely forested parts of the Dividing Range escarpment. It occurs as a single population throughout NSW. Occupies open eucalypt forest, woodland, or open woodland. Sheoak or Acacia woodlands and riparian woodlands of interior NSW are also used. Nests in tall living trees within a remnant patch, where pairs build a large stick nest in winter.	**Potential**. Records within 10 km and utilisable habitat present within the project area.
Hirundapus caudacutus	White-throated Needletail	V (M)	V	**Yes (4)**	**Yes (2)**	**Yes (50)**	Widespread in eastern and south-eastern Australia. In eastern Australia, it is recorded in all coastal regions of Queensland and NSW, extending inland to the western slopes of the Great Divide and occasionally onto the adjacent inland plains. Almost exclusively aerial species that forages for insects up to 1 km above ground, usually in large flocks. Only occurs in Australia between late spring and early autumn, breeds in north Asia.	**Potential**. Records within 10 km and utilisable habitat present within the project area.
Lathamus discolor	Swift Parrot	CE	E	No	No	No	Distinctive parrot that breeds in Tasmania during spring and summer and migrates to the mainland for autumn and winter, where they are found in areas with eucalypts that flower profusely in winter or that have abundant lerp (sap-sucking bugs) infestations. Some favourite flowering trees include but not limited to Swamp Mahogany (*Eucalyptus robusta*,), and Spotted Gum (*Corymbia maculata)*, Red Bloodwood (*C. gummifera*).	**Unlikely.** No records within 10 km and sub-optimal habitat present within the project area.
Limosa limosa	Black-tailed Godwit	E	V	**Yes (2)**	No	**Yes (2)**	Primarily inhabits coastal environments such as sheltered bays, estuaries and lagoons with large intertidal mudflats or sandflats, occasionally recorded on rocky coasts or coral islets. The species also utilises wetlands and floodplains and may also use lagoons in sewage farms or saltworks.	**Unlikely.** Few records within 10 km and sub-optimal habitat present within the project area.
Melanodryas cucullata cucullata	South-eastern Hooded Robin	E	E	No	No	No	Widespread, found across Australia, except for the driest deserts and the wetter coastal areas. Prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas. Requires structurally diverse habitats featuring mature eucalypts, saplings, some small shrubs, and a ground layer of moderately tall native grasses.	**Unlikely.** No records within 10 km and sub-optimal habitat present within the project area.

Scientific name	Common name	Cwlth EPBC Act	NSW Law	ALA records within 10 km	BioNet records within 10km	eBird hotspot	Comment about species preferences and habitat in the project area	Likely presence
Neophema chrysostoma	Blue-winged Parrot	V	V	No	No	No	Inhabits a range of habitats from coastal, sub-coastal and inland areas, through to semi-arid zones. Tends to favour grasslands and grassy woodlands and are often found near wetlands both near the coast and in semi-arid zones. Species breeds south of the Great Dividing Range, through southern Victoria and South Australia, and in parts of Tasmania. Partially migratory as variable numbers of individuals migrate across the Bass Strait during winter.	**Unlikely.** No records within 10 km and sub-optimal habitat present within the project area.
Ninox strenua	Powerful Owl	—	V	No	**Yes (1)**	No	Inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. Requires large tracts of forest or woodland habitat but can occur in fragmented landscapes as well. Roosts by day in dense vegetation.	**Unlikely.** One record within 10 km and sub-optimal habitat present within the project area.
Oxyura australis	Blue-billed Duck	—	V	**Yes (55)**	**Yes (3)**	**Yes (623)**	Endemic to south-eastern and south-western Australia. It is widespread in NSW, but most common in the southern Murray-Darling Basin area. Birds disperse during the breeding season to deep swamps up to 300 km away. 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.	**Likely**. Records within 10 km and some suitable foraging habitat present within the project area.
Petroica boodang	Scarlet Robin	—	V	**Yes (23)**	**Yes (12)**	No	Found from south east Queensland to south east South Australia and also in Tasmania and south west Western Australia. In NSW, it occurs from the coast to the inland slopes. A season altitudinal migrant, breeding in high altitude forests in the spring and summer and migrating to lower open woodlands for autumn and winter. Prefers sites with abundant logs and fallen timber, though sometimes found in grazed paddocks with scattered trees.	**Potential**. Records within 10 km and utilisable habitat present within the project area.

Scientific name	Common name	Cwlth EPBC Act	NSW Law	ALA records within 10 km	BioNet records within 10km	eBird hotspot	Comment about species preferences and habitat in the project area	Likely presence
Petroica phoenicea	Flame Robin	—	V	**Yes (33)**	**Yes (1)**	**Yes (1)**	Endemic to south eastern Australia, and ranges from near the Queensland border to south east South Australia and also in Tasmania. In NSW, it breeds in upland areas and in winter, many birds move to the inland slopes and plains. Species is generally seasonally migratory between their more alpine and subalpine ranges. Breeds in upland tall moist eucalypt forests during spring and summer and moving to open grasslands and open woodlands in the autumn and winter. The species forages for insects from perched positions from course woody debris, logs or other favoured perches.	**Potential**. Records within 10 km and utilisable habitat present within the project area.
Pluvialis squatarola	Grey Plover	V (M)	—	**Yes (4)**	No	No	Annual migratory bird from Siberia that overwinters in parts of Australia, particularly the coastlines of South Australia, Western Australia, Queensland and the Northern Territory. It occurs almost entirely in coastal areas, where they typically inhabit sheltered bays, estuaries and lagoons with mudflats and sandflats, and occasionally on rocky coasts or on reefs within muddy lagoons. They also occur around terrestrial wetlands such as near-coastal lakes and swamps, or salt-lakes. It is also very occasionally recorded further inland, where they occur around wetlands or salt-lakes.	**Unlikely.** Few records within 10 km and sub-optimal habitat present within the project area.
Polytelis swainsonii	Superb Parrot	V	V	**Yes (1)**	No	No	Found throughout eastern inland NSW. Inhabits Box-Gum, Box-Cypress-pine and Boree Woodlands and River Red Gum Forest. They nest in the hollows of large trees (dead or alive). May forage up to 10 km from nesting sites, primarily in grassy box woodland.	**Unlikely.** One record within 10 km and sub-optimal habitat present within the project area.
Pycnoptilus floccosus	Pilotbird	V	—	No	No	No	Widely distributed throughout the south-eastern region of Australia. Ground foraging species that occupies a variety of different habitats. Strictly terrestrial species, living on the ground in dense forests with heavy undergrowth. Habitat critical to their survival includes wet sclerophyll forests in temperate zones in moist gullies with dense undergrowth, and dry sclerophyll forests and woodlands occupying dry slopes and ridges.	**Unlikely.** No records within 10 km and sub-optimal habitat present within the project area.

Scientific name	Common name	Cwlth EPBC Act	NSW Law	ALA records within 10 km	BioNet records within 10km	eBird hotspot	Comment about species preferences and habitat in the project area	Likely presence
Rostratula australis	Australian Painted Snipe	E	E	No	No	No	In NSW many records are from the Murray-Darling Basin including the Paroo wetlands, Lake Cowal, Macquarie Marshes, Fivebough Swamp and more recently, swamps near Balldale and Wanganella. A small freshwater wader. Prefers fringes of swamps, dams, and nearby marshy areas where there is a cover of grasses, lignum, low scrub, or open timber. Nests on the ground amongst tall vegetation, such as grasses, tussocks, or reeds.	**Unlikely.** No records within 10 km and sub-optimal habitat present within the project area.
Stagonopleura guttata	Diamond Firetail	V	V	**Yes (51)**	**Yes (7)**	**Yes (8)**	Endemic to south-eastern Australia, extending from central Queensland to the Eyre Peninsula in South Australia. It is widely distributed in NSW, with a concentration of records from the Northern, Central and Southern Tablelands, the Northern, Central and South Western Slopes and the North West Plains and Riverina. Distinctive ground-feeding bird found in grasslands and grassy eucalyptus woodlands, riparian areas, and sometimes lightly wooded farmland. Has been recorded in some towns and near farmhouses.	**Potential**. Records within 10 km and utilisable habitat present within the project area.
Stictonetta naevosa	Freckled Duck	—	V	**Yes (107)**	**Yes (5)**	**Yes (2)**	Primarily in south-eastern and south-western Australia, occurring as a vagrant elsewhere. Prefers permanent freshwater swamps and creeks with heavy growth of Cumbungi, Lignum or Tea-tree. During drier times they move to lakes, reservoirs, farm dams and sewage ponds. Generally, rest in dense cover during the day, usually in deep water. Nests are usually located in dense vegetation at or near water level.	**Likely**. Records within 10 km and some suitable foraging habitat present within the project area.
*Tringa nebularia**	Common Greenshank	E (M)	—	**Yes (7)**	**Yes (4)**	**Yes (1)**	This species occurs across most of coastal NSW. It is also widespread west of the Great Dividing Range, particularly between the Murray and Lachlan Rivers and the Darling River drainage basin, as well as the Macquarie Marshes.	**Potential**. Records within 10 km and utilisable habitat present within the project area.
Tyto tenebricosa	Sooty Owl	—	V	**Yes (1)**	No	No	Occurs in rainforest, including dry rainforest, subtropical and warm temperate rainforest, as well as moist eucalypt forests. Roosts by day in the hollow of a tall forest tree or in heavy vegetation; hunts by night for small ground mammals or tree-dwelling mammals Occupies the easternmost one-eighth of NSW, occurring on the coast, coastal escarpment, and eastern tablelands. Territories are occupied permanently.	**Unlikely.** One record within 10 km and sub-optimal habitat present within the project area.
Fish								

Scientific name	Common name	Cwlth EPBC Act	NSW Law	ALA records within 10 km	BioNet records within 10km	eBird hotspot	Comment about species preferences and habitat in the project area	Likely presence
Macquaria australasica	Macquarie Perch	E	E	No	No	N/A	Found in the Murray-Darling Basin (particularly upstream reaches) of the Lachlan, Murrumbidgee and Murray rivers, and parts of south-eastern coastal NSW, including the Hawkesbury/Nepean and Shoalhaven catchments. Occurs in waters with lots of cover such as aquatic vegetation, snags, boulders, and overhanging banks.	**Unlikely.** No records within 10 km and where the project area is not within the known indicative distribution of the species in NSW.
Frogs								
Litoria aurea	Green and Golden Bell Frog	V	E	**Yes (1)**	**Yes (1)**	N/A	Since 1990 the species has only been recorded at an approximate 50 locations in NSW, most of which are small, coastal, or near coastal populations. Only a single population is known to exist in the NSW Southern Tablelands. Found in marshes, dams, and stream-sides, particularly those containing bullrushes (*Typha* spp.) or spike-rushes (*Eleocharis* spp.). A relatively large species that can reach 100 mm in length and usually vividly pea coloured, splotched with a near metallic brown or golden. However, colouration is variable in the species.	**Potential**. Records within 10 km and utilisable habitat present within the project area.
Litoria castanea	Yellow-Spotted Tree Frog	CE	CE	No	No	N/A	Long-lived and mostly aquatic tree frogs. Require large permanent ponds or slow flowing 'chain-of-ponds' streams with abundant emergent vegetation such as bulrushes and aquatic vegetation.	**Unlikely.** No records within 10 km and the project area contains sub-optimal habitat.
Mammals—bats								
Chalinolobus dwyeri	Large-eared Pied Bat	E	E	No	No	N/A	Small-medium bat mainly found in well-timbered 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. Breeds in breeds in sandstone caves/overhangs and will return to same nursery sites over many years.	**Unlikely.** No records within 10 km and the project area contains sub-optimal habitat.

Scientific name	Common name	Cwlth EPBC Act	NSW Law	ALA records within 10 km	BioNet records within 10km	eBird hotspot	Comment about species preferences and habitat in the project area	Likely presence
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	**Yes (7)**	**Yes (6)**	N/A	Largest bat in Australia, generally found within 200 km of the east coast. Roosts communally in large camps often located in a gully close to water under dense canopy cover. May travel 20–50 km when foraging for foods, with a home range is ~785,000 ha. Favourite food plants include flowering native trees (Eucalyptus, Melaleuca and Banksia), fruiting rainforest trees and vines, urban gardens, and cultivated fruit crops.	**Unlikely.** Some records within 10 km, however, the project area contains sub-optimal habitat.
Mammals—other								
Cercartetus nanus	Eastern Pygmy-possum	—	V	**Yes (1)**	**Yes (1)**	N/A	Smallest possum in Australia. Inhabits shrubby vegetation in a wide variety of habitats, from open heathland or shrubland to sclerophyll or rain forest, at elevations from sea level to 1,800 metres. Feeds largely on nectar and pollen collected from banksias, eucalypts and bottlebrushes; an important pollinator of heathland plants such as banksias; soft fruits are eaten when flowers are unavailable.	**Unlikely.** Some records within 10 km, however, the project area contains sub-optimal habitat.
Dasyurus maculatus	Spotted-tail Quoll	E	V	**Yes (1)**	No	N/A	Found in eastern NSW, eastern Victoria, south-east and north-eastern Queensland, and Tasmania. Only in Tasmania is it still considered relatively common. Mostly nocturnal predator that forages 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. Lives in hollow-bearing trees, fallen logs, other animal burrows, caves, and rocky outcrops. Often hunts densely vegetated creek lines but may also consume carrion.	**Unlikely.** One record within 10 km, however, the project area contains sub-optimal habitat.
Dasyurus viverrinus	Eastern Quoll	E	E	**Yes (2)**	No	N/A	The mainland population of this species, previously believed to have disappeared from NSW by the 1990s, shows genetic signs of persistence. Credible reports suggest a potential small population still exists across its former range, offering hope for conservation efforts. Displays adaptable habitat preferences, inhabiting diverse environments including dry sclerophyll forests, scrublands, heathlands, pastures, and cultivated areas. Roosts in burrows, hollow logs, rock formations, and even man-made structures.	**Unlikely.** Some records within 10 km, however, the project area contains sub-optimal habitat.

Scientific name	Common name	Cwlth EPBC Act	NSW Law	ALA records within 10 km	BioNet records within 10km	eBird hotspot	Comment about species preferences and habitat in the project area	Likely presence
Petauroides volans	Greater Glider	E	E	No	No	N/A	Largest glider in Australia. Prefers old growth forests with many hollows and may den in up to 18 hollows across their home range, which averages just 1–3 ha. Favourite foods including leaves from the Ribbon Gum (*Eucalyptus viminalis*), Mountain Gum (*E. dalrympleana*) and Narrow-leaved Peppermint (*E. radiata*) as well as mistletoe, *Acacia* foliage and young pinecones (*Pinus radiata*).	**Unlikely.** No records within 10 km and the project area contains sub-optimal habitat.
Petaurus australis	Yellow-bellied Glider	V	V	No	No	N/A	Found along the eastern coast to the western slopes of the Great Dividing Range, from southern Queensland to Victoria. Occurs in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils. Very mobile and occupy large home ranges between 20 to 85 ha to encompass dispersed and seasonally variable food resources.	**Unlikely.** No records within 10 km and the project area contains sub-optimal habitat.
Petaurus norfolcensis	Squirrel Glider	—	V	**Yes (1)**	No	N/A	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. Prefers mixed species stands with a shrub or Acacia midstory. Requires abundant tree hollows for refuge and nest sites.	**Unlikely.** One record within 10 km, however, the project area contains sub-optimal habitat.
Phascolarctos cinereus	Koala	E	E	**Yes (41)**	**Yes (5)**	N/A	Fragmented distribution throughout eastern Australia from north-east Queensland to the Eyre Peninsula in South Australia. Iconic tree-dweller that inhabits eucalypt woodlands and forests, feeding on the foliage of 70+ Eucalyptus species and 30+ other species.	**Unlikely.** Records within 10 km, however, the project area contains sub-optimal habitat.
Reptiles								
Aprasia parapulchella	Pink-tailed Worm-lizard	V	V	No	No	N/A	Primarily known from the Central and Southern Tablelands and the South Western Slopes, with a confirmed outlier record on the Hay Plains north of Hay. Species inhabits sloping, open woodland areas with predominantly native grassy ground layers, particularly those dominated by Kangaroo Grass. Sites are typically well-drained, with rocky outcrops or scattered, partially buried rocks.	**Unlikely.** No records within 10 km and the project area contains sub-optimal habitat.

Scientific name	Common name	Cwlth EPBC Act	NSW Law	ALA records within 10 km	BioNet records within 10km	eBird hotspot	Comment about species preferences and habitat in the project area	Likely presence
Delma impar	Striped Legless Lizard	V	V	No	No	N/A	Occurs in the Southern Tablelands, the South West Slopes, the Upper Hunter and possibly on the Riverina. Mainly found in and around Natural Temperate Grassland but has also been captured in grasslands with a high exotic component and in open Box-Gum Woodland.	**Unlikely.** No records within 10 km and the project area contains sub-optimal habitat.
Varanus rosenbergi	Rosenberg's Goanna	—	V	**Yes (1)**	**Yes (1)**	N/A	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. Found in heath, open forest, and woodland. Associated with termites, shelters in hollow logs, rock crevices and in burrows.	**Unlikely.** Some records within 10 km, however, the project area contains sub-optimal habitat.
Invertebrates								
Synemon plana	Golden Sun Moth	V	V	No	No	N/A	NSW populations are found in the area between Queanbeyan, Gunning, Young and Tumut. Medium-sized day-flying moth that requires native grassland dominated by Kangaroo Grass, Wallaby Grass *(Rytidosperma* spp.) and (exotic) Chilean Needle Grass (*Nassella neesiana*). Spends much of its lifecycle underground and adult females are flightless.	**Unlikely.** No records within 10 km and the project area contains sub-optimal habitat.
Keyacris scurra	Key's Matchstick Grasshopper	E	E	**Yes (1)**	**Yes (2)**	N/A	Usually found in native grasslands but it has also been recorded in other vegetation associations containing a native grass understory. Associated with Kangaroo Grass and known to feed on Asteraceae species. Disturbance appears to be an important determinant of site occupancy, and it appears to be absent from sites that are disturbed during inappropriate times of the year (and interrupt the short non-overlapping lifecycle) or have been subjected to erratic management (e.g. periods of over and under grazing).	**Present.** A single individual of this species was observed within the project area at the time of inspection
	Species count	35	45				53 species across all jurisdictions	

* Local bird sighting data from eBird hotspots: Lake Bathurst (https://ebird.org/hotspot/L2542792), Tarago Village (https://ebird.org/hotspot/L2542763), and Duck Flat Travelling Stock Reserve (southern section) (https://ebird.org/hotspot/L9829457).

A7.4 Threatened populations

Threatened populations are geographically defined groups of native plants and animals likely to become extinct in NSW in the near future. A population is a group of organisms of the same species occupying a particular area. A search of the BioNet Atlas of NSW Wildlife found no threatened populations exist or may exist within 10 km of the project area.

A7.5 Migratory species

TABLE A 13: LIKELIHOOD OF OCCURRENCE FOR EPBC ACT LISTED MIGRATORY SPECIES

Scientific name	Common name	Cwlth EPBC Act	NSW Law	ALA records within 10 km	BioNet records within 10km	eBird	Distribution and habitat	Likelihood of Occurrence
Marine birds								
Apus pacificus	Fork-tailed Swift	(M)	—	No	No	No	Non-breeding visitor to all states and territories of Australia. Recorded in all regions of NSW, with many records occur east of the Great Divide, however, a few populations have been found west of the Great Divide. Almost exclusively aerial and feeds on insects in mid-air, only landing occasionally where it nests on mountain cliffs and cliff faces.	**Unlikely.** No records within 10 km and the project area contains sub-optimal habitat.
Terrestrial birds								
*Hirundapus caudacutus**	White-throated Needletail	V (M)	V	**Yes (4)**	**Yes (2)**	**Yes (50)**	Widespread in eastern and south-eastern Australia. In eastern Australia, it is recorded in all coastal regions of Queensland and NSW, extending inland to the western slopes of the Great Divide and occasionally onto the adjacent inland plains. Almost exclusively aerial species that forages for insects up to 1 km above ground, usually in large flocks. Only occurs in Australia between late spring and early autumn, breeds in north Asia.	**Potential**. Records within 10 km and utilisable habitat present within the project area.
Motacilla flava	Yellow Wagtail	(M)	—	No	No	No	Has an extremely large range, extending from Europe, east through Siberia to west Asia and northwestern China; and south through the Arabian Peninsula to Egypt. Important habitat is mostly well watered open grasslands and the fringes of wetlands. Roosts in mangroves and other dense vegetation.	**Unlikely.** No records within 10 km and the project area contains sub-optimal habitat.
Wetlands birds								

Scientific name	Common name	Cwlth EPBC Act	NSW Law	ALA records within 10 km	BioNet records within 10km	eBird	Distribution and habitat	Likelihood of Occurrence
Actitis hypoleucos	Common Sandpiper	(M)	—	**Yes (1)**	**Yes (1)**	No	Found along all coastlines of Australia and in many areas inland, the Common Sandpiper is widespread in small numbers. Utilises a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around muddy margins or rocky shores and rarely on mudflats.	**Unlikely.** Few records within 10 km and the project area contains sub-optimal habitat.
*Arenaria interpres**	Ruddy Turnstone	V (M)	—	**Yes (3)**	No	**Yes (1)**	During Australian summer, the species is widespread for its non-breading season. Found mostly in coastal regions, preferring rocky shores, beaches and occasionally recorded in inland populations.	**Unlikely.** Few records within 10 km and sub-optimal habitat present within the project area.
*Calidris acuminata**	Sharp-tailed Sandpiper	V (M)	—	**Yes (61)**	**Yes (1)**	**Yes (53)**	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. Prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh, or other low vegetation.	**Potential**. Records within 10 km and some suitable foraging habitat present within the project area.
*Calidris ferruginea**	Curlew Sandpiper	CE (M)	E	**Yes (12)**	**Yes (1)**	**Yes (2)**	Annual migratory shorebird to and from Siberia. Recorded in all states in Australia during non-breeding seasons as well as breeding season when many one-year-old birds remain in Australia. Most often found around the coasts and widespread inland with small numbers. Mainly occur in littoral and estuarine habitats. Sometimes found in inland swamps and lakes during annual migration.	**Potential**. Records within 10 km and some suitable foraging habitat present within the project area.
Calidris melanotos	Pectoral Sandpiper	(M)	—	**Yes (9)**	**Yes (4)**	No	Widespread, but scattered in NSW with records existing east of the Great Divide, from Casino and Ballina, south to Ulladulla. West of the Great Divide, the species is widespread in the Riverina and Lower Western regions. Prefers shallow fresh to saline wetlands. The species is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains, and artificial wetlands.	**Potential.** Records within 10 km and **s**ome suitable foraging and transitory habitat present within the project area.

