Kempsey - Armidale Road Restoration

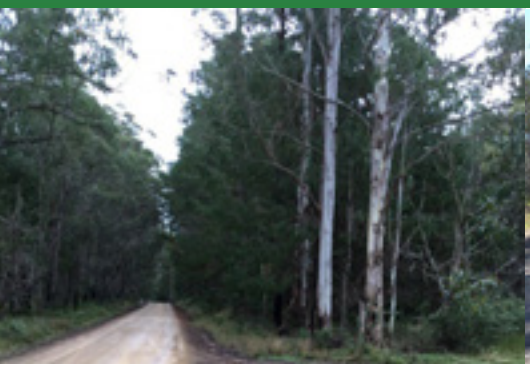
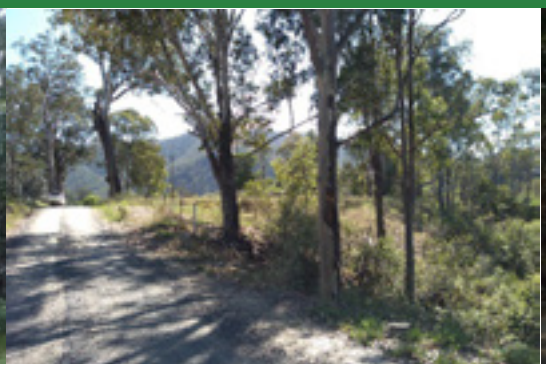