Scientific name	Common name	Cwlth EPBC Act	NSW Law	ALA records within 10 km	BioNet records within 10km	eBird	Distribution and habitat	Likelihood of Occurrence
Calidris ruficollis	Red-necked Stint	(M)	—	**Yes (27)**	No	**Yes (5)**	Annual migratory bird from Siberia arriving in Australian from August for non-breeding summer, the species can be found in south-east Australia in October. Mosly found in coastal areas, including estuaries and mudflats, but also can occasionally be found in inland in freshwater lagoons, swamps, lakes or even flooded paddocks.	**Potential.** Records within 10 km and **s**ome suitable foraging and transitory habitat present within the project area.
Charadrius bicinctus	Double-banded Plover	(M)	—	**Yes (28)**	**Yes (4)**	**Yes (19)**	Breeding occurs in New Zealand, in non-breeding season part of the population migrates to Australia and part remains. The species is found on a variety of littoral, estuarine, fresh or saline ecosystems. Outside of breeding season it commonly roosts in flocks.	**Unlikely.** Records within 10 km, however, sub-optimal habitat present within the project area.
*Gallinago hardwickii**	Latham's Snipe	V (M)	—	**Yes (10)**	No	**Yes (3)**	Non-breeding visitor to south-eastern Australia and is a passage migrant through northern Australia. Occurs in permanent and ephemeral wetlands up to 2000 m above sea-level, usually inhabiting open, freshwater wetlands with low, dense vegetation. However, they can also occur in habitats with saline or brackish water, in modified or artificial habitats, and in habitats located close to humans or human activity.	**Potential**. Records within 10 km and some suitable foraging habitat present within the project area.
Numenius minutus	Little Curlew	(M)	—	**Yes (6)**	**Yes (2)**	**Yes (1)**	This species has a mostly coastal distribution within NSW. Most records have been recorded from between Casino in the north and Greenwell Point in the south. Scattered records also occur west of the Great Dividing Range. Most often occupies grassy habitats such as grassland and sedgeland, floodplains, mud and sandflats, open woodland and a range of aquatic habitats.	**Potential.** Records within 10 km and **s**ome suitable foraging and transitory habitat present within the project area.
Pluvialis fulva	Pacific Golden Plover	(M)	—	**Yes (14)**	**Yes (7)**	No	Breeding mostly in northern Siberia, this species migrates to Australia, Asia, Melanesia and Polynesia for its non-breeding season. In Australia it inhabits diverse coastal habitats or occasionally inland wetlands. The species preferably forages on sandy or muddy shores but can be seen to forage on rocky shores.	**Unlikely.** Recorded within 10 km, however, sub-optimal habitat present within the project area.

Scientific name	Common name	Cwlth EPBC Act	NSW Law	ALA records within 10 km	BioNet records within 10km	eBird	Distribution and habitat	Likelihood of Occurrence
*Tringa nebularia**	Common Greenshank	E (M)	—	**Yes (7)**	**Yes (4)**	**Yes (1)**	This species occurs across most of coastal NSW. It is also widespread west of the Great Dividing Range, particularly between the Murray and Lachlan Rivers and the Darling River drainage basin, as well as the Macquarie Marshes.	**Potential**. Records within 10 km and utilisable habitat present within the project area.
Tringa stagnatilis	March Sandpiper, Little Greenshank	(M)	—	No	**Yes (2)**	**Yes (1)**	A migratory bird breeding in east Europe, southern Siberia and northern China which migrates to Africa southern Asia and Australia for its non-breeding season. Lives on permanent or ephemeral wetlands of varying salinity foraging in shallow water at the edge/ they probe wet mud of mudflats or feed among marshy vegetation.	**Unlikely.** Recorded within 10 km, however, sub-optimal habitat present within the project area.
	Species count	**15**	**2**				***These species are also listed and considered under** A7.3.	

A7.6 Pest species associated with Key Threatening Processes (KTPs)

Scientific name	Common name	Cwlth EPBC Act	NSW BC Act	ALA records within 10 km	BioNet records within 10km	eBird hotspots#	Comment about species preferences and habitat in the project area	Likelihood of Occurrence
Mammals								
Canis lupus	Wild dog	—	Yes	**Yes**	**Yes**	n/a	Found across NSW but most common in the eastern ranges, the coastal hinterland, and tablelands. Prefers areas where human disturbance is limited and where shelter, food and water are abundant.	**Potential**
Capra hircus	Goat	Yes	Yes	No	No	n/a	Found in many areas of NSW. They have benefited from sheep grazing practices and the provision of artificial water points throughout the dryer regions of NSW.	**Potential**
Felis catus	Cat	Yes	Yes	No	No	n/a	Found all over Australia in all habitats, including forests, woodlands, grasslands, wetlands, and arid areas.	**Potential**
Lepus capensis	Hare	Yes	—	No	**Yes**	n/a	Preferred habitat is open country with the presence of tussock or rocks to hide amongst.	**Potential**
Mus musculus	House mouse	Yes	—	**Yes**	No	n/a	Associated with human habituation, nest behind rafters, in woodpiles, storage areas, or any hidden spot near a source of food.	**Potential**
Oryctolagus cuniculus	Rabbit	Yes	Yes	**Yes**	**Yes**	n/a	Densities are greatest around non-arable rough country. This includes creeks, riverbanks, erosion gullies and rocky outcrops.	**Likely**
Rattus rattus	Black Rat	Yes	—	No	No	n/a	Very closely associated with humans and common in urban areas.	**Potential**
Sus scrofa	Feral Pig	Yes	Yes	**Yes**	**Yes**	n/a	Need moist areas providing adequate food and water and enough shelter to protect against extremes of temperature.	**Potential**
Vulpes vulpes	Fox	Yes	Yes	**Yes**	**Yes**	n/a	Common in fragmented landscapes and areas with shelter, food, and den sites. Highest densities include temperate grazing lands and peri-urban/urban areas where food is abundant.	**Likely**
various species	Deer	Yes	Yes	**Yes**	**Yes**	n/a	Live predominantly in grassy forests. They occupy rainforests, eucalypt forests and farmlands. Preferred food is grass, though they also eat the leaves of shrubs, trees and herbs, bark, and some fruit.	**Likely**
Birds								
Acridotheres tristis	Common Myna	Yes	—	**Yes**	**Yes**	**Yes**	Typically found in open woodland, cultivation, and around human habitation.	**Likely**

Scientific name	Common name	Cwlth EPBC Act	NSW BC Act	ALA records within 10 km	BioNet records within 10km	eBird hotspots#	Comment about species preferences and habitat in the project area	Likelihood of Occurrence
Alauda arvensis	Skylark	Yes	—	**Yes**	**Yes**	**Yes**	Found in cultivated grasslands and crops, wastelands, and coastal dunes.	**Likely**
Anas platyrhynchos	Mallard	Yes	—	**Yes**	**Yes**	**Yes**	Prefers still, shallow water with abundant plant life and is most often found on artificial lakes, ponds, and wetlands in urban and farm areas.	**Potential**
Carduelis carduelis	European Goldfinch	Yes	—	**Yes**	**Yes**	**Yes**	Fairly common to common in open woodland, parks, gardens, and farmland and open country with hedges and weedy patches; often feeds on seeding thistles.	**Potential**
Columba livia	Rock Dove	Yes	—	**Yes**	No	**Yes**	Common in most built-up areas.	**Unlikely**
Passer domesticus	House Sparrow	Yes	—	No	**Yes**	**Yes**	Occurs in and around human habitation, as well as cultivated areas and some wooded country.	**Likely**
Passer montanus	Eurasian Tree Sparrow	Yes	—	No	No	No	Relative to the House Sparrow, although typically found in small flocks, often in more natural areas than House Sparrow.	**Potential**
Pycnonotus jocosus	Red-whiskered Bulbul	Yes	—	No	No	No	Occurs mainly in built-up areas, inhabiting parks, gardens, and streetscapes, though they are occasionally recorded in orchards. They especially favour areas infested with weeds, especially lantana, privet, and blackberry.	**Unlikely**
Streptopelia chinensis	Spotted Turtledove	Yes	—	No	No	No	Common around human habitation and can easily be seen in parks, gardens, and agricultural areas.	**Unlikely**
Sturnus vulgaris	Common Starling	Yes	—	**Yes**	**Yes**	**Yes**	Short-grassed habitats are favoured foraging habitats, and they may feed in association with livestock.	**Likely**
Turdus merula	Common Blackbird	Yes	—	**Yes**	**Yes**	**Yes**	Most often found in urban areas and surrounding localities but has successfully moved into bushland habitats.	**Likely**
Fish								
Gambusia holbrooki	Mosquito Fish	Yes	—	No	No	n/a	Typically found in a diverse range of waterways. Species was not observed during site inspections.	**Potential**
Cyprinus carpio	European Carp	Yes	—	No	No	n/a	Typically found in a diverse range of waterways. Species was not observed during site inspections.	**Potential**
	Species count	**19**	**16**				**21 species total**	

A7.7 Weed species

The following information relates to Weeds of National Significance identified as potentially occurring within the project area and surrounding landscape.

Scientific name	Common name	Cwlth EPBC Act	Priority weed	ALA records within 10 km	BioNet records within 10km	Comment about species preferences and habitat in the project area	Likelihood of Occurrence
Asparagus asparagoides	Bridal Creeper	WONS	Yes (State)	**Yes**	No	As well as a wide range of natural habitats, bridal creeper grows well in citrus orchards and pine plantations. It can grow in most soils but is most common close to the coast where it invades woodlands and other open coastal vegetation.	**Present**
Chrysanthemoides monilifera	Bitou Bush	WONS	Yes (State)	No	No	Found mostly in coastal areas but does not tolerate waterlogged soils. Grows best on sandy or medium textured soils.	**Unlikely**
Cytisus scoparius, and various Genista spp.	Broom spp.	WONS	Yes (State)	**Yes**	**Yes**	Evergreen shrub 1–4 m tall with bright yellow pea-like flowers, tends to form dense thickets. All species prefer cool temperate areas especially the tablelands.	**Likely**
Lycium ferocissimum	African Boxthorn	WONS	Yes (State)	**Yes**	**Yes**	Drought tolerant species growing in temperate, subtropical, and semi-arid regions. It can grow on all soil types, though it grows best on well-drained, sandier soils along dry creek beds.	**Potential**
Nassella neesiana	Chilean Needle Grass	WONS	Yes (State)	**Yes**	No	Resembles native spear grasses (*Austrostipa* spp.) but has a distinctive corona of 'little teeth' where the awn joins the seed. Has a major impact on grassland productivity and animal health.	**Likely**
Nassella trichotoma	Serrated Tussock	WONS	Yes (State)	**Yes**	**Yes**	Drought tolerant grass with exceptionally low feed value that can completely take over a new area within 4 years. Prefers cool temperate conditions and does not grow well in wet areas, heavy shade, or heavily vegetated areas.	**Present**
Opuntia spp.	Prickly Pears	WONS	Yes (State)	**Yes**	No	Present in all regions of NSW from the coast to the far west. See DPI Weeds for details of individual Opuntia species.	**Unlikely**
Rubus fruticosus aggregata	Blackberry	WONS	Yes (State)	**Yes**	**Yes**	Prickly scrambler with edible purplish berries. Grows 7 m long canes that touch the ground and take root, forming dense thickets. Prefers cool temperate climate with >700 mm annual rainfall but will grow in drier areas if has access to water e.g., along riverbank.	**Present**
Sagittaria platyphylla	Delta Arrowhead	WONS	Yes (State)	No	No	An aquatic weed capable of aggressive growth and rapid spread. Establishment is favoured by slow moving or static shallow water. The smaller channels provide ideal conditions for infestation, as the water is generally warmer, shallower, and slower moving.	**Unlikely**

Scientific name	Common name	Cwlth EPBC Act	Priority weed	ALA records within 10 km	BioNet records within 10km	Comment about species preferences and habitat in the project area	Likelihood of Occurrence
Salix spp. except *S. babylonica, S.* x *calodendron & S.* x *reichardtii*	Willows except Weeping Willow, Pussy Willow, and Sterile Pussy Willow	WONS	Yes (State)	**Yes**	**Yes**	Deciduous trees or shrubs that form large, dense root mats on the surface of the soil or in shallow. Historically planted for erosion control, but had had a major impact on the amount, speed and quality of water flows especially when they drop leaves in autumn.	**Likely**
Salvinia molesta	Salvinia	WONS	Yes (State and Regional)	No	No	Aquatic weed growing along the NSW coast. It is common in the Tweed, Richmond, Clarence, and Macleay catchments, the central coast and Sydney metropolitan areas. There are heavy infestations in the Hawkesbury–Nepean system.	**Unlikely**
Senecio madagascariensis	Fireweed	WONS	Yes (State)	**Yes**	No	A widely naturalised forb of pastures, open woodlands, grasslands, suburban bushland, roadsides, disturbed sites, waste areas, parks, and coastal environments in sub-tropical and warmer temperate regions.	**Likely**
Ulex europaeus	Gorse	WONS	Yes (State and Regional)	**Yes**	No	Evergreen shrub 1–2.5 m tall with spiny leaves and bright yellow peak-like flowers with coconut scent. Forms dense thickets. Prefers cool temperate areas.	**Likely**
	Species count	**13**	**13**			**13 species total**	

A8 NSW Test of Significance

The NSW *Biodiversity Conservation Act 2016* sets out a five-part Test of Significance "for the purposes of determining whether a proposed activity or activity is likely to significantly affect threatened species or ecological communities, or their habitats" (s7.3). The five-part test also applies to aquatic species and ecological communities listed as threatened or otherwise protected in NSW under the *Fisheries Management Act 1994*.

The NSW five-part Test of Significance focuses on NSW-listed species (BC Act and FM Act). Impacts on species that are only listed under Commonwealth (EPBC Act), not NSW law are assessed in the MNES table (Table 3).

The following assessment considers all of the potential impacts of the proposed works on species and communities listed as threatened under the NSW law, that are known or have been assessed as having a potential of higher likelihood of occurring in the project area. Depending on what is proposed, these impacts may include:

- direct impacts, such as the loss of hollow-bearing trees;
- indirect impacts, such as loss of native seed bank due to soil erosion/deposition.
- cumulative impacts, such as fragmentation of wildlife corridors; and
- key threatening processes, such as the removal of dead wood and dead trees.

A8.1 Threatened species

In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

A8.1.1 Threatened plants

Desktop searches identified five threatened plants listed under the BC Act as potentially occurring within the project area. These five plants are:

- Dwarf Kerrawang (*Commersonia prostrata*),
- Trailing Hopbush (*Dodonaea procumbens*),
- Black Gum (*Eucalyptus aggregata*),
- Hoary Sunray (*Leucochrysum albicans* subsp. *tricolor*), and
- Round-leaf Wilsonia (*Wilsonia rotundifolia*),

Dwarf Kerrawang occurs on sandy, sometimes peaty soils in a wide variety of habitat. The species appears to respond positively to some forms of disturbance, however, there are conflicting reports about the species response to fire. There are records within 10 km of the project area.

Trailing Hopbush grows on sandy-clay soils, on or near vertically-tilted shale outcrops. The species occurs in Natural Temperate Grassland or fringing eucalypt woodland of Snow Gum, often occurring in disturbed or exposed locations such as roadsides or outcrops of rocks. There are records within 10 km of the project area.

Black Gum grows in the lowest parts of the landscape, on alluvial soils in poorly drained flats and hollows near creeks and small rivers and known to the Southern Tablelands. There are records within 10 km of the project area.

Hoary Sunray 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. Records within 10 km of the project area.

Round-leaf Wilsonia is perennial forb that is prostrate in growth form and has succulent leaves. The species is typically found in muddy habitats, inhabiting coastal saltmarshes and inland saline or brackish lake beds. Flowering takes place mainly in spring and summer leading to the production small fruits containing a single black seed. There are records within 10 km of the project area.

Assessment:

The project area was assessed as potentially having all of the abovementioned species present. The proposed activity will require the removal of up to 0.002 ha of riparian vegetation and 0.32 ha of woodland and dry forest vegetation from within the project area. It is in these impacted areas where the abovementioned species are considered to potentially occur. No threatened species were observed within the work area during field inspections. The timing of inspections was suitable to allow the detection for all species. Due to all species not being detected during the TBDC recognised survey period, the disturbance of the potential habitat is not considered likely to have a significant impact such that a local population of the species is to be placed at risk of extinction.

A8.1.2 Threatened birds

Small grassland/woodland birds:

- Southern Whiteface (*Aphelocephala leucopsis*),
- Dusky Woodswallow (*Artamus cyanopterus cyanopterus*),
- Speckled Warbler (*Chthonicola sagittata*),
- Varied Sittella (*Daphoenositta chrysoptera*),
- White-fronted Chat (*Epthianura albifrons*),
- Scarlet Robin (*Petroica boodang*),
- Flame Robin (*P. phoenicea*), and
- Diamond Firetail (*Stagonopleura guttata*).

Southern Whiteface is a small passerine inhabitant in arid open woodlands with a shrubby or grassy understory, as well as on grass plains. There are records within 10 km of the project area.

Dusky Woodswallow is a medium-sized woodland specialist typically located in grassy eucalypt forests and woodlands. It favours locations abundant with logs and fallen timber but is also observed to utilize farmland on the periphery of forests or woodlands. There are records within 10 km of the project area.

Speckled Warbler is a ground-dwelling bird that inhabits a variety of Eucalyptus-dominated communities with a grassy understory, often preferring rocky ridges or gullies. Typical habitat for the species includes scattered native tussock grasses, a sparse shrub layer, some regrowth of eucalypts, and an open canopy. There are records within 10 km of the project area.

Varied Sittella is an acrobatic woodland specialist that lives in lives in eucalypt forests and woodland, mallee, and Acacia woodland. It prefers rough-barked trees such as stringybarks and ironbarks, as well as mature trees containing hollows or dead branches. There are records within 10 km of the project area.

White-fronted Chat found foraging on bare or grassy ground in wetland areas, singly or in pairs. They are insectivorous, feeding mainly on flies and beetles caught from or close to the ground. There are records within 10 km of the project area.

Scarlet Robin is an iconic robin that prefers sites with abundant logs and fallen timber but is also known to utilise more open woodland, grasslands, pastures with scattered trees and even gardens. It breeds in grassy eucalypt forests and woodlands where it nests in tree forks > 2 m above ground level. There are records within 10 km of the project area.

Flame Robin is a small Australian robin that breeds in upland tall moist eucalypt forests and woodlands, often on ridges and slopes. It prefers clearings or areas with open understory. There are records within 10 km of the project area.

Diamond Firetail is a large finch that is found in grassy eucalypt woodlands, open forest, mallee, Natural Temperate Grassland and in secondary grassland derived from other communities. It feeds exclusively on the ground, on ripe and partly ripe grass and herb seeds, green leaves, and insects. There are records within 10 km of the project area.

Assessment:

Habitat for these threatened small grassland/woodland birds was observed in and around the project area in the form of a grassy woodlands and dry sclerophyll forest with a native canopy and midstory, and a mix understory. Habitat features in these areas that may be utilised by these species include some course woody debris as well as scatterings of native mistletoe (*Amyema* sp.). Further habitat is present in the form of riparian habitat which includes reeds, rushes and grasses. Exotic species such as grasses, Blackberry and other fruiting shrubs may be utilised for feeding by these species. While these species were not observed during field surveys, they can generally be predicted to utilise the project area.

The proposed works will see the removal of up to the 0.002 ha of riparian vegetation and 0.32 ha of woodland and dry forest vegetation from within the project area. The proposed works will be impacting what is considered a small area within the surrounding landscape with mature native trees in the east and west of the project area to be retained. Furthermore, mitigation measures are to be implemented to prevent impacts from disrupting surrounding native vegetation. As such it is considered unlikely that the proposed development will have an adverse impact on the life cycle of the above species to the extent that a viable local population is at risk of extinction.

Remediation of the site with native species will offset some of the potential impacts and increase habitat availability in the area (see **Section 6**).

<u>Wetland birds:</u>

- Magpie Goose (*Anseranas semipalmata*),
- Australasian Bittern (*Botaurus poiciloptilus*),
- Sharp-tail Sandpiper (*Calidris acuminata*),
- Curlew Sandpiper (*Calidris ferruginea*),
- Latham's Snipe (*Gallinago hardwickii*),
- Blue-billed Duck (*Oxyura australis*), and
- Freckled Duck (*Stictonetta naevosa*).

Magpie Goose is a large, distinctive black and white water bird. It is often found in shallow wetlands with dense rushes and sedges. It feeds on grasses, bulbs, rhizomes and roosts in tall vegetation. It often breeds in monsoonal areas. There are records within 10 km of the project area.

Australasian Bittern is a large stocky bird with a long, thick neck and straight, brownish-yellow bill. It lives in permanent freshwater wetlands with tall, dense vegetation. It hides in dense reeds or rushes during the day and feed mainly at night on frogs, fish, yabbies, spiders, insects, and snails. There are no records within 10 km of the project area.

Sharp-tail Sandpiper is a wader with a flat back and pot bell with slightly decurved bill. It can be found foraging at the edge of wetlands or intertidal mudflats, among inundated vegetation or saltmarshes, grass or sedge lands or can be found in sewage or hypersaline environments. There are records within 10 km of the project area.

Curlew Sandpiper is a migratory shorebird most often found in littoral and estuarine habitats. The species is sometimes found in inland swamps and lakes during annual migration to and from Siberia. There are records within 10 km of the project area.

Latham's Snipe is a wetlands specialist spending its breeding season in Japan and regions of eastern Russia, before migrating to Australia and other areas in the south-pacific for the non-breeding season. There are records within 10 km of the project area.

Blue-billed Duck is a small and compact duck with stiff tails. During summer breeding season, the male's bill turns bright blue. It prefers deep water in large permanent wetlands and swamps with dense aquatic vegetation. It is completely aquatic and can fly if disturbed but prefers to dive if approached. There are records within 10 km of the project area.

Freckled Duck is a dark, greyish-brown bird characterized by its dark, greyish-brown plumage and distinctive narrow, slightly upturned bill. It prefers permanent freshwater swamps and creeks with heavy growth of Cumbungi, Lignum or Tea-tree. There are records within 10 km of the project area.

Assessment:

Habitat for these species was observed in the form of riparian habitat and aquatic habitat within and near to the project area. Most of the above species are wetlands species that have an increased likelihood of presence due to records from nearby Lake Bathurst and The Morass. Although none of these threatened species were observed within the project area, they may be generally predicted to utilise the project area in a transitory nature to access these nearby lakes. The proposal will require the removal of up to 0.002 ha of riparian vegetation and disturbance of aquatic habitat within the local area, which may impact the foraging and transitory habitat of some of the species mentioned above. Due to the higher-quality habitat found in the surrounding nearby landscape, and the small area of impact of the proposed development, it is not considered likely the works have a significant impact on the above-mentioned species such that a viable local population is likely to be placed at risk of extinction.

Furthermore, measures recommended in **Section 6** such as erosion mitigation, remediation work, and replanting of native species will further reduce the extent of impacts and the chance of a significant impact.

Parrots:

- Gang-gang Cockatoo (*Callocephalon fimbriatum*), and
- South-eastern Glossy Black-Cockatoo (*Calyptorhynchus lathami lathami*).

Gang-gang Cockatoo is a distinctive parrot found from southern Victoria through south- and central-eastern New South Wales. In Spring and summer, it is generally found in tall mountain forests and woodlands especially wet sclerophyll forests. In autumn and winter, it often moves to lower altitudes in drier and more open forests and woodlands. It prefers to roost in old-growth forests and to nest in

hollows with a 10+ cm diameter at least 9 m above ground level. There are records within 10 km of the project area.

South-eastern Glossy Black-Cockatoo is the smallest of the black cockatoos, inhabiting 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 for this species. There are records within 10 km of the project area.

Assessment:

The project area contains potential foraging habitat for the abovementioned species. This is present in the form of mature wattles, semi-mature eucalypts and exotic fruit trees. The project area does however not contain important feed trees for the Glossy Black-Cockatoo such as Sheoak. The proposed works will only require the removal of up to 0.002 ha of riparian vegetation and 0.32 ha of grassy woodland and dry sclerophyll forest. Given the lack of mature overstory vegetation in these areas they are considered unsuitable for these species nesting requirements. With higher quality habitat available outside of the works area, and the habitat being impacted being habitat that is likely only utilised in a transitory nature, it is not likely that the proposed development will have an adverse effect on the life cycle of these species such that a viable local population of these species is likely to be placed at risk of extinction.

Swifts:

- White-throated Needletail (*Hirundapus caudacutus*).

White-throated Needletail is an almost exclusively aerial species that forages for insects up to 1 km above ground, usually in large flocks. It only occurs in Australia between late spring and early autumn, breeds in north Asia. There are records within 10 km of the project area.

Assessment:

Although the species is almost exclusively an aerial foraging species, it forages on insects that are often more abundant around certain terrestrial habitats, such as forests, mudflats, coastlines and waterways. The project area is considered an area that is likely to produce abundant foraging opportunities for the White-throated Needletail given the presence of riparian areas with water as well as the presence of native multi-strata vegetation. The proposed works will only require the removal of up to 0.002 ha of riparian vegetation and 0.32 ha of grassy woodland and dry sclerophyll forest. The proposed works will be impacting what is considered a small area within the surrounding landscape with all surrounding mature vegetation being retained and mitigation measures in place to prevent impacts disrupting surrounding native vegetation. As such it is considered unlikely that the proposed development will have an adverse impact on the life cycle of the above species to the extent that a viable local population is at risk of extinction.

Raptors and owls:

- Spotted Harrier (*Circus assimilis*)
- White-bellied Sea-eagle (*Haliaeetus leucogaster*), and
- Little Eagle (*Hieraaetus morphnoides*).

Spotted Harrier is known to occur in grassy open woodland, it is most commonly found in native grassland however also occurs in agricultural land. It forages over open habitats including edges of inland wetlands where it preys on terrestrial mammals (e.g. bandicoots, bettongs, and rodents), birds and reptile, occasionally insects and rarely carrion. The species builds a stick nest in a tree. There are records within 10 km of the project area.

White-bellied Sea-eagle habitats are characterised by the presence of large areas of open water including larger rivers, swamps, lakes, and the sea. Terrestrial habitats for this species include coastal dunes, tidal flats, grassland, heathland, woodland, and forest (including rainforest). There are records within 10 km of the project area.

Little Eagle is a medium-sized bird of prey. It occupies open eucalypt forest, woodland, open woodland, or riparian woodlands. It nests in tall living trees within a remnant patch and builds large stick nests. There are records within 10 km of the project area.

Assessment:

A small amount of habitat for the above species was observed in the project area, mostly in the form of riparian areas and adjacent native vegetation, including grassy woodland and dry sclerophyll forest vegetation. The proposed works will only require the removal of up to 0.002 ha of riparian vegetation and 0.32 ha of grassy woodland and dry sclerophyll forest. Although these areas would not likely be inhabited by the above species, they are considered to have the potential to provide suitable foraging habitat as they may be occupied by prey species that the above threatened species may hunt within or above the project area.

The proposal does not involve the removal of habitat for the above species. Given the small size of the work area, it is not considered to provide a large area of foraging habitat for these species. The project area exhibits relatively higher-quality habitat outside the work area and in the surrounding landscape, characterized by large areas of native woodland and dry sclerophyll forests nearby. Riparian habitat along the Mulwaree River and other waterbodies in the surrounding landscape such as Lake Bathurst and The Morass are considered more likely to be utilised, given observations of these species have occurred in these areas.

For the reasons above, the proposed development is not likely to have an adverse effect on the life cycle of the species such that a viable local population of these species is likely to be placed at risk of extinction.

A8.1.3 Threatened fish

No threatened fish species are considered likely to be present on site based on mapped distribution within the Species Profile and Threats Database and Fisheries NSW Spatial Data Portal.

A8.1.4 Threatened frogs

- Green and Golden Bell Frog (*Litoria aurea*).

Green and Golden Bell Frog is characterized by a distinctive gold or creamish white stripe along its sides. It favours habitats such as marshes, dams, and stream-sides that are open, lack predatory fish, and have nearby grassy areas for shelter, along with available diurnal sheltering sites. It has been found in human-disturbed areas containing vegetation in and around water. There are records within 10 km of the project area.

Assessment:

Potential habitat for the Green and Golden Bell Frog occurs within the works area of the project area, mainly in the form of the Mulwaree River riparian habitat and areas of inundation with aquatic fringing and submerged and emergent vegetation in and around water sources. These areas may provide breeding and foraging habitat for the species, particularly since there is prevalence of rushes, sedges and reeds in areas of the Mulwaree River within the project area.

No evidence was found within the project area during field surveys. However, the scope of this assessment cannot definitively exclude the presence of either this species from the project area, as surveys were conducted during the day, which is not the optimal time to detect this species.

The proposed works will require the removal of up to a total of 0.002 ha of riparian vegetation which is a potential habitat for the Green and Golden Bell Frog. Due to the inability to discount the presence of this species, the proposed works may have a significant impact on the species such that a viable local population is likely to be placed at risk of extinction. It is therefore recommended that targeted surveys are conducted to determine the presence of the Green and Golden Bell Frog before works are conducted.

When works proceed, suitable habitat will remain available in the surrounding areas outside of both works areas, reducing the likelihood of local population extinction. Strict mitigation measures, including sediment and erosion control measures, will be implemented to prohibit the proposed works from accessing and disturbing areas close to the river where the species may occur (see **Section 6**).

A8.1.5 Threatened insects

- Key's Matchstick Grasshopper (*Keyacris scurra*).

Assessment:

Patches of habitat for the above species was observed in the project area, mostly in the form of areas containing a native grass cover and adjacent native vegetation, including grassy woodland to the north of the project area. A single Key's Matchstick Grasshopper as seen in **Figure 15** was observed within the north of the project area, occupying an area composed primarily of Kangaroo Grass (*Themeda triandra*) and Wallaby Grass (*Rytidosperma* sp.). The proposed works will require the removal of up to 0.32 ha of species habitat in the form of derived native grassland and woodland (PCT 3338). Although this species was found to occupy the northside of the project area, habitat of greater condition and quality occurs beyond the project area to the north on private land (**Figure 14**). This area is considered likely to be occupied by the species given the greater extent of Kangaroo Grass and other native understory species that occur, as well as its substantially greater size than that of the project area.

While the project will require the removal of habitat from within the project area, mitigation measures should be implemented as to reduce the direct impacts of the project on the Key's Matchstick Grasshopper. Required actions to achieve this include pre-clearing surveys to identify and relocate any species individuals that may be present within the impact area prior to clearing. As the species is flightless and thus has a limited ability for dispersal, any individuals present at the time of clearing are very likely to be killed. Relocation to the connected northern private land will largely reduce impacts to this species beyond the removal of species habitat from within the project area. If pre-clearing surveys are not conducted, there is the potential for the removal of habitat and death of any individuals to have a significant impact on the local population of this species.

FIGURE 14: HABITAT ON PRIVATE LAND TO THE NORTH OF THE PROJECT AREA

FIGURE 15: KEY'S MATCHSTICK GRASSHOPPER RECORDED WITHIN THE PROJECT AREA

A8.1.6 Threatened bats

No threatened bat species are considered likely to be present on site based on the lack of records within 10 km and unsuitable habitat within the project area.

A8.1.7 Threatened mammals other than bats

No threatened mammal species are considered likely to be present on site based on the lack of records within 10 km and unsuitable habitat within the project area.

A8.1.8 Threatened reptiles

No threatened reptile species are considered likely to be present based on unsuitable habitat within the project area.

A8.2 Threatened Ecological Communities

In the case of a critically endangered or endangered ecological community, whether the action proposed:

1. Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or
2. Is likely to modify the composition substantially and adversely such that its local occurrence is likely to be placed at risk of extinction.

Two threatened communities have been assessed as occurring within the project area. These include Werriwa Tablelands Cool Temperate Grassy Woodland in the South Eastern Highlands and South East Corner Bioregions (BC Act listed) which is associated with the presence of PCT 3338 - Goulburn Tableland Frost Hollow Grassy Woodland, and Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands and Australian Alps bioregions (BC Act listed) which is associated with the presence of PCT 3932 - Central and Southern Tableland Swamp Meadow Complex.

Impacts to the Werriwa Tablelands Cool Temperate Grassy Woodland TEC include the removal of an area of 0.32 ha of this community. This vegetation is composed of recent (~5 – 10 years old) regeneration including both overstory and understory vegetation and fringing semi-mature Snow Gums (*E. pauciflora*). The removal of 0.32 ha of this vegetation is considered have an adverse effect on the extent of the ecological community, however, not to the extent that its local occurrence is likely to be placed at risk of extinction given its presence within the local landscape. Moreover, the proposed works are unlikely to modify the composition substantially and adversely such that its local occurrence is likely to be placed at risk of extinction given the small-scale of the proposed works and areas of connected areas of this TEC within the local landscape.

Impacts to the Montane Peatlands and Swamps TEC include the removal of an area of 0.002 ha of this community. This vegetation is composed of a mixed understory containing both native and exotic species, these being primarily forbs, grasses and grass-like species. While a moderate diversity of native species was recorded within the extent of this community within the project area, sections are dominated by exotic species include pasture grasses and highly invasive species such as Blackberry (*Rubus fruticosus*). The community has been assessed as occurring in a low-moderate condition within the project area and close surrounds. Impacts to this community include the removal and or disturbance of 0.002 ha of the community from within the project area. Provided mitigation measures listed in **Section 6** are implemented, it is considered unlikely the proposed works will have a significant impact on the local occurrence of this community. Moreover, it is unlikely that the proposed works will lead to the modification of composition substantially and adversely such that its local occurrence is likely to be placed at risk of extinction.

A8.3 Habitat for a threatened species, population or ecological community

In relation to the habitat of a threatened species, population, or ecological community;

1. The extent to which habitat is likely to be removed or modified as a result of the action proposed, and
2. Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and
3. The importance of the habitat to be removed, modified, fragmented, or isolated to the long-term currently interconnecting or proximate areas of habitat for a threatened species, population, or ecological community.

The work areas require the removal of otherwise disturbance of up to 0.32 ha of woodland and derived native grassland habitat as well as up to 0.002 ha of riparian habitat. No threatened species populations are known to occur within 10 km of either site as listed on BioNet as of July 2024.

As discussed above in **A8.1,** the project area has been assessed as containing habitat that may be utilised by a range of threatened flora and fauna species. No species of threatened flora were recorded during the conducted inspections across the months of August and September. Surveys were conducted during the optimal survey period for all species. No other threatened flora species are considered to be potentially directly impacted by the proposed works given their lack of presence within the project area.

No threatened fauna species were identified as occupying, occurring or utilising habitat features within the project area at the times of inspections, aside from the Key's Matchstick Grasshopper as discussed in **A8.1.5**. While an individual of this species was recorded within the project area, given the connectivity of greater condition habitat to the north and if mitigation measures outlined in **Section 6** are adhered to, direct impacts to this species beyond the removal of 0.32 ha of habitat should be avoided.

The required removal and impact on riparian vegetation are considered to be small-scale works, as such, the habitat for threatened fauna will not be modified, fragmented, or isolated (see **A8.1**).

It is recognised that works may require minimal disturbance to the surrounding vegetation in the stockpile and main compound sites. The project site is of a small scale and are unlikely to require significant impact or modification to the habitat of a threatened species, population, or ecological community.

A8.4 Declared areas of Outstanding Biodiversity Value

Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).

The proposed development is unlikely to have an adverse impact on any declared Area of Outstanding Biodiversity Value (AOBV) in NSW due to its very small scale and distance from any such area. There are currently four declared AOBVs in all of NSW. The closest to the project area is the Wollemi Pine habitat more than 150 km away in the Blue Mountains; the remainder all involve marine habitats even further away. For more information about such areas, see the NSW Government's Area of Outstanding Biodiversity Value register.

A8.5 Key Threatening Processes

Whether the proposed development or activity is or is part of a Key Threatening Process or is likely to increase the impact of a Key Threatening Process.

Key threatening processes (KTPs) are listed under both Commonwealth and State legislation. There are 22 Commonwealth-listed KTPs, 38 NSW-listed KTPs and eight under the FM Act. The lists overlap and include broad threats such as climate change as well as specific threats relating to Lord Howe Island, shark control programs on beaches and longwall mining. The NSW-listed KTPs most relevant to the project are as follows.

A8.5.1 Feral animals

A number of KTPs are associated with feral animals, which may have impacts including predation, habitat degradation, competition, and disease transmission. Most of the feral animals assessed occupy vast areas of NSW and are extremely difficult to control without a concerted effort at the landscape level. The proposed activity is considered very unlikely to increase the impact of KTP's associated with feral animals. For details of all the feral animal species considered as part of the field inspection and this test of significance, see **A7.6**.

A8.5.2 Weeds

Invasion and establishment of exotic vines and scramblers

The following exotic vine and scrambler was observed within the project area:

- Blackberry complex (*Rubus fruticosus* sp. *agg*.), and
- Bridal Creeper (*Asparagus asparagoides*).

Infestations of Blackberry were found to be present both along the northern bank of the Mulwaree River corridor as well as on the northern side of Bungendore Road, particularly surrounding the northern extent of the project area. Scattered patches of Bridal Creeper were also observed to be present on the northern side of Bungendore Road, particularly in areas closely surrounding the road verge. There is a potential that these species could unknowingly be transported into an unaffected area of the works areas of the project area and the surrounding area through contaminated machinery. Controlling this potential impact will significantly mitigate the potential of Blackberry and Bridal Creeper to be potentially transferred into the project area. Physical removal of the weed species surrounding the Mulwaree River corridor prior to the commencement of works is recommended to prevent herbicides from entering this waterway.

It is unlikely that the proposed activity will significantly contribute to this KTP provided appropriate measures are implemented as recommended in **Section 6** and **Section 7.1**.

Invasion and establishment of Scotch Broom (Cytisus scoparius)

No evidence of Scotch Broom was observed during the field inspection. The proposed activity is not likely to result in an increase in the impact of this KTP within the locality provided appropriate measures are implemented as recommended in **Section 6** and **Section 7.1.**

Invasion of native plant communities by exotic perennial grasses

Several perennial exotic grasses invade and may dominate native plant communities by competing with and displacing, many native species. Many of the perennial exotic grasses are established following disturbances such as overgrazing, road works and management of roadside areas. The spread of these grasses is often exacerbated by slashing, weed control, forestry and mining operations, movement or addition of fertilisers and nutrients, and changes to drainage and fire regimes.

Two species of perennial exotic grass listed in the NSW Scientific Committee's final determination for this KTP were observed to be present throughout areas of the project area in a low to moderate abundance. One Weed of National Significance, Serrated Tussock, and one High Threat Exotic species, African Lovegrass were also observed within the project area. The presence of these exotic perennial grasses is likely due to use in pasture improvement in neighbouring farmland, vehicle transportation of seeds and the dispersal of seeds down the waterways.

These exotic perennial grasses have the potential to adversely affect native plant communities and remaining native species. Impacts are to be mitigated by appropriate weed control measures prior to any planned construction in the future to ensure construction does not lead to the introduction or further establishment of exotic species on site, and in ongoing rehabilitation efforts.

Overall, it is unlikely that the project will significantly contribute to this KTP if strict mitigation measures set out in **Section 6** and **Section 7.1** are implemented.

Loss/degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants

Field inspection of the project area recorded a total of 51 exotic species. While it is hard to determine from these species which were introduced as garden plants, management of all species considered invasive (i.e. forming populations beyond their original introduction and having a detrimental effect on native biodiversity) should be undertaken to limit the potential spread of these species through the proposed works. There is the potential that some of these species will inevitability be spread through the proposed works given that areas of exotic species dominance occur within the project area, particularly surrounding the road verge of Bungendore Road and the river corridor of Mulwaree River. To reduce the potential impact of the KTP it is strongly recommended that the strict mitigation measures set out in **Section 6** and **Section 7.1** are implemented. Nevertheless, even through the implementation of these mitigation measures there remains the potential that the proposed works could lead to the loss/degradation of native plant and animal habitat by escaped garden plants given the wide variety of exotic species that occur within the project area. However, it is considered unlikely that if the provided mitigation measures are implemented the proposed works will introduce an exotic species that has not been thus far recorded and identified in this report.

A8.5.2 Habitat modification

Alteration to the natural flow regimes of rivers, streams, floodplains, and wetlands

The proposed works within the extent of the Mulwaree River and adjacent northern bank is considered unlikely to impede the current flow regime of the river. Mitigation measures such as silt curtains may lead to minor temporary alterations and obstructions to the flow regimes, however, this is considered to be temporary.

During the works the site will include strict ESCP and associated erosion control devices, including silt curtains to be installed to minimise downstream sedimentation impacts. Sedimentation and erosion issues (discussed in **Section 5.1** and **Section 5.2**) during construction have the potential to alter the natural flow of the Mulwaree River, however, this is considered unlikely, given mitigation measures as set out in **Section 6** are implemented.

Clearing of native vegetation

Clearing is defined in section 3 of the BC Act as:

> *"the destruction of a sufficient proportion of one or more strata (layers) within a stand or stands of native vegetation so as to result in the loss, or long-term modification, of the structure, composition and ecological function of stand or stands".*

Clearing of native vegetation for the proposed works is estimated to be of a relatively small scale, impacting 0.002 ha of riparian vegetation and 0.32 ha of terrestrial vegetation. It is not considered to likely contribute to this KTP due to the small area of impact if mitigation measure outlined in **Section 6** are adhered to. The area should be further supported in regenerating naturally so that no long-term modification occurs. Furthermore, the impact area is of small scale and does not constitute "a sufficient proportion".

Appendix B: Clause 171 of the EP&A Regulation

Clause 171 of the EP&A Regulation 2021 sets out 16 factors that need to be considered when assessing environmental impact under Part 5 of the EP&A Act. The impact of proposed works is described below.

Positive | Neutral | Negative

Relevant clause	Impact	Reason
Any environmental impact on a community?	Neutral	The project is not expected to have an adverse social, economic or cultural impact on communities at Tarago.
Any transformation of a locality?	Neutral	Any transformation will be limited to the site, Bungendore Road, and its embankments. No transformation of the broader locality is expected.
Any environmental impact on the ecosystem of the locality?	Neutral	Ecosystems can be impacted by any activity that involves soil or vegetation disturbance, or where there is any potential for changes to surface water quality and flows. A number of safeguards and mitigation measures are proposed to reduce (avoid and minimise) the likelihood and consequences of this risk occurring, see **Section 6**.
Any reduction of the aesthetic, recreational, scientific, or other environmental quality or value of a locality?	Neutral	Any reduction in aesthetic, recreational, scientific, or other environmental quality values will be limited to the project area and its immediate approaches/surrounds. No longer-term or broader impacts are expected, and the area should be remediated after completion of works.
Any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific, or social significance or other special value for present or future generations?	Neutral	As discussed in various parts of **Section 5.4** and **Section 5.5**, the project is not expected to have any effect on a listed or otherwise special place. Mitigation measures including an unexpected finds procedure are recommended to ensure any unexpected heritage or other finds are protected pending an assessment of their significance, see **Section 6**.
Any impact on the habitat of protected animals (within the meaning of the *Biodiversity Conservation Act 2016*)?	Neutral	As discussed in **Section 5.3** and related Appendices, the project is not expected to have a significant impact on the habitat of protected animals.
Any endangering of any species of animal, plant or other form of life whether living on land, in water or in the air?	Neutral	As detailed in **Section 5.3** and related Appendices, the project is not expected to endanger any species of animal, plant, or other form of life.
Any long-term effects on the environment?	Neutral	As detailed in **Section 5.3**, the project is not expected to have any long-term adverse ecological, social or economic effects on the environment.
Any degradation of the quality of the environment?	Neutral	As detailed in **Section 5.3**, the project may have short term minor effects on air quality, noise, and vibrations. However, there is no foreseen adverse or significant degradation on the ecological, social or economic quality of the environment.
Any risk to the safety of the environment?	Neutral	No significant risks to the safety of the environment are likely if effective mitigation measures are put in place as recommended in **Section 6**.
Any reduction in the range of beneficial uses of the environment?	Neutral	No reduction in the range of beneficial uses of the environment are likely if effective mitigation measures are put in place as recommended in **Section 6**.
Any pollution of the environment?	Neutral	As discussed in **Section 5,** the project may have short term, very minor impacts on matters including air quality, noise, and vibrations. However, no pollution of the environment is likely if effective mitigation measures are put in place as recommended in **Section 6**.
Any environmental problems associated with the disposal of waste?	Neutral	No environmental problems associated with the disposal of waste are likely if effective mitigation measures are put in place as recommended in **Section 6**.

Relevant clause	Impact	Reason
Any increased demand on resources (natural or otherwise) which are, or are likely to become, in short supply?	Neutral	The project will utilise standard road building materials and does not utilise any resources that are, or that are likely to become, in short supply.
Any cumulative environmental effect with other existing or likely future activities?	Neutral	As discussed in **Section 5.12**, the project might have cumulative effects, however, the cumulative effects are considered negligible.
Any impact on coastal processes and coastal hazards, including those under projected climate change conditions?	Neutral	The project is not in a coastal management area.
Is the project applicable to the l**ocal** strategic planning statements made under the Act, Division 3.1?	Neutral	The Goulburn Mulwaree Local Strategic Planning Statement outlines 10 planning priorities for a 20-year vision. The proposed project aligns with Priority 1, Infrastructure, which focuses on access to community in rural area.
Other relevant environmental factors	Neutral	No other environmental factors relevant to this project have been identified.

Attachment 1: Site plans

LANDSLIP REMEDIATION
BUNGENDORE RD, TARAGO
GOULBURN MULWAREE COUNCIL

SHEET INDEX

REVISION	DATE	DESCRIPTION
D	JAN 25	REVISED DESIGN
C	JAN 25	DETAIL ROCK FILL DESIGN
B	NOV 24	PRELIMINARY ROCK FILL DESIGN
A	SEP 24	PRELIMINARY SITE DETAILS

HIGHLANDS DESIGN & DRAFTING

S P FOWLER
ABN 38 736 450 419

PHONE 0412 626 126
EMAIL fowlers202@gmail.com

HD &D

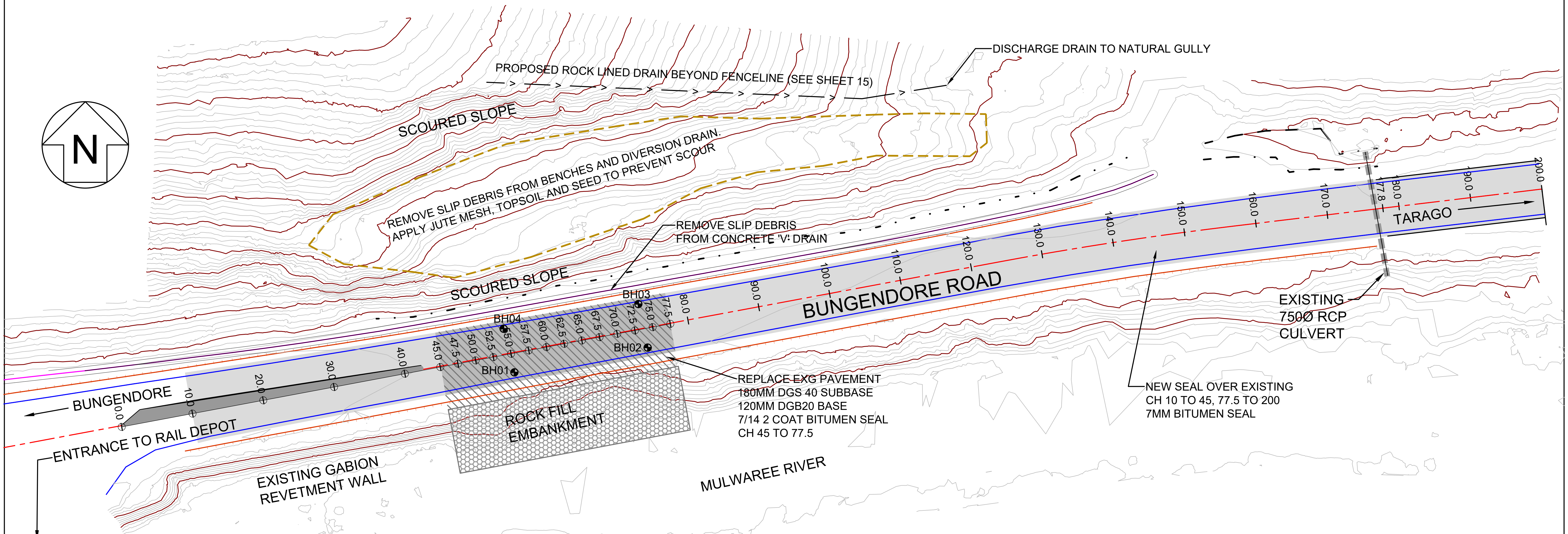
DRAWING TITLE, LOCATION, INDEX

PROJECT LANDSLIP REMEDIATION BUNGENDORE RD, TARAGO GOULBURN MULWAREE COUNCIL

REVISION D

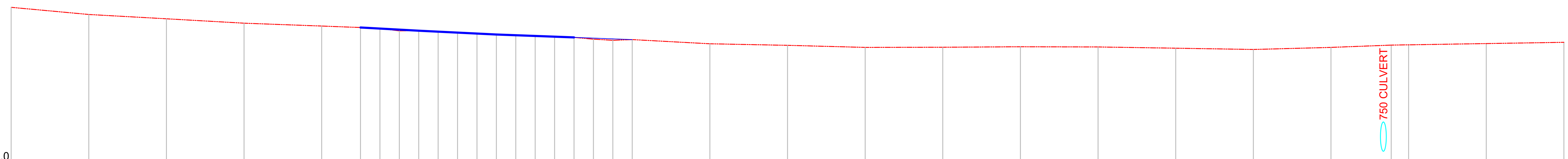
Dwg No GMC 04.24

SHEET 1 OF 15



SITE PLAN

SCALE 1:550 (A3)



Datum R.L. 693.0

CHAINAGE	DESIGN	EXISTING
0.000		696.964
10.000		696.781
20.000		696.670
30.000		696.558
40.000		696.484
45.000	696.447	696.446
47.500	696.419	696.421
50.000	696.392	696.360
52.500	696.364	696.364
55.000	696.340	696.334
57.500	696.316	696.311
60.000	696.291	696.288
62.500	696.267	696.267
65.000	696.248	696.249
67.500	696.230	696.231
70.000	696.212	696.213
72.500	696.193	696.193
75.000	696.174	696.147
77.500	696.155	696.119
80.000	696.137	696.137
90.000		696.029
100.000		695.990
110.000		695.936
120.000		695.940
130.000		695.953
140.000		695.948
150.000		695.916
160.000		695.883
170.000		695.936
177.759		695.995
180.000		
190.000		
200.000		

Scale Horizontal 1:550 Vertical 1:110

LONGSECTION OF ROAD CENTRELINE

REVISION	DATE	DESCRIPTION
D	JAN 25	REVISED DESIGN
C	JAN 25	DETAIL ROCK FILL DESIGN
B	NOV 24	PRELIMINARY ROCK FILL DESIGN
A	SEP 24	PRELIMINARY SITE DETAILS

HIGHLANDS DESIGN & DRAFTING
HD &D
S P FOWLER
ABN 38 736 450 419
PHONE 0412 626 126
EMAIL fowlers202@gmail.com

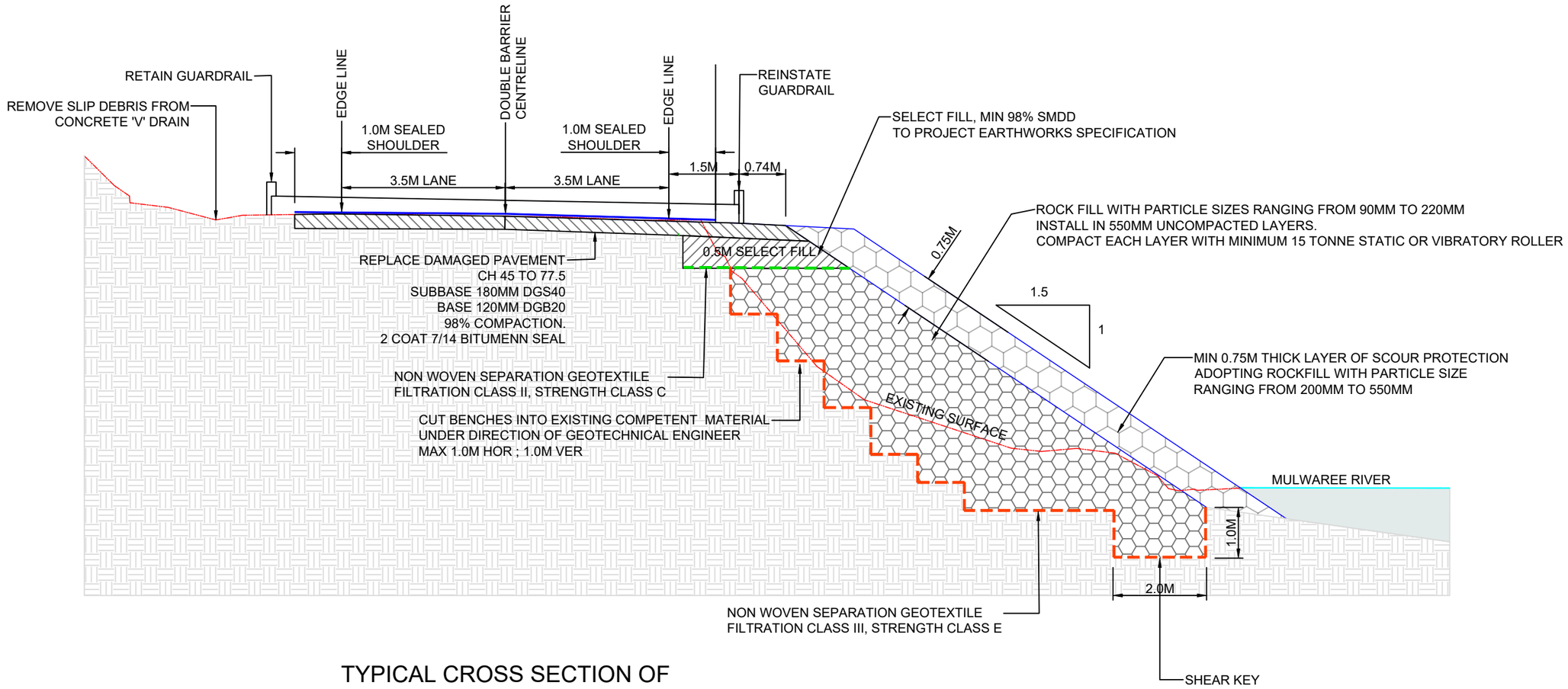
DRAWING SITE PLAN AND LONGSECTION

PROJECT L A N D S L I P R E M E D I A T I O N
B U N G E N D O R E R D , T A R A G O
GOULBURN MULWAREE COUNCIL

REVISION D

Dwg No GMC 04.24

SHEET 2 OF 15



TYPICAL CROSS SECTION OF ROCK FILL EMBANKMENT

NOTES:

1. SITE EXTENTS APPROXIMATED FROM OBSERVED SITE FEATURES. TO BE CONFIRED ON SITE BY PRINCIPAL GEOTECHNICAL ENGINEER DURING SITE SETOUT WORKS.
2. ALIGNMENT TO BE BASED ON SITE LIDAR DATA AND CIVIL DESIGN.
3. IT IS RECOMMENDED THAT THE SCOUR PROTECTION BUTTRESS BE CONSTRUCTED AT A SLOPE NO STEEPER THAN 1.5 H : 1.0 V.
4. ALL SPRAY SEAL DESIGNS SHALL BE UNDERTAKEN USING THE TfNSW 395K FORM, TO BE REVIEWED AND ENDORSED BY THE PRINCIPAL.
5. FOUNDATION AREAS MUST BE STRIPPED OF ALL TOPSOIL, VEGETATION, AND UNSUITABLE MATERIAL.
6. THE WORKS MUST BE CONSTRUCTED AND MAINTAINED IN GENERAL ACCORDANCE WITH TfNSW R44 AND AUS-SPEC#1 DEVELOPEMENT SPECIFICATION SERIES CONSTRUCTION
7. CONTRACTOR TO REINSATE ROAD FURNITURE FOLLOWING COMPLETION OF PAVEMENT WORKS, INCLUDING LINEMARKING, SIGNAGE, GUIDEPOSTS AND BARRIERS.
8. ALL DESIGN DRAWINGS TO BE READ IN CONJUNCTION WITH GEOTECNICAL DESIGN REPORT AND HYDROLOGICAL AND HYDRAULIC REPORT, WITH THE MORE ONEROUS REQUIREMENTS TO BE ADOPTED, UNLESS OTHERWISE AGREED WITH THE PRINCIPAL.

REVISION	DATE	DESCRIPTION
D	JAN 25	REVISED DESIGN
C	JAN 25	DETAIL ROCK FILL DESIGN
B	NOV 24	PRELIMINARY ROCK FILL DESIGN
A	SEP 24	PRELIMINARY SITE DETAILS

HIGHLANDS DESIGN & DRAFTING
S P FOWLER
ABN 38 736 450 419
PHONE 0412 626 126
EMAIL fowlers202@gmail.com
HD &D

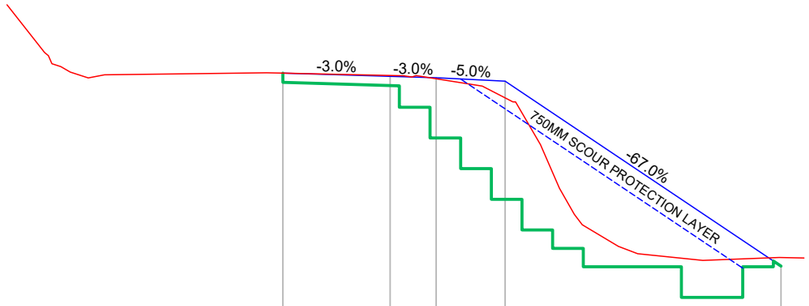
DRAWING TYPICAL ROCK FILL CROSS SECTION

PROJECT LANDSLIP REMEDIATION BUNGENDORE RD, TARAGO GOULBURN MULWAREE COUNCIL

REVISION D

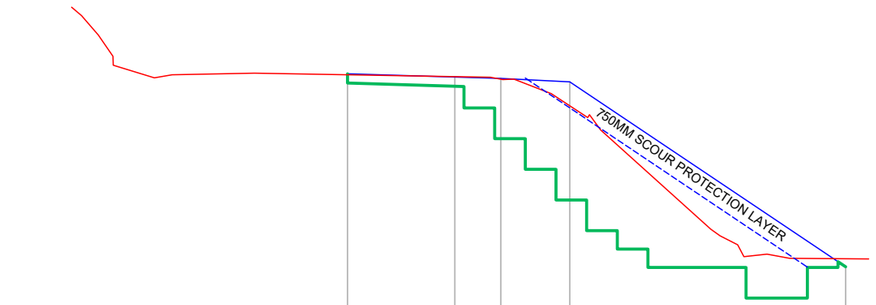
Dwg No GMC 04.24

SHEET 3 OF 15



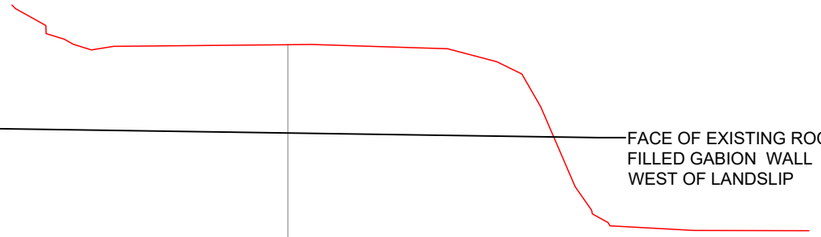
RL 687.5								
HT. DIFF		0.001	-0.028	0.034	0.544		-0.281	
DESIGN		696.447	696.342	696.297	696.185		690.155	
EXISTING	698.677	696.446	696.370	696.263	695.640		690.435	690.419
OFFSET	9.000	0.000	3.500	5.000	7.250		16.250	17.000

CH 45.0



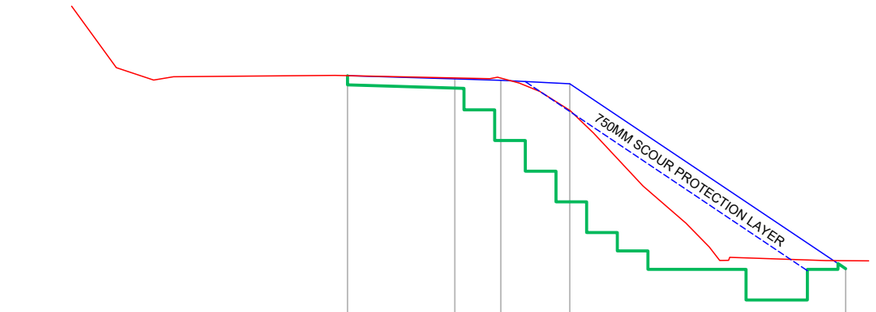
RL 687.5								
		0.032	-0.012	0.026	0.780		-0.262	
		696.392	696.287	696.242	696.130		690.100	
	698.564	696.360	696.299	696.216	695.349		690.362	690.355
	9.000	0.000	3.500	5.000	7.250		16.250	17.000

CH 50.0



RL 689.0				
HT. DIFF		0.000		
DESIGN		696.484		
EXISTING	697.780	696.484		690.419
OFFSET	9.000	0.000		17.000

CH 40.0



RL 687.5								
		-0.001	-0.031	-0.072	0.868		-0.259	
		696.419	696.314	696.269	696.157		690.127	
	698.685	696.421	696.345	696.341	695.289		690.386	690.382
	9.000	0.000	3.500	5.000	7.250		16.250	17.000

CH 47.5

Scale Horizontal 1:200 Vertical 1:200

REVISION	DATE	DESCRIPTION
D	JAN 25	REVISED DESIGN
C	JAN 25	DETAIL ROCK FILL DESIGN
B	NOV 24	PRELIMINARY ROCK FILL DESIGN
A	SEP 24	PRELIMINARY SITE DETAILS

HIGHLANDS DESIGN & DRAFTING
S P FOWLER
ABN 38 736 450 419
PHONE 0412 626 126
EMAIL fowlers202@gmail.com

HD &D

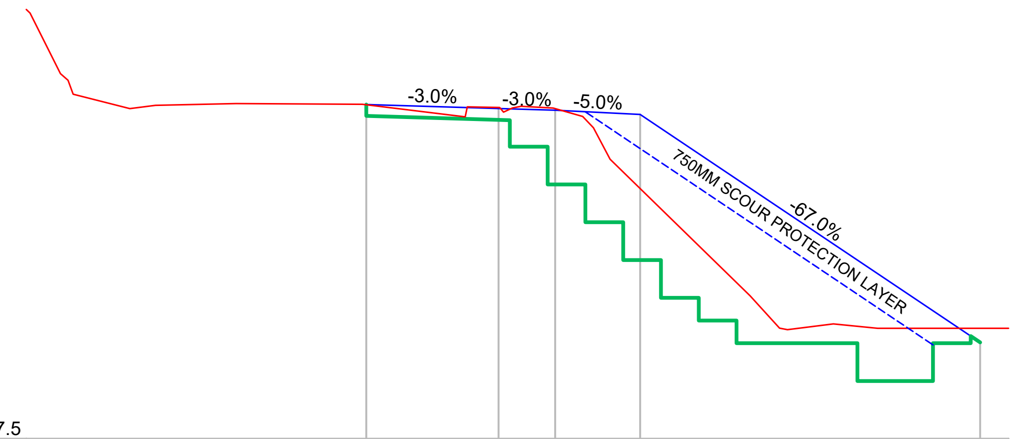
DRAWING DESIGN CROSS SECTIONS CH 40 - 50

PROJECT LANDSLIP REMEDIATION BUNGENDORE RD, TARAGO GOULBURN MULWAREE COUNCIL

REVISION D

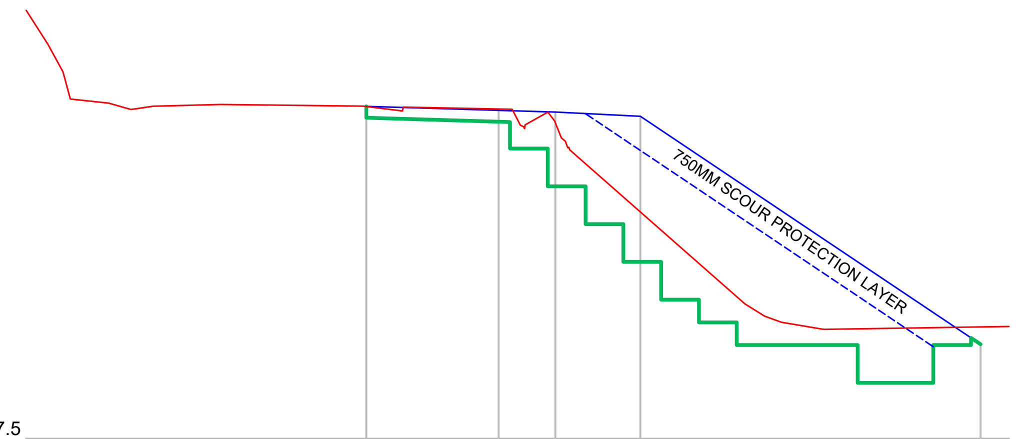
Dwg No GMC 04.24

SHEET 4 OF 15



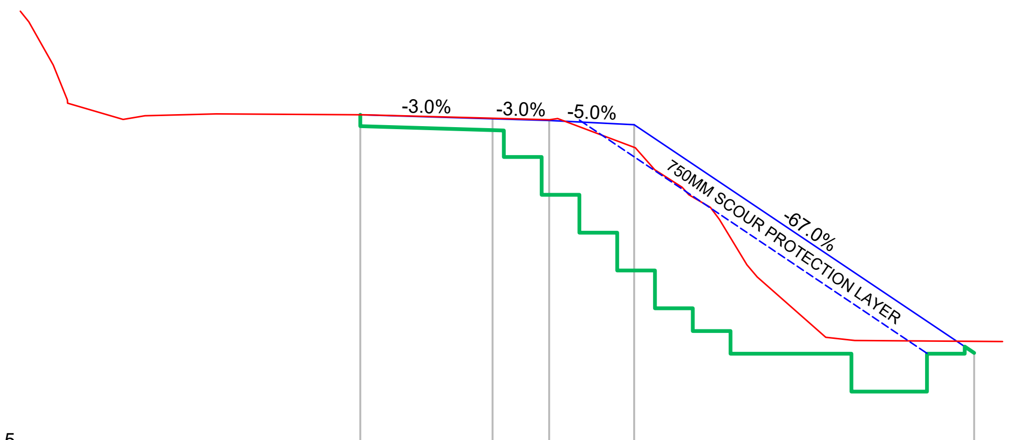
HT. DIFF		0.006	-0.029	-0.041	1.961	-0.373	
DESIGN		696.340	696.235	696.190	696.078	690.048	
EXISTING	698.854	696.334	696.264	696.231	694.116	690.421	690.421
OFFSET	9.000	0.000	3.500	5.000	7.250	16.250	17.000

CH 55.0



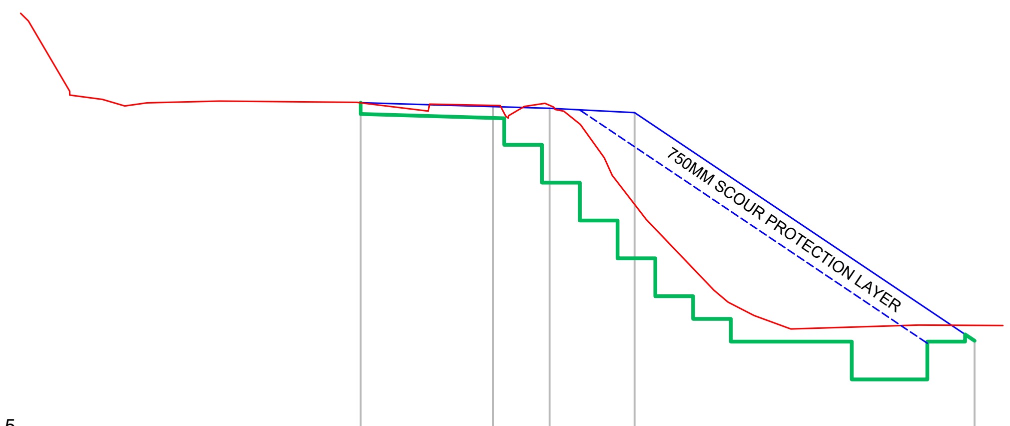
		0.003	-0.037	0.285	2.530	-0.458	
		696.291	696.186	696.141	696.029	689.999	
	698.835	696.288	696.223	695.857	693.498	690.457	690.468
	9.000	0.000	3.500	5.000	7.250	16.250	17.000

CH 60.0



HT. DIFF		0.000	-0.014	-0.019	0.597	-0.306	
DESIGN		696.365	696.260	696.215	696.102	690.072	
EXISTING	699.103	696.364	696.274	696.233	695.505	690.378	690.373
OFFSET	9.000	0.000	3.500	5.000	7.250	16.250	17.000

CH 52.5



		0.005	-0.033	-0.080	2.425	-0.407	
		696.316	696.211	696.166	696.053	690.023	
	698.676	696.311	696.243	696.245	693.628	690.430	690.426
	9.000	0.000	3.500	5.000	7.250	16.250	17.000

CH 57.5

Scale Horizontal 1:200 Vertical 1:200

REVISION	DATE	DESCRIPTION
D	JAN 25	REVISED DESIGN
C	JAN 25	DETAIL ROCK FILL DESIGN
B	NOV 24	PRELIMINARY ROCK FILL DESIGN
A	SEP 24	PRELIMINARY SITE DETAILS

HIGHLANDS DESIGN
& DRAFTING
S P FOWLER
ABN 38 736 450 419
PHONE 0412 626 126
EMAIL fowlers202@gmail.com

HD &D

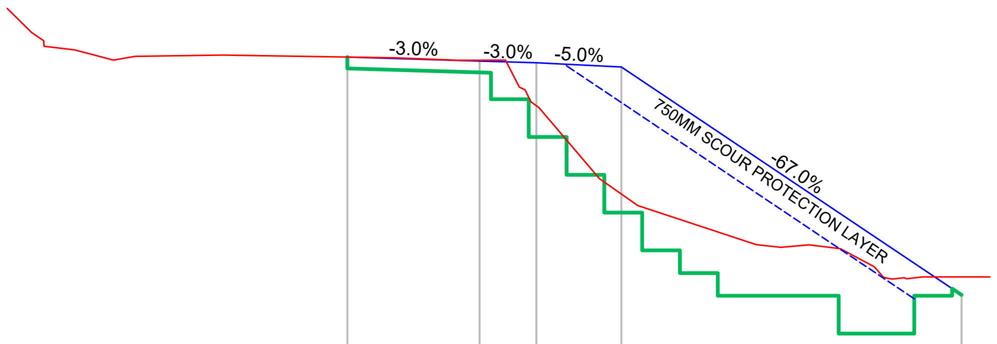
DRAWING DESIGN CROSS SECTIONS CH 52.5 - 60

PROJECT LANDSLIP REMEDIATION
BUNGENDORE RD, TARAGO
GOULBURN MULWAREE COUNCIL

REVISION D

Dwg No GMC 04.24

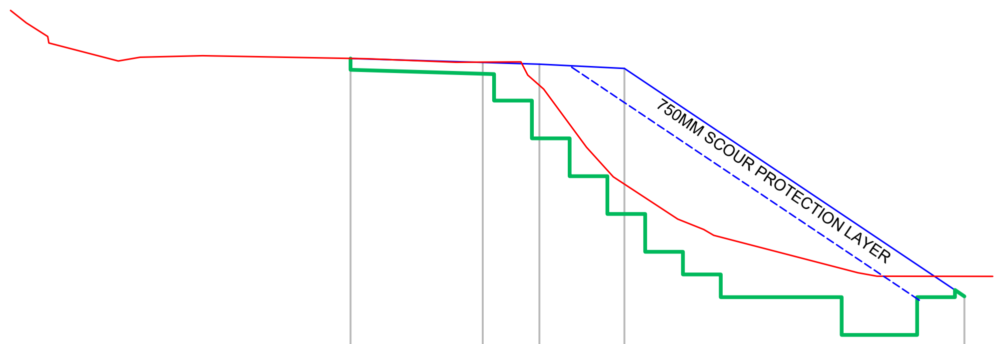
SHEET 5 OF 15



RL 687.5

HT. DIFF		-0.000	-0.021	1.137	3.360	-0.477	
DESIGN		696.248	696.143	696.098	695.986	689.956	
EXISTING	697.536	696.249	696.164	694.962	692.626	690.432	690.432
OFFSET	9.000	0.000	3.500	5.000	7.250	16.250	17.000

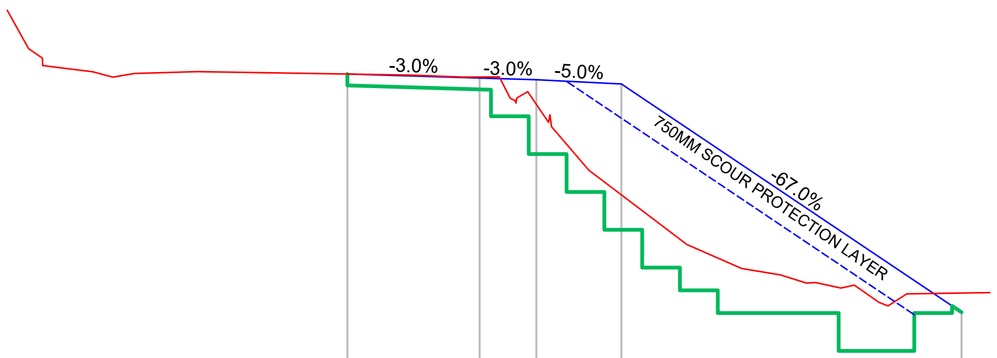
CH 65.0



RL 687.5

HT. DIFF		-0.001	-0.009	0.560	3.060	-0.529	
DESIGN		696.212	696.106	696.062	695.949	689.919	
EXISTING	697.484	696.213	696.115	695.501	692.889	690.448	690.447
OFFSET	9.000	0.000	3.500	5.000	7.250	16.250	17.000

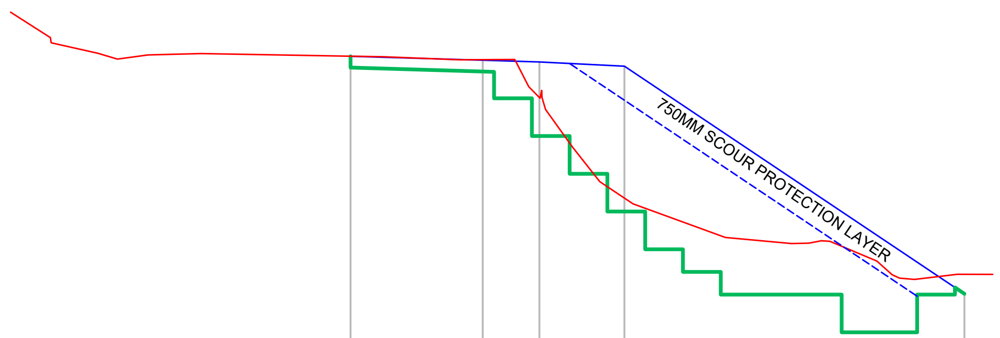
CH 70.0



RL 687.5

HT. DIFF		-0.000	-0.027	0.650	2.929	-0.508	
DESIGN		696.267	696.162	696.117	696.004	689.974	
EXISTING	697.952	696.267	696.189	695.466	693.076	690.482	690.494
OFFSET	9.000	0.000	3.500	5.000	7.250	16.250	17.000

CH 62.5



RL 687.5

HT. DIFF		-0.001	-0.015	0.944	3.494	-0.515	
DESIGN		696.230	696.125	696.080	695.967	689.937	
EXISTING	697.397	696.231	696.140	695.136	692.473	690.452	690.452
OFFSET	9.000	0.000	3.500	5.000	7.250	16.250	17.000

CH 67.5

Scale Horizontal 1:200 Vertical 1:200

REVISION	DATE	DESCRIPTION
D	JAN 25	REVISED DESIGN
C	JAN 25	DETAIL ROCK FILL DESIGN
B	NOV 24	PRELIMINARY ROCK FILL DESIGN
A	SEP 24	PRELIMINARY SITE DETAILS

HIGHLANDS DESIGN & DRAFTING

S P FOWLER
ABN 38 736 450 419
PHONE 0412 626 126
EMAIL fowlers202@gmail.com

HD &D

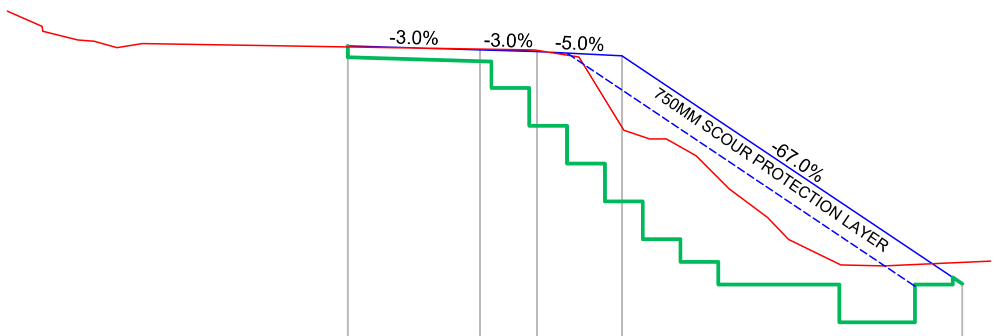
DRAWING DESIGN CROSS SECTIONS CH 62.5 - 70

PROJECT LANDSLIP REMEDIATION
BUNGENDORE RD, TARAGO
GOULBURN MULWAREE COUNCIL

REVISION D

Dwg No GMC 04.24

SHEET 6 OF 15



RL 687.5

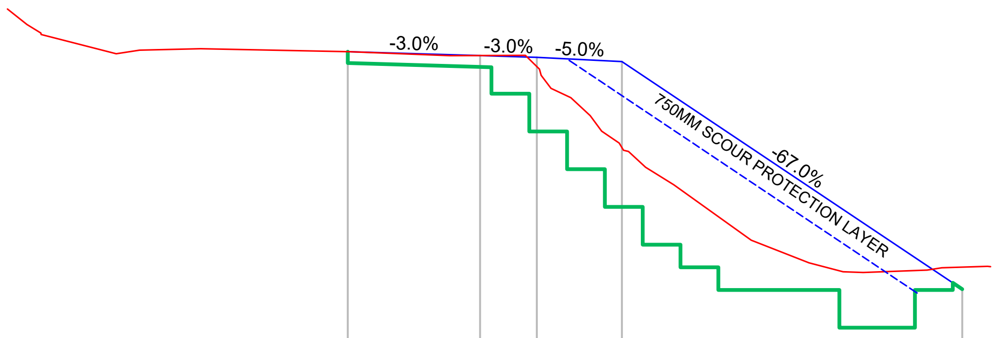
HT. DIFF		0.027	-0.021	-0.033	1.886	-0.564	
DESIGN		696.174	696.069	696.024	695.912	689.882	
EXISTING	697.095	696.147	696.090	696.057	694.025	690.446	690.480
OFFSET	9.000	0.000	3.500	5.000	7.250	16.250	17.000

CH 75.0

RL 689.0

HT. DIFF		
DESIGN		
EXISTING	697.351	690.446
OFFSET	9.000	17.000

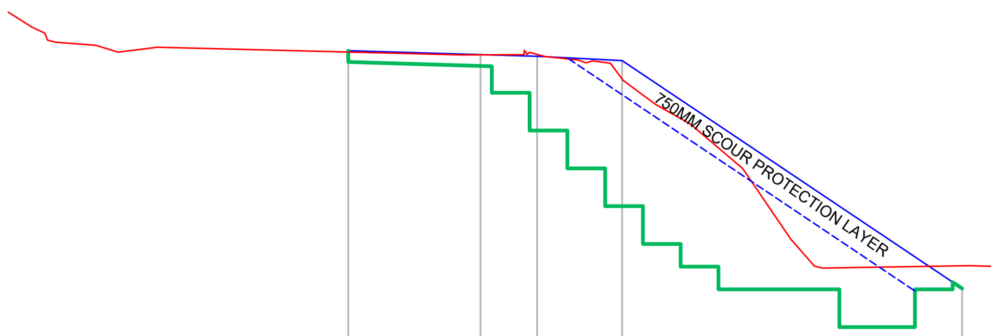
CH 80.0



RL 687.5

HT. DIFF		-0.000	-0.002	0.247	2.281	-0.583	
DESIGN		696.193	696.088	696.043	695.931	689.901	
EXISTING	697.323	696.193	696.090	695.796	693.650	690.484	690.498
OFFSET	9.000	0.000	3.500	5.000	7.250	16.250	17.000

CH 72.5



RL 687.5

HT. DIFF		0.036	0.006	-0.050	0.489	-0.601	
DESIGN		696.155	696.050	696.005	695.893	689.863	
EXISTING	697.175	696.119	696.044	696.055	695.404	690.464	690.450
OFFSET	9.000	0.000	3.500	5.000	7.250	16.250	17.000

CH 77.5

Scale Horizontal 1:200 Vertical 1:200

REVISION	DATE	DESCRIPTION
D	JAN 25	REVISED DESIGN
C	JAN 25	DETAIL ROCK FILL DESIGN
B	NOV 24	PRELIMINARY ROCK FILL DESIGN
A	SEP 24	PRELIMINARY SITE DETAILS

HIGHLANDS DESIGN
& DRAFTING
S P FOWLER
ABN 38 736 450 419
PHONE 0412 626 126
EMAIL fowlers202@gmail.com

HD &D

DRAWING DESIGN CROSS SECTIONS CH 72.5 - 80

PROJECT LANDSLIP REMEDIATION
BUNGENDORE RD, TARAGO
GOULBURN MULWAREE COUNCIL

REVISION D

Dwg No GMC 04.24

SHEET 7 OF 15

Scale Horizontal 1:500 Vertical 1:500

REVISION	DATE	DESCRIPTION
D	JAN 25	REVISED DESIGN
C	JAN 25	DETAIL ROCK FILL DESIGN
B	NOV 24	PRELIMINARY ROCK FILL DESIGN
A	SEP 24	PRELIMINARY SITE DETAILS

HIGHLANDS DESIGN & DRAFTING
S P FOWLER
ABN 38 736 450 419
PHONE 0412 626 126
EMAIL fowlers202@gmail.com
HD &D

DRAWING EXG. CROSS SECTIONS CH 00 TO 30

PROJECT LANDSLIP REMEDIATION BUNGENDORE RD, TARAGO GOULBURN MULWAREE COUNCIL

REVISION D

Dwg No GMC 04.24

SHEET 8 OF 15

Scale Horizontal 1:500 Vertical 1:500

REVISION	DATE	DESCRIPTION
D	JAN 25	REVISED DESIGN
C	JAN 25	DETAIL ROCK FILL DESIGN
B	NOV 24	PRELIMINARY ROCK FILL DESIGN
A	SEP 24	PRELIMINARY SITE DETAILS

HIGHLANDS DESIGN & DRAFTING
S P FOWLER
ABN 38 736 450 419
PHONE 0412 626 126
EMAIL fowlers202@gmail.com

HD &D

DRAWING EXG. CROSS SECTIONS CH 40 TO 55

PROJECT LANDSLIP REMEDIATION
BUNGENDORE RD, TARAGO
GOULBURN MULWAREE COUNCIL

REVISION D

Dwg No GMC 04.24

SHEET 9 OF 15

Scale Horizontal 1:500 Vertical 1:500

REVISION	DATE	DESCRIPTION
D	JAN 25	REVISED DESIGN
C	JAN 25	DETAIL ROCK FILL DESIGN
B	NOV 24	PRELIMINARY ROCK FILL DESIGN
A	SEP 24	PRELIMINARY SITE DETAILS

HIGHLANDS DESIGN & DRAFTING
S P FOWLER
ABN 38 736 450 419
PHONE 0412 626 126
EMAIL fowlers202@gmail.com

HD &D

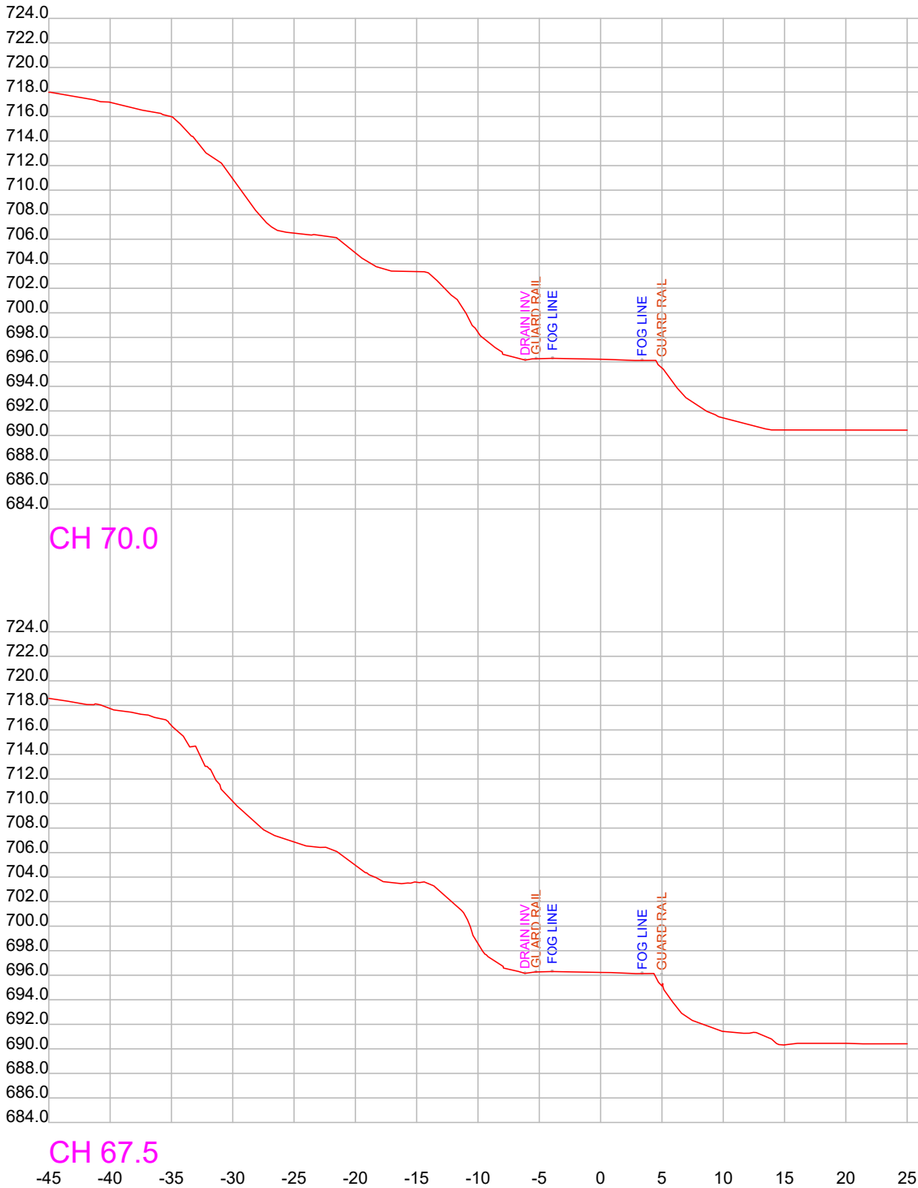
DRAWING EXG. CROSS SECTIONS CH 57.5 TO 65

PROJECT L A N D S L I P R E M E D I A T I O N
B U N G E N D O R E R D , T A R A G O
G O U L B U R N M U L W A R E E C O U N C I L

REVISION D

Dwg No GMC 04.24

SHEET 10 OF 15



Scale Horizontal 1:500 Vertical 1:500

REVISION	DATE	DESCRIPTION
D	JAN 25	REVISED DESIGN
C	JAN 25	DETAIL ROCK FILL DESIGN
B	NOV 24	PRELIMINARY ROCK FILL DESIGN
A	SEP 24	PRELIMINARY SITE DETAILS

HIGHLANDS DESIGN
& DRAFTING
S P FOWLER
ABN 38 736 450 419
PHONE 0412 626 126
EMAIL fowlers202@gmail.com

HD &D

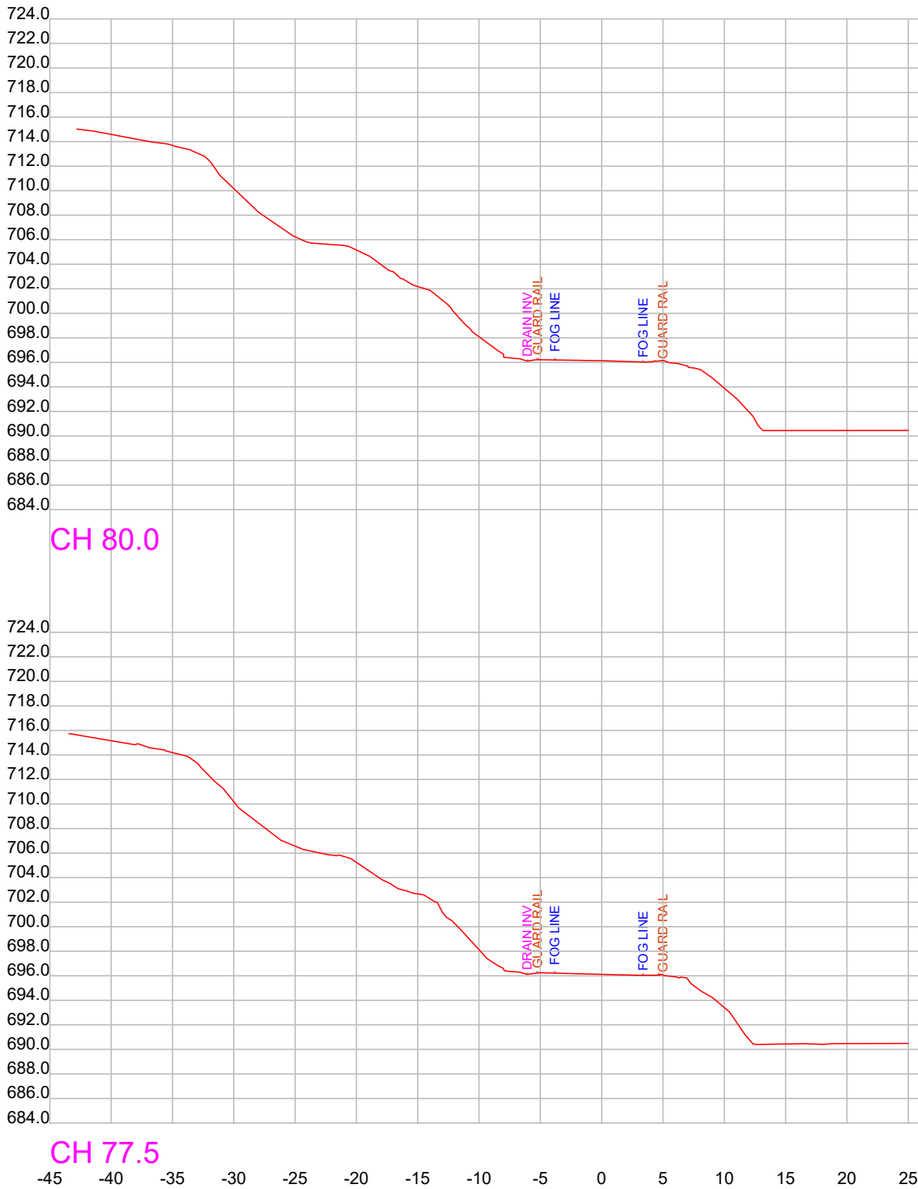
DRAWING EXG. CROSS SECTIONS CH 67.5 TO 75

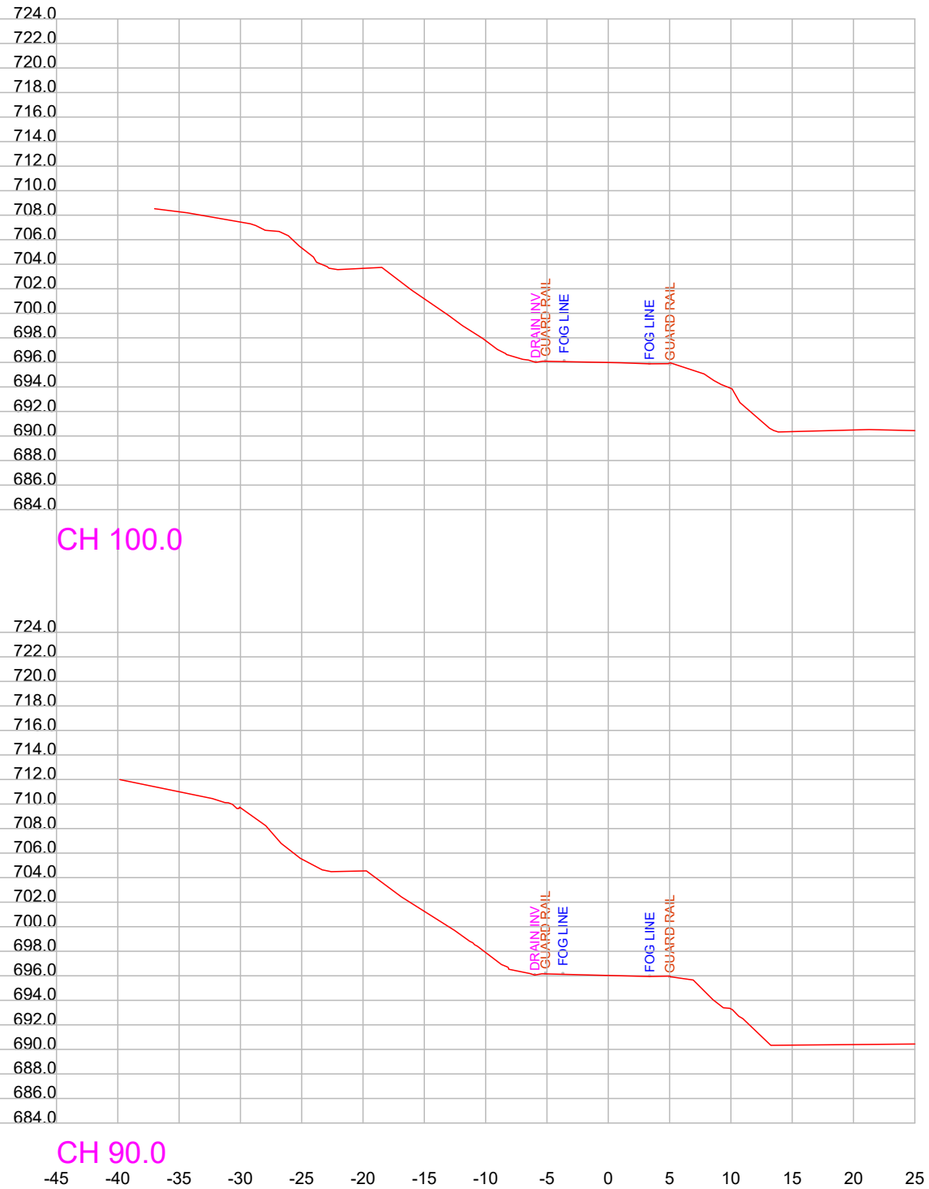
PROJECT L A N D S L I P R E M E D I A T I O N
B U N G E N D O R E R D , T A R A G O
GOULBURN MULWAREE COUNCIL

REVISION D

Dwg No GMC 04.24

SHEET 11 OF 15





Scale Horizontal 1:500 Vertical 1:500

REVISION	DATE	DESCRIPTION
D	JAN 25	REVISED DESIGN
C	JAN 25	DETAIL ROCK FILL DESIGN
B	NOV 24	PRELIMINARY ROCK FILL DESIGN
A	SEP 24	PRELIMINARY SITE DETAILS

HIGHLANDS DESIGN
& DRAFTING
S P FOWLER
ABN 38 736 450 419
PHONE 0412 626 126
EMAIL fowlers202@gmail.com
HD &D

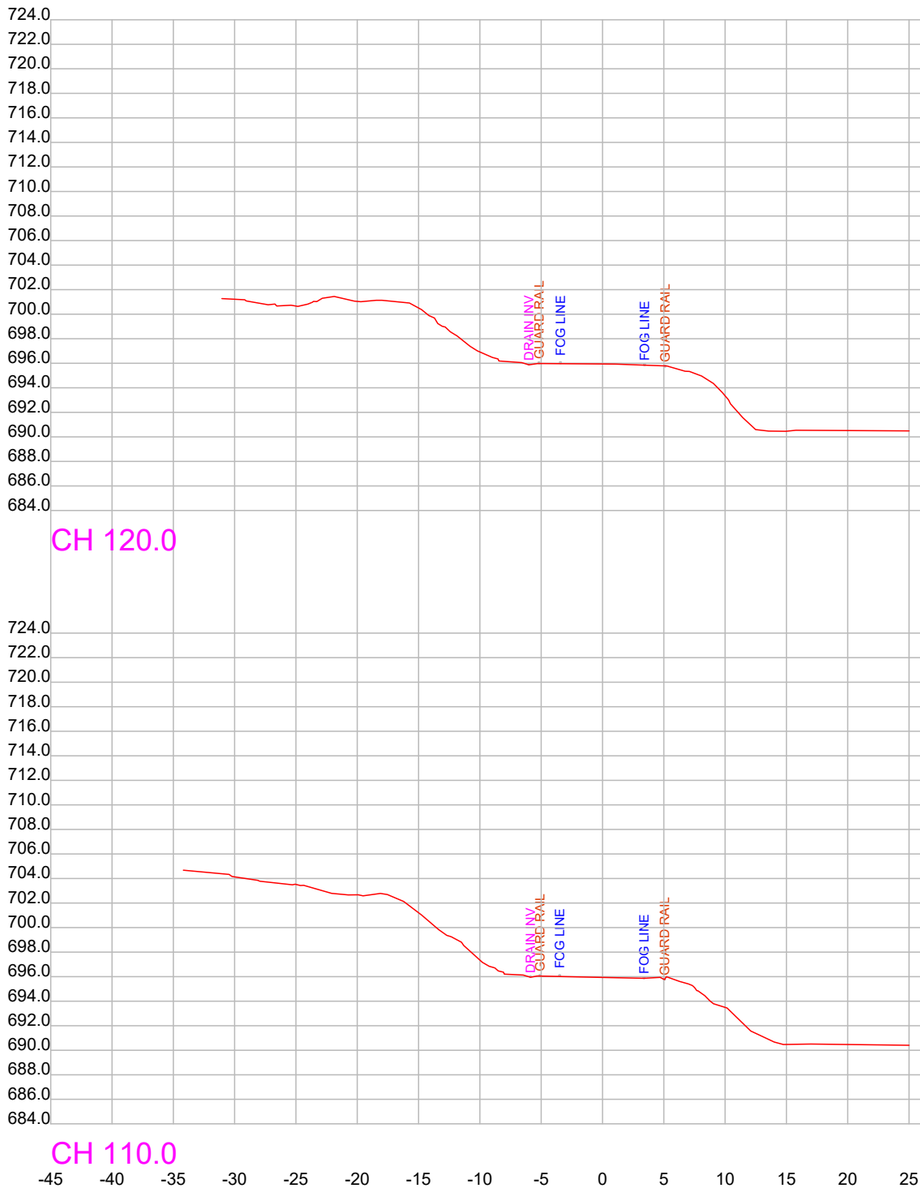
DRAWING EXG. CROSS SECTIONS CH 77.5 TO 100

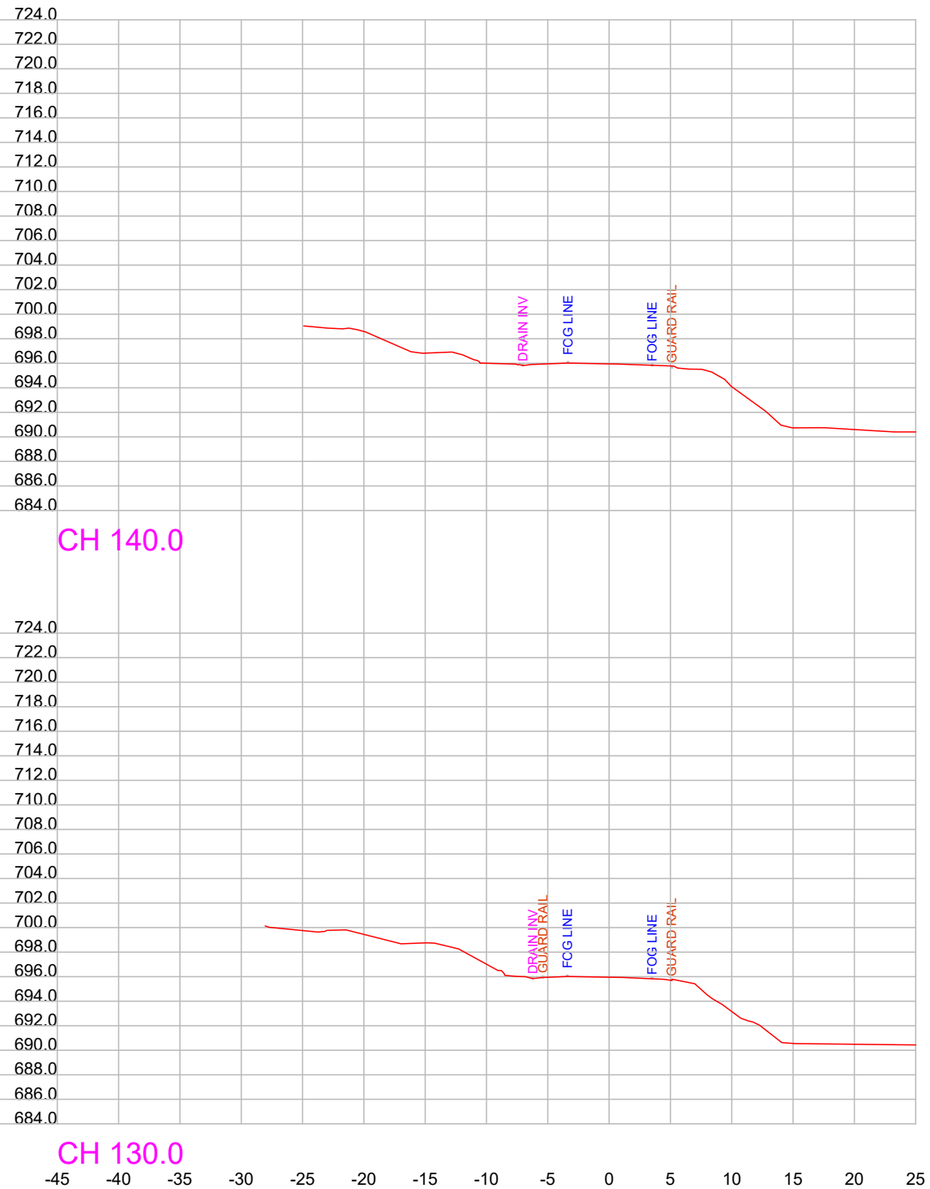
PROJECT LANDSLIP REMEDIATION
BUNGENDORE RD, TARAGO
GOULBURN MULWAREE COUNCIL

REVISION D

Dwg No GMC 04.24

SHEET 12 OF 15





Scale Horizontal 1:500 Vertical 1:500

REVISION	DATE	DESCRIPTION
D	JAN 25	REVISED DESIGN
C	JAN 25	DETAIL ROCK FILL DESIGN
B	NOV 24	PRELIMINARY ROCK FILL DESIGN
A	SEP 24	PRELIMINARY SITE DETAILS

HIGHLANDS DESIGN & DRAFTING
S P FOWLER
ABN 38 736 450 419
PHONE 0412 626 126
EMAIL fowlers202@gmail.com

HD &D

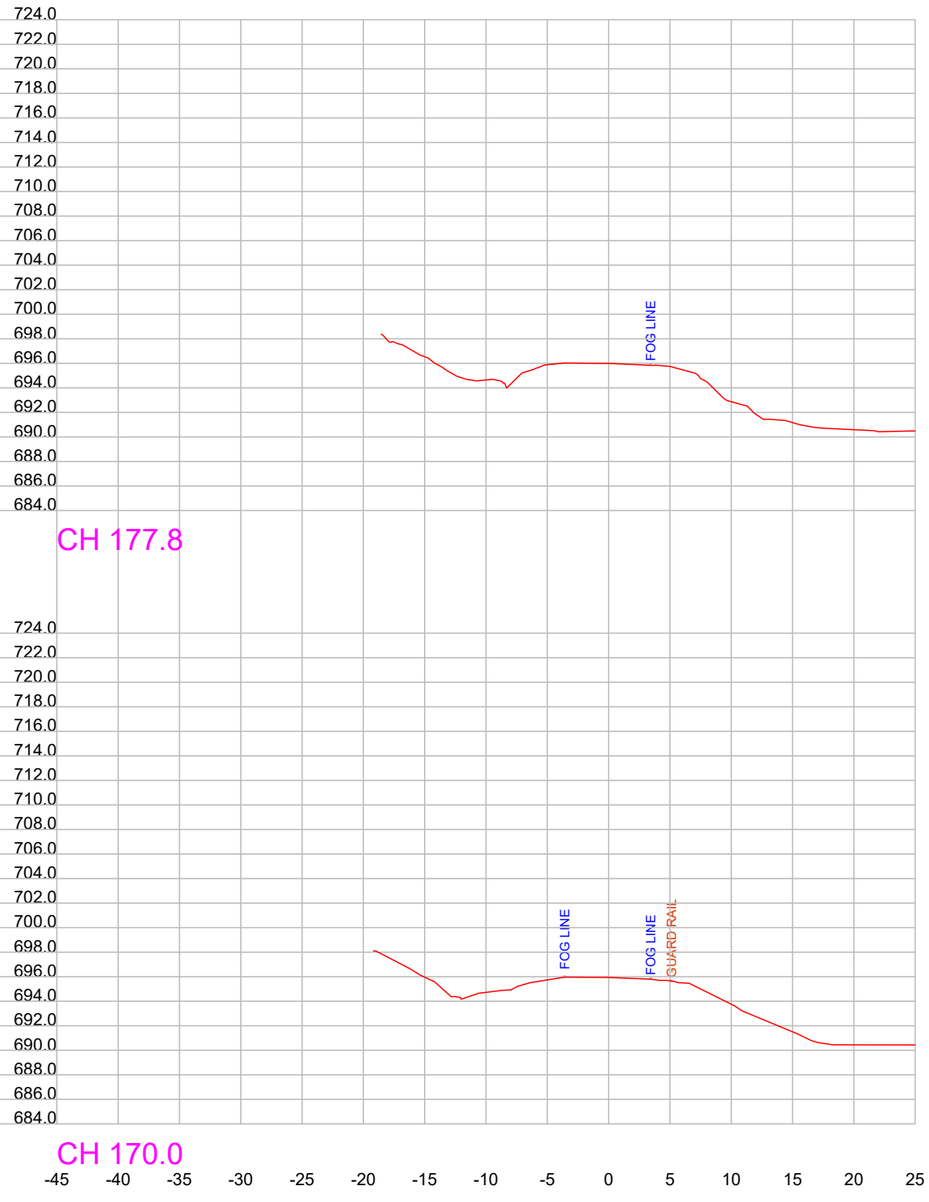
DRAWING EXG. CROSS SECTIONS CH 110 TO 140

PROJECT L A N D S L I P R E M E D I A T I O N
B U N G E N D O R E R D , T A R A G O
GOULBURN MULWAREE COUNCIL

REVISION D

Dwg No GMC 04.24

SHEET 13 OF 15



Scale Horizontal 1:500 Vertical 1:500

REVISION	DATE	DESCRIPTION
D	JAN 25	REVISED DESIGN
C	JAN 25	DETAIL ROCK FILL DESIGN
B	NOV 24	PRELIMINARY ROCK FILL DESIGN
A	SEP 24	PRELIMINARY SITE DETAILS

HIGHLANDS DESIGN & DRAFTING
S P FOWLER
ABN 38 736 450 419
PHONE 0412 626 126
EMAIL fowlers202@gmail.com

HD &D

DRAWING EXG. CROSS SECTIONS CH 150 TO 177.8

PROJECT LANDSLIP REMEDIATION BUNGENDORE RD, TARAGO GOULBURN MULWAREE COUNCIL

REVISION D

Dwg No GMC 04.24

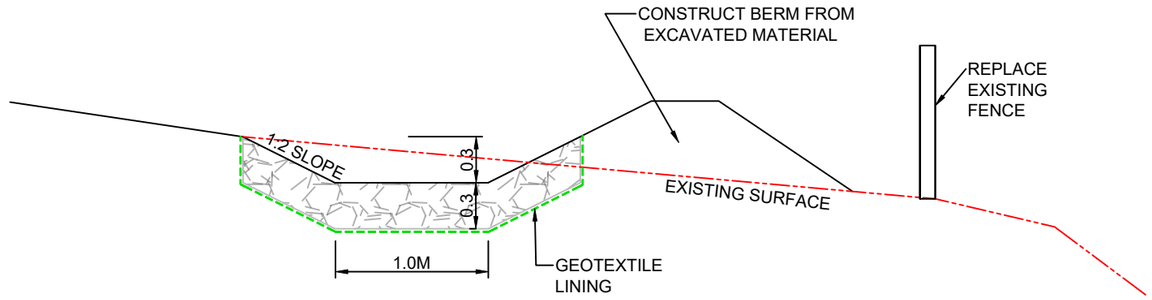
SHEET 14 OF 15

SOILS & CONSTRUCTION FIGURE 5.4
ROCK LINED WATERWAY

PROPOSED ROCK LINED DRAIN TO UPPER SLOPE

PROPOSED ROCK LINED DRAIN TO UPPER SLOPE TO BE CONSTRUCTED IN ACCORD WITH "SOILS & CONSTRUCTION" VOL 1 (THE BLUE BOOK) CLAUSE 5.4.3 - CONCENTRATED FLOWS.

CHANNEL LENGTH 80M
CHANNEL DIMENSIONS- BASE WIDTH 1.0M DEPTH 0.3M , SIDE SLOPES 1V : 2H
UPSTREAM RL 720.000, DOWNSTRAM RL 700.000
SLOPE GRADIENT DETERMINED FORM LIDAR DATA = 25%
UPSTEAM CATCHMENT 1.0 Ha
MAX FLOW AEP 1% STORM = 0.25 CU. M/S. MAX VELOCITY = 2.5M/S
ROCK SIZES TO WITHSTAND FLOW VELOCITY.
ROCK SIZE = 50% > 200MM DIA, 90% > 100MM DIA , ROCK LAYER 0.3M THICK.
EXCAVATE TO ACCOMMODATE ROCK LAYER.
PLACE GEOTEXTILE TO BASE OF EXCAVATED CHANNEL.
PLACE 50MM LAYER OF SAND TO PROTECT GEOTEXTILE.
USE CRUSHED/ANGULAR ROCK TO PROMOTE INTERLOCKING.
PLACE ROCK IN A MANNER SO AS NOT TO TEAR OR DISTURB THE GEOTEXTILE.
FILL VOIDS WITH SOIL, ALLOW SEDGES AND GRASS TO GROW.



REVISION	DATE	DESCRIPTION
D	JAN 25	REVISED DESIGN
C	JAN 25	DETAIL ROCK FILL DESIGN
B	NOV 24	PRELIMINARY ROCK FILL DESIGN
A	SEP 24	PRELIMINARY SITE DETAILS

HIGHLANDS DESIGN & DRAFTING
S P FOWLER
ABN 38 736 450 419
PHONE 0412 626 126
EMAIL fowlers202@gmail.com
HD &D

DRAWING UPPER SLOPE CHANNEL DETAILS
PROJECT LANDSLIP REMEDIATION BUNGENDORE RD, TARAGO GOULBURN MULWAREE COUNCIL

REVISION D
Dwg No GMC 04.24
SHEET 15 OF 15

Attachment 2: Due Diligence Assessment report

PastTraces Heritage Consultants

Aboriginal Cultural Heritage Due Diligence Assessment

Bungendore Road Upgrade, Tarago

Report Prepared for Ecology Consulting

Date 11/11/2024

www.pasttraces.com.au

email: office@pasttraces.com.au

Document Control

Revision	Date	Author	Reviewed
D1	11/11/2024	N. Cracknell	L. O'Brien

Disclaimer

Past Traces Pty Ltd has undertaken this assessment in accordance with the relevant Federal, State and Local Government legislation. Past Traces accepts no liability for any damages or loss incurred as a result of use for any purpose other than that for which it was commissioned.

Restricted Information

Information contained within this report is culturally sensitive and should not be made publically available. The information that is restricted includes (but is not limited to):

- Maps, Mapping Grid Reference Co-ordinates or images for Aboriginal heritage sites, places and objects.
- Location or detailed information regarding places of Aboriginal cultural significance, as expressed or directed by Representative Aboriginal Organisations, Aboriginal elders, or members of the wider Aboriginal community.
- Other culturally appropriate restricted information as advised by Aboriginal representatives and traditional knowledge holders.

Information in the report covered by the above categories should be redacted before being made available to the general public. This information should only be made available to those persons with a just and reasonable need for access.

www.pasttraces.com.au

email: office@pasttraces.com.au

CONTENTS

www.pasttraces.com.au

email: office@pasttraces.com.au

EXECUTIVE SUMMARY

This report provides Aboriginal heritage due diligence advice for the proposed upgrades to a section of Bungendore Road, Tarago. The project area consists of a section of the two-lane Bungendore Road, its verges and its intersection with the Crisps Creek Intermodal Facility access road. The area has been heavily impacted by the construction of the road, bridge construction and associated infrastructure. The study area is shown on Figure 1 in a regional context with the project area detailed in Figure 2.

This Due Diligence heritage assessment has been undertaken in accordance with the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW* (DECCW 2010a).

The proposal would involve the following impacts:

- Landscaping of surrounding area
- Widening of sealed road area and repair of existing road
- Installation of boundary fencing and road safety barriers

No heritage sites or areas of Potential Archaeological Deposit (PAD) were identified within the project area based on a review of previous reports and field survey of the project area.

Field survey was undertaken across the project area in accordance with the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010b). The field survey focussed on the unimpacted areas within the project area, and areas of exposure. Ground visibility was low at the time of field survey, with large areas of exposed soils, no heritage sites or areas of potential were identified during the field survey.

As a result of the field survey and background research completed for the project, the following recommendations have been developed:

- The development proposal should be able to proceed with no additional archaeological investigations. No areas of potential archaeological deposits or heritage sites have been identified within the development area and the potential for Aboriginal or historical heritage objects within the development area has been assessed as low.
- All Aboriginal objects are protected under the *NSW National Parks and Wildlife Act 1974*. It is an offence to disturb an Aboriginal site without a consent permit issued by NSW Heritage. Should any Aboriginal objects be encountered during works then works must cease and the find should not be moved until assessed by a qualified archaeologist.
- In the unlikely event that human remains are discovered during the construction, all work must cease. NSW Heritage, the local police and the appropriate Local Aboriginal Land Council (LALC) should be notified. Further assessment would be required to determine if the remains are Aboriginal or non-Aboriginal.
- Further archaeological assessment would be required if the proposal activity extends beyond the area of the current investigation.

1 INTRODUCTION

This report provides Aboriginal heritage due diligence advice for the proposed upgrades to a section of Bungendore Road, Tarago. The project area consists of a section of the two-lane Bungendore Road, its verges and its intersection with the Crisps Creek Intermodal Facility access road. The area has been heavily impacted by the construction of the road, bridge construction and associated infrastructure. The study area is shown on Figure 1 in a regional context with the project area detailed in Figure 2.

This Due Diligence heritage assessment has been undertaken in accordance with the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW* (DECCW 2010a).

The proposal would involve the following impacts:

- Landscaping of surrounding area
- Widening of sealed road area and repair of existing road
- Installation of boundary fencing and road safety barriers

These works are high impact and would have a negative impact on any heritage located within the project boundary. Heritage sites may be located on the surface or subsurface in areas of high potential for the preservation of archaeological remains of historical events or past usage by Aboriginal groups.

To assess the potential impacts of the proposed works on heritage this Due Diligence Heritage Assessment has been undertaken.

This report, field survey and associated research has been conducted in accordance to the requirements of the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* (OEH 2010).

1.1 PROJECT OBJECTIVES

The due diligence assessment is being undertaken to complete the following objectives:

1. Review of the NSW Heritage Aboriginal Heritage Information Management System (AHIMS), to identify any recorded Aboriginal heritage sites within the project area.
2. Review of historic registers to identify any historic heritage.
3. Review of previous reports in area to develop predictive model of site location
4. Assess landforms present in project area against predictive model to determine potential for heritage sites and determine level of disturbance
5. Complete site visit to visually inspect impact areas or areas assessed as holding potential based on predictive model and record any identified heritage sites. The site visit will also document levels of disturbance within project area.

www.pasttraces.com.au

email: office@pasttraces.com.au

6. Complete due diligence report with management recommendations to avoid or minimise impacts within the project area.

1.2 ABORIGINAL CONSULTATION

As the project is still in the early design phase, no consultation with the local Aboriginal community has been undertaken. Consultation with the Aboriginal community is not a requirement of the Due Diligence Code of assessment, which is undertaken at the preliminary planning stage of the project.

If the assessment finds that impacts to Aboriginal heritage will occur as a result of the development then consultation will be undertaken with the Local Aboriginal Land Council (LALC) and the wider Aboriginal community, in accordance with the consultation guidelines required by NSW Heritage.

www.pasttraces.com.au

email: office@pasttraces.com.au

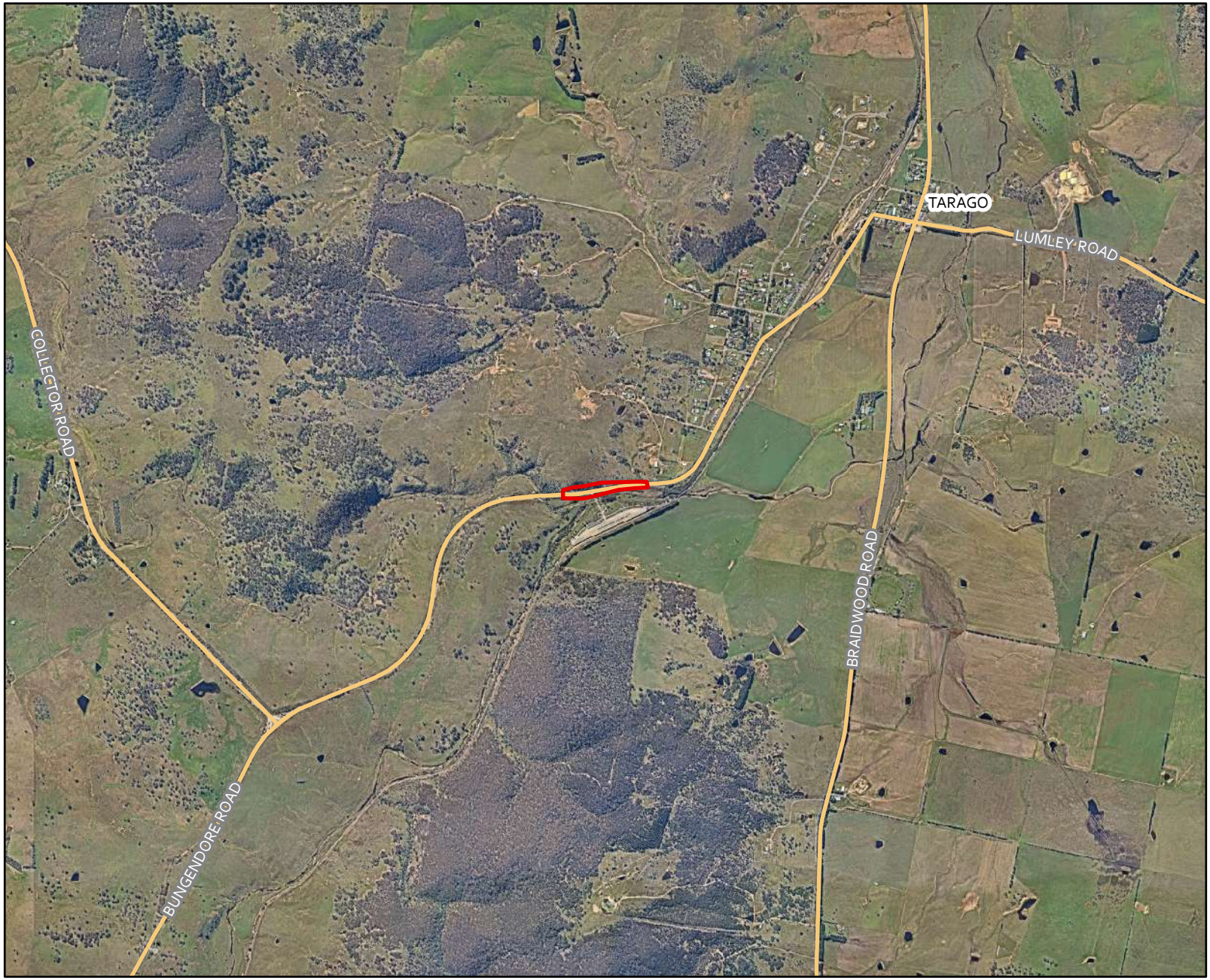


Figure 1: Regional Context

Legend

Study Area

Major Road

N

1:30,000

0 250 500 1,000

Meters
Coordinate System:
GDA 1994 MGA Zone 55

PastTraces Heritage Consultants

Figure 2: Project Area

Legend

- Contour -10m
- Watercourse
- Major Road
- Minor Road
- StudyArea
- Cadastre

N

1:2,000

0 25 50 100

Meters
Coordinate System:
GDA 1994 MGA Zone 55

Imagery: © Nearmap

PastTraces Heritage Consultants

2 DESKTOP ASSESSMENT RESULTS

2.1 ABORIGINAL HERITAGE INFORMATION MANAGEMENT SYSTEM (AHIMS) SEARCH

A search of the NSW Heritage AHIMS database was undertaken on the 4/11/2024 covering the approximate 2km surrounding area centred on the project area. The extensive search revealed one previously recorded heritage site within the project area (57-3-0347), which was salvaged in 2000 by NOHC, with 9 sites within the wider search area. The recorded sites consisted of isolated artefacts with no camp sites, scarred trees or areas of Potential Archaeological Deposit (PAD) recorded within the search area.

Heritage assessments have been undertaken in increasing frequency due to the level of increased development within the Tarago region and increased legislative requirements within NSW. These studies have resulted in a site location model being developed for the region. This model predicts the majority of sites will consist of small artefact sites located on level ground or terrace features in proximity to water sources, with larger sites being present in proximity to water features such as a creek confluence or major water sources. This predictive model is discussed in more detail in Section 2.2.

The recorded sites on AHIMS for the area are listed in Table 1 and shown on Figure 3 in relation to the project area. The heritage site recorded within the project area is highlighted in bold.

Table 1. AHIMS Site Details

Site ID	Site name	Site features	Recorders
57-3-0347	Crisps Creek 1	Isolated Find	NOHC 2000
57-3-0348	Crisps Creek 2	Artefact Scatter	NOHC 2000
57-3-0349	Crisps Creek 3	Artefact Scatter	NOHC 2000
57-3-0350	Crisps Creek 4	Artefact Scatter	NOHC 2000
57-3-0466	Tarago 1	Artefact Scatter	Kayandel 2011
57-3-0465	Tarago 2	Artefact Scatter	Kayandel 2011
57-3-0464	Tarago PAD1	Potential Archaeological Deposit (PAD)	Kayandel 2011
57-3-0380	WL 15	Artefact Scatter	Reeves 2004
57-3-0538	KST1 – King St Tarago	Artefact Scatter	Past Traces 2023

www.pasttraces.com.au

email: office@pasttraces.com.au

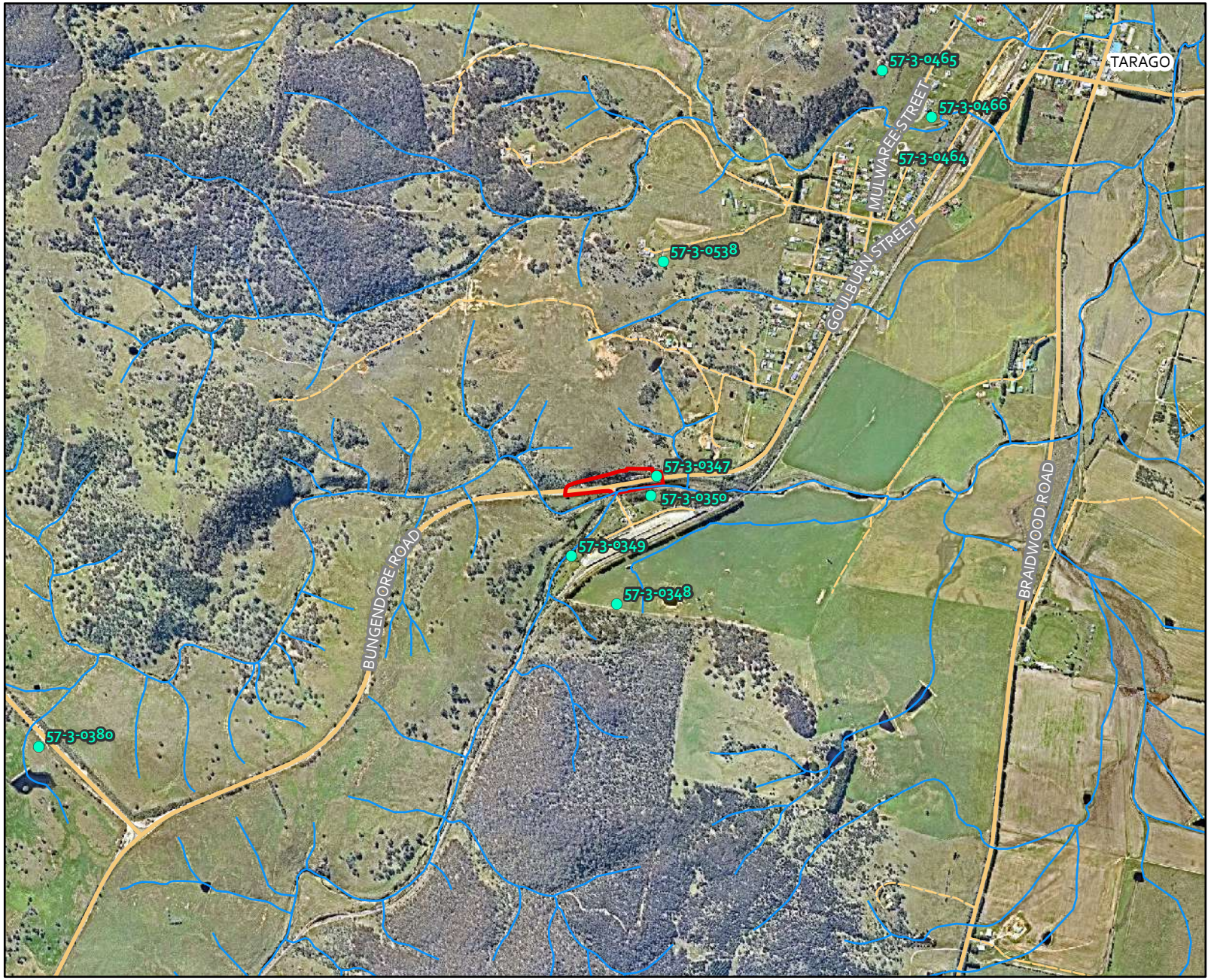


Figure 3: Previously Recorded Heritage Sites

Legend

- Watercourse
- Previously Recorded Site
- Study Area
- Highway
- Major Road
- Minor Road
- Track-Vehicular

N

1:20,000

0 0.25 0.5 1

Kilometers
Coordinate System:
GDA 1994 MGA Zone 55

Imagery: © Nearmap

PastTraces Heritage Consultants

Figure 3a: Previously Recorded Heritage Sites Near Project Area

Legend

- Watercourse
- Previously Recorded Site
- Study Area
- Highway
- Major Road
- Minor Road
- Track-Vehicular

N

1:2,000

0 25 50 100

Meters
Coordinate System:
GDA 1994 MGA Zone 55

PastTraces Heritage Consultants

2.2 HISTORICAL HERITAGE SEARCH

Within NSW Local government is responsible for managing heritage items. This responsibility is mainly fulfilled by listing heritage items in the Local Environmental Plans (LEPs) under the *Environmental Planning & Assessment Act 1979*. Council approval is required to impact any listed item.

Heritage items can also be of 'state significance' in which case they are listed on the NSW Heritage Register by the NSW Heritage Council under the *Heritage Act 1977*. These items are usually substantial and consist of buildings, bridges or other structures that represent events in the local area.

A search of the NSW Heritage Register and the Goulburn-Mulwaree LEP 2009 was undertaken for the project. No historical items were located during these searches. A review of historical parish maps (County of Argyle, Parish of Mulwaree) was also undertaken with no known structures or items identified within the project area.

2.3 PREVIOUS HERITAGE STUDIES

The project area is located in the Goulburn Plains within the Southern Tablelands. Regional models of aboriginal landscape and resource use, along with models of intensity of utilization and number of Aboriginal occupants have been developed for the wider Goulburn region (Koettig and Lance 1986, Fuller 1989). Limited heritage studies have been undertaken in the Tarago area, and fewer still within proximity of the Project area.

Following reports to National Parks and Wildlife Service in 1975, McBryde was consulted to assess archaeological deposits stemming from the commercial sand mines on the southeastern shores of Lake Bathurst. McBryde undertook the salvage collection and investigation with students from the ANU. This site occurred in a beach deposit at about 40cm below the current land surface and just above one of two gravel bands recorded from this beach. Over 6000 artefacts have been recorded from this site with the maximum artefact density being 326 in a 100sqm area, i.e. about 3/sqm.

Several sites have been recorded in similar topographic situations in the Lake George Basin (Hughes, Barz and Hiscock 1984) and numerous sites have been recorded in the Shoalhaven River catchment to the east and southeast (Attenbrow and Hughes 1983).

In 2000, Navin Officer Heritage Consultants (NOHC) were commissioned for a Cultural Heritage Assessment of a proposed landfill site at the Woodlawn Mine and an Intermodal Facility at Crisps Creek south of Tarago, which included the current project area. Four artefact scatters (Crisps Creek 1 to Crisps Creek 4) were identified during the survey with a 'Consent to Destroy' issued for three of the four sites, Crisps Creek 1, 2 & 4, with these sites recovering one, one and 70 artefacts respectively. This Consent to Destroy has removed Crisp Creek 1 as a heritage constraint on the project.

Reeves (Biosis Research) in 2005 conducted the archaeological subsurface testing of the proposed Woodlawn wind farm at Tarago, as well as the development of a project Cultural Heritage Management Plan (CHMP). As a result of the assessment, 11 isolated finds and 10 artefact scatters were identified, with eight of those sites associated with low-density subsurface deposits. It was concluded that the lack of subsurface archaeological material was likely due to the extensive erosion of sparse rocky soils associated with the ridge landform context revealing the majority of the present archaeological record.

NSW Archaeology conducted an assessment of the 'Roseview' property south of Tarago for proposed erosion control works in 2008, approximately 4km southeast of the current project area. Of the surveyed 8.5ha, three Aboriginal heritage sites were identified. Two of these sites (SU2/L1 & SU3/L1) were comprised of low-density artefact scatters with site SU1/L1 consisting of a low-moderate density scatter with moderate-high potential to contain areas of intact archaeological deposit.

The proposed construction of Capital Wind Farm was located between Tarago and Bungendore, with the initial cultural assessments being undertaken by Austral Archaeology in 2004 and 2005. As a result, five Aboriginal sites were recorded consisting of three isolated finds and two low-density artefact scatters, as well as six areas of PAD. In 2007, six areas within four of the areas of PAD were subsurface tested. In total, 83 test pits were excavated yielding 348 artefacts from across the site namely constructed of quartz, quartzite, silcrete and chert. In 2010, Austral Archaeology were again commissioned for Capital Wind Farm II located to the east of Lake George. This assessment identified 63 new sites consisting of 31 isolated finds, 30 artefact scatters and two areas of PAD, with 23 of these sites located with proximity to Taylors Creek.

In 2011, Kayandel Archaeological Services undertook a heritage assessment for a proposed subdivision in Tarago along what is now the area of Mulwaree Street. This assessment identified two artefact sites and two areas of PAD. These sites were located on low slope crests overlooking a 4th order stream that feeds into the Mulwaree River 700m to the east.

In 2021, Austral Archaeology conducted a Due Diligence Assessment of 800m of John Holland CRN railway line at Tarago (approximately 400m from the current project area). No artefacts were identified from the survey or areas of potential.

In 2022, Past Traces conducted a due diligence assessment for the proposed extension of the Holy Cross Cemetery at Lake Bathurst. The area adjacent to the current cemetery was surveyed with no identified heritage sites in the vicinity.

Past Traces in 2023 conducted a heritage assessment of 41 King Street, Tarago, located approximately 4.5km southeast of the current project. The field survey identified one Aboriginal heritage site (KST1) consisting of two chert flakes on a crest overlooking a water way.

2.3.1 Predictive Model

Predictive modelling has been undertaken to broadly predict the type and location of Aboriginal cultural heritage sites within the boundaries of the project area. The model is based primarily on Fuller's (1989) prediction model, NOHC 2000 assessment, the landforms present within the project area and the degree of disturbance which has occurred historically.

Based on the previous assessments completed through the region site locations and types can be summarised as follows:

- the majority of open artefact scatters are located near creek lines, particularly on reasonably level, elevated ground,
- large artefact scatters occur most frequently within 100-150m of major water features, with a possible preference for creek confluences,
- artefact scatters occurring away from major creek lines tend to be small and sparse,
- scarred trees are rare and may occur wherever old growth trees of sufficient age have survived (locally at least 140-150 years); and
- stone procurement sites may occur where rock suitable for stone tool manufacture is present on the surface, but none are recorded in the area.

Table 2. Site Prediction Model

Probability	Site Type	Definition	Typical Landform	Assessment
Low to Moderate	Isolated finds and surface scatters of stone artefacts	Stone artefacts ranging from single artefact to high numbers	Most likely in proximity to creek lines and river flats	Heavy previous impacts from road and previous surface collection. Project area is adjacent to confluence of Crisps Creek and Mulwaree River
Low to Moderate	Potential Archaeological Deposits (PADs)	Area considered on landform to hold higher potential for unidentified subsurface deposits	Varies, but most frequent on elevated terraces along creek lines and river frontage.	Heavy previous impacts from road and previous surface collection. Project area is adjacent to confluence of Crisps Creek and Mulwaree River
Low	Culturally Modified Trees (CMTs)	Trees which have been modified by scarring, marking or branch twining	Wherever old remnant trees remain	Very few old growth trees remain and none previously recorded.
Nil	Rock Engravings	Images engraved on flat rock surfaces	Escarpments, rock platforms or rock shelters	Not present

Probability	Site Type	Definition	Typical Landform	Assessment
Nil	Stone arrangements	Arrangements of stones by human intention, including circles lines or patterns.	Any landform	Previous impacts and ongoing use suggest unlikely these sites would remain and none are previously recorded.
Nil	Stone quarries/Ochre sources	Quarry sites where resources have been mined.	Any landform	Not present based on geology.
Nil	Axe grinding grooves	Grooves in stone caused by the grinding of stone axes	Usually in creek lines, as water is used as abrasive with sand.	None previously recorded.
Nil	Burials	Burials of Aboriginal persons	Usually requiring deep sandy soils on eastern facing slopes	Relevant soils not present. None previously recorded.

2.4 LANDFORM AND DISTURBANCE LEVEL ASSESSMENT

The landforms within the project area consist of moderately steep simple slopes stemming from the hill crest to the north. No water sources are present within the small project area; however, two permanent water sources are directly adjacent to the south. The confluence of Crisps Creek (5th order) and the Mulwaree River (6th order) is present at the base of slopes to the south. These major water sources would have been a permanent water source throughout the year and continuing as a chain of ponds during drier periods.

The project area is bisected by and has been heavily impacted by the cutting in and construction of Bungendore Road with the later addition of an elevated intersection and access road for the Crisps Creek Intermodal Facility.

All of these landscape and soil impacts reduce the potential for archaeological or heritage sites to remain intact within the landscape. Confined areas of disturbance are present along fence lines and road verges. Exposed ground is present in areas of animal impacts, vehicle tracks, fence lines, under trees and large areas of erosion.

Review of previous Aboriginal sites located in the vicinity indicates a site location model based on level areas in proximity to water resources such as creek lines with smaller sites located on hilltop ridgelines. The study area consists of moderately steep simple slopes classified as holding low overall low potential for heritage sites. The proximity of two major permanent water sources, Crisps Creek and the Mulwaree River, increase the likelihood for unrecorded heritage sites based on predictive modelling.

www.pasttraces.com.au

email: office@pasttraces.com.au

As a result of the landform assessment the study area contains low to moderate potential to contain any unrecorded heritage sites or areas of PAD and has suffered a high degree of previous impact. An aim of the field survey will be to investigate the potential of the landforms, along with the degree of disturbance to verify the desktop findings.

www.pasttraces.com.au

email: office@pasttraces.com.au

3 FIELD SURVEY RESULTS

A field survey of the project area was undertaken on the 7th November 2024 to verify the findings of the desktop review of landforms and disturbance. The aim of the investigation was to identify heritage objects or places of potential archaeological Deposit (PAD). Based upon the background research, known Aboriginal site patterning, and current aerial photography, the areas of the access road, building envelopes and surrounding landforms were inspected.

All surveyed areas and items of interest were recorded on a topographic map of the study area (using a GPS and GDA94 MGA55 coordinates), along with levels of visibility, erosion, soil conditions, and evidence of land disturbance.

Ground surface visibility (GSV) is the percentage of ground surface that is visible during the field inspection. GSV increases in areas of exposures such as stock impact trails, roads, gates and along areas of erosion such as creek banks and dam walls. As a result surveys undertaken in areas with high exposure rates result in a more effective survey coverage.

The site visit resulted in the following findings.

3.1.1 Ground Surface Visibility

GSV over most of the study area was low due to dense vegetation coverage across the most of the proposed works area. Bare earth was visible in large exposures and across the project area the average GSV was estimated at 30%. Due to the prevailing vegetation, large areas of exposed ground were present under trees, along fence lines, along animal tracks and previously scraped areas. Exposures were uncommon at low frequency across the project areas with large areas of bare soils with natural gravels visibly present. The conditions at the time of the field survey are shown in plates 1 to 6.

Plate 1: East extent of Project Area along north verge (Facing West)

Plate 2. Eroded track leading upslope along north verge (west)

Plate 3: Northern verge cutting into slope (West)

Plate 4: Southern verge with view of bridge intersection with heavy erosion along Mulwaree River (West)

Plate 5: East extent of Project Area along south verge with view of Mulwaree River (West)

Plate 6: West extent of Project Area along south verge with previous erosion barrier posts present (East)

3.1.2 Disturbance

The degree of disturbance across the study area was high stemming from the previous high impact works of road construction, cutting and bridge foundations. The ground is comprised of a volcanic geology and alluvial gravels covered with a thin clay soil with natural quartz and volcanic gravels present. Bungendore Road has been heavily landscaped and considerably cut-into the adjacent slope in multiple areas to create a sort of terrace. The road's length adjacent to the Mulwaree River has been elevated to create a relatively flat road surface and erosion has been prominent in some areas, as shown in Plate 4.

www.pasttraces.com.au

email: office@pasttraces.com.au

The length of the project area features steel road safety barriers, with the steel posts featuring concreted footings. The bridge intersection for the Crisps Creek Intermodal Facility access road has also been heavily impacted, with the bridge supports and road junction requiring extensive footing excavations with gabion rock cages present along the intersection. The northern verge of the road had been heavily landscaped to allow for road drainage, with large concrete culverts allowing water to run into the Mulwaree River.

Other more general types of disturbance were also present in the form of prior vegetation and tree removal, animal impacts and fence lines. The locations of the proposed works are not located on high potential landforms and these areas are considered to hold low potential for heritage sites. Soils were displaced in areas and erosion appears active within the large exposures. The thinness of the soils with natural gravels exposed, indicates that no subsurface deposits are present.

3.1.3 Previously Recorded Site: Crisps Creek 1 (57-3-0347)

Site Crisps Creek 1 (57-3-0347) was previously recorded by Navin Officer Heritage Consultants (NOHC) in 2000 and consisted as an isolated find located on the upper slopes of a small spurline east of the Mulwaree River and west of the Goulburn-Cooma railway line. This grey silcrete proximal flake was identified in an 3x3m area of wombat diggings. This artefact was collected by NOHC in 2000. Despite a careful search of the area, no new artefacts were identified during the field survey. The location of this salvaged find is shown in Figure 3.

Plate 7: Location of previously collected site 57-3-0347 (East)

www.pasttraces.com.au

email: office@pasttraces.com.au

3.1.4 Results - Aboriginal Heritage Sites

No areas of Aboriginal heritage were identified during the field survey despite constant rate of exposures and low vegetation coverage. No known heritage sites will be affected by the proposed development.

3.1.5 Results - Areas of Potential Archaeological Deposit (PAD)

Areas of PAD are defined as landforms that hold higher potential than their surrounds to contain subsurface deposits of past Aboriginal occupation. Based on a review of previous studies completed for the region, areas of PAD would be located in association with waterways (1st or 2nd order streams) on level ground or along spur crest and ridge lines.

As a result, of the landforms and prior impacts, no areas of PAD have been identified and the project area is considered to hold low potential.

3.1.6 Results – Historical Heritage

No areas or items of historical heritage were identified within the project area as a result of the background review or field survey.

3.1.7 Summary

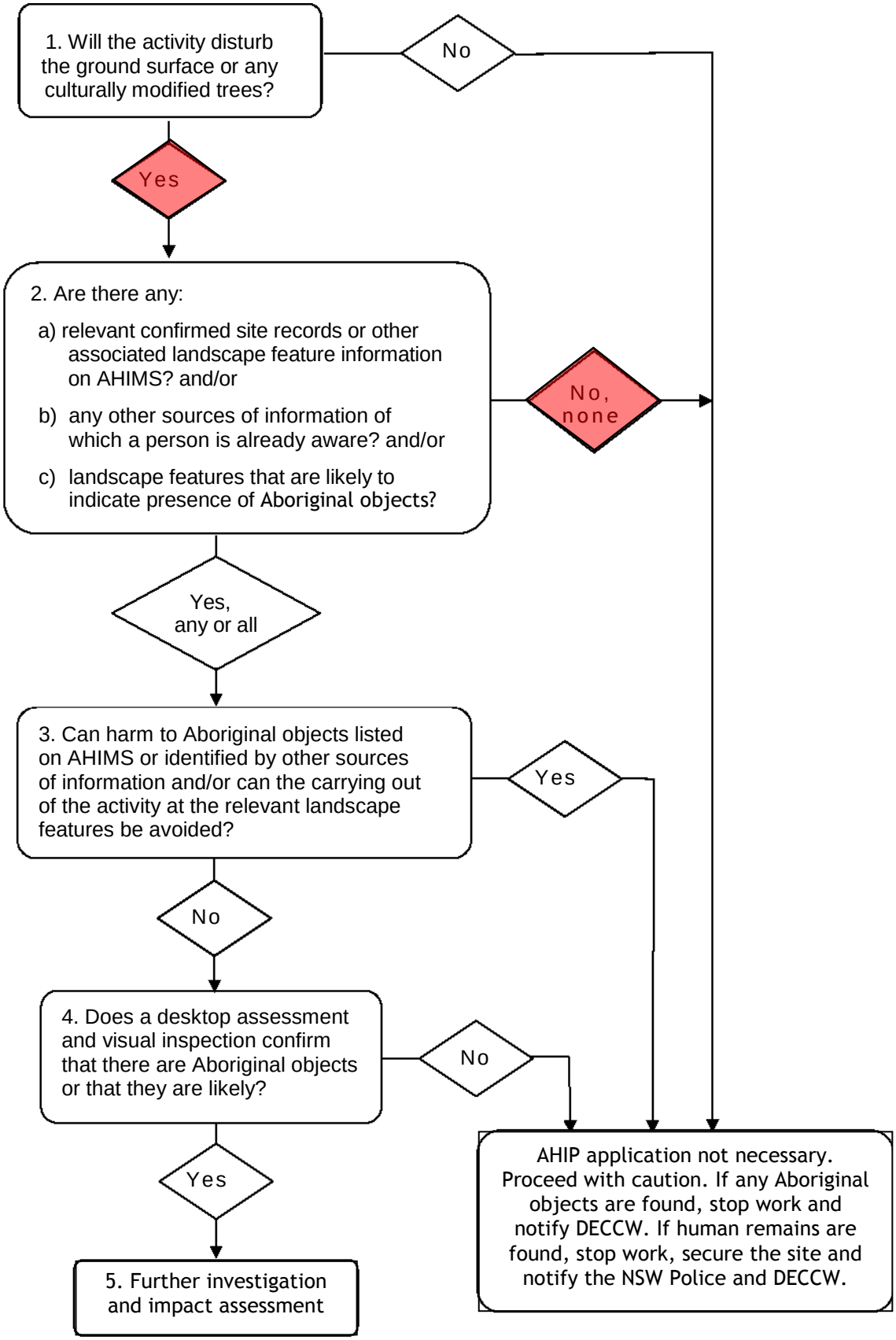
As a result of the site visit, field survey of impact areas and background research, it is considered that the project has low potential to impact on unrecorded Aboriginal or Historical heritage sites or areas of PAD. No Aboriginal heritage sites or areas of PAD were recorded or identified as a result of the assessment and no areas of high or moderate sensitivity are present in the development area based on previous research, modelling and the field survey assessment of disturbance and soils.

Based on the assessment the impacts from the project are as follows:

- No known Aboriginal objects or places will be impacted by the proposed works.
- No known Historical objects or places are present in the project area.
- No areas of high potential to contain unrecorded Aboriginal or historical objects or places are present in the project area.

The Aboriginal Due Diligence Code provides a flowchart of six questions to identify the presence of and potential harm to Aboriginal heritage. These questions and their applicability to the project are shown in Figure 4. The responses to these questions determine if further heritage investigations are required.

Figure 4. Due Diligence Flow Diagram (OEH 2010:10 – Due Diligence Code of Practice)



4 RECOMMENDATIONS

Based on this due diligence assessment the following actions are recommended for the project.

Recommendation 1: Works to proceed without further heritage assessment with caution.

The proposed works can proceed without further assessment as no Aboriginal or historical heritage sites (objects or places) have been identified within the project area. The potential for impacting on unrecorded heritage sites within the project area is assessed as extremely low, based on landform analysis and field survey.

Recommendation 2: Discovery of Unidentified Aboriginal cultural material during works.

Under the *NPW Act 1977* all Aboriginal places and objects are protected from harm, even if they have not been previously identified during the assessment process. If Aboriginal material is discovered during works then the steps as outlined below should be followed:

- All work must cease in the vicinity of the find and project manager notified immediately.
- A buffer zone of 10m should be fenced in all direction of the find and construction personnel made aware of the 'no go' zone.
- NSW Heritage must be notified of the find and advice sought on the proper steps to be undertaken.
- After confirmation with NSW Heritage a heritage consultation should be engaged to undertake assessment of the find and provide appropriate management recommendations to the proponent.

Recommendation 3: Discovery of Human Remains

In the highly unlikely event that human remains are discovered during any construction work, than all activity in the vicinity of the find must cease. As a first step the local police must be notified, followed by NSW Heritage and advice sought on appropriate next actions. No work can continue on the site until cleared with police and NSW Heritage.

Recommendation 4: Alteration of impact footprint

Further archaeological assessment would be required if the proposal activity extends beyond the area of the current investigation.

Implementation of the above management recommendations will result in low potential for the project to impact on heritage values or result in damage to heritage sites.

www.pasttraces.com.au

email: office@pasttraces.com.au

5 REFERENCES

Attenbrow, V and Hughes, P. (1983). *Welcome Reef Dam Survey Report Volume 1.* Report to Metropolitan Water, Sewerage and Drainage Board.

Austral Archaeology. (2005). *Proposed Capital Wind Farm Tarago Region NSW: Aboriginal Archaeological and Cultural Heritage Assessment.*

Austral Archaeology. (2009). *Capital Wind Farm Tarago Region NSW. Aboriginal Archaeological Excavation Report.* Report to Renewable Power Ventures.

Austral Archaeology. (2010). *Capital Wind Farm II Tarago Region NSW: Aboriignal Archaeology and Culural Heritage Assessment.* Report for Infigen Energy.

Austral Archaeology. (2021). *Aboriginal Cultural Heritage Due Dlligence Advice for Tarago Rail Improvements, Bungendore, NSW.* Report to Cardno.

Biosis Research. (2005). *Archaeological subsurface testing of the proposed Woodlawn Wind Farm, Tarago, NSW.* Report to EHN Oceania Pty Ltd.

DECCW. (2010). *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales.* Sydney: DECCW.

Fuller, N. (1989). *Goulburn City - An Archaeological Investigation of Site Location .* Report to Greater Argyle City Council .

Hughes, P., R. K.Barz & P. Hiscock. (1984). *An Archaeological Investigation of the Bungendore Sand Quarry, Lake George NSW.* Report to Corkhill Bros Pty Ltd.

Koettig, M and Lance, A. (1986). *An Aboriginal Resources Planning Study for the City of Goulburn, NSW.* Report to Greater Argyle City Council.

McBryde, I. &. (1989). *Aboriginal Sites on the Southern Tablelands National Parks and Wildlife Services Workshop November 1989.* Department of Prehistory and Anthropology, ANU and National Centre for Cultural Heritage Science Studies, CCAE.

McBryde,I. (1975). *Report on Investigations at Lake Bathurst Tarago NSW.*

Navin Officer Heritage Consultants. (2000). *Collection of Aboriginal Artefacts: Crisps Creek, Tarago, NSW.* Report to Collex Waste Management.

OEH. (2011). *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in New South Wales .* Office of Environment and Heritage .

Past Traces. (2022). *Aboriginal Cultural Heritage Due Diligence Assessment: Holy Cross Cemetery Lake Bathurst - Lot 1 DP 843767.* Report to Laterals Planning.

Past Traces. (2023). *Aboriginal Cultural Heritage Due Diligence Assessment: 41 King Street, Tarago.* Report to Group One Pty Ltd.

A.1 AHIMS SITE SEARCH

www.pasttraces.com.au

email: office@pasttraces.com.au

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : Bungendore Rd Tarago1

Client Service ID : 946409

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
57-3-0348	Crisps Creek 2	AGD	55	740280	6113970	Open site	Valid	Artefact : -	Open Camp Site	98643,102136
	Contact	**Recorders**	Kerry Navin,Mr.Kelvin Officer					**Permits**	1543,1544	
57-3-0350	Crisps Creek 4	AGD	55	740400	6114350	Open site	Valid	Artefact : -	Open Camp Site	98643
	Contact	**Recorders**	Kerry Navin,Mr.Kelvin Officer					**Permits**	1543,1544	
57-3-0349	Crisps Creek 3	AGD	55	740120	6114140	Open site	Valid	Artefact : -	Open Camp Site	98643,102136
	Contact	**Recorders**	Kerry Navin,Mr.Kelvin Officer					**Permits**		
57-3-0465	Tarago 2	GDA	55	741326	6116030	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Kayandel Archaeological Services					**Permits**		
57-3-0347	Crisps Creek 1	AGD	55	740420	6114420	Open site	Valid	Artefact : -	Isolated Find	98643
	Contact	**Recorders**	Kerry Navin,Mr.Kelvin Officer					**Permits**	1543,1544	
57-3-0538	KST1 - King St Tarago 1	GDA	55	740557	6115357	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Ms.Lyn O'Brien,Past Traces Pty Ltd					**Permits**		
57-3-0464	Tarago PAD1	GDA	55	741350	6115760	Open site	Valid	Potential Archaeological Deposit (PAD) : -		
	Contact	**Recorders**	Kayandel Archaeological Services					**Permits**		
57-3-0380	WL15	AGD	55	738249	6113469	Open site	Valid	Artefact : 15		99321,99582,102136
	Contact Searle	**Recorders**	Mr.Jamie Reeves					**Permits**		
57-3-0466	Tarago 1	GDA	55	741500	6115865	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Kayandel Archaeological Services					**Permits**		

**** Site Status**

Valid - The site has been recorded and accepted onto the system as valid

Destroyed - The site has been completely impacted or harmed usually as consequence of permit activity but sometimes also after natural events. There is nothing left of the site on the ground but proponents should proceed with caution.

Partially Destroyed - The site has been only partially impacted or harmed usually as consequence of permit activity but sometimes also after natural events. There might be parts or sections of the original site still present on the ground

Not a site - The site has been originally entered and accepted onto AHIMS as a valid site but after further investigations it was decided it is NOT an aboriginal site. Impact of this type of site does not require permit but Heritage NSW should be notified

Report generated by AHIMS Web Service on 04/11/2024 for Nathaniel Cracknell for the following area at Lat, Long From : -35.1006, 149.6062 - Lat, Long To : -35.0655, 149.668. Number of Aboriginal sites and Aboriginal objects found is 9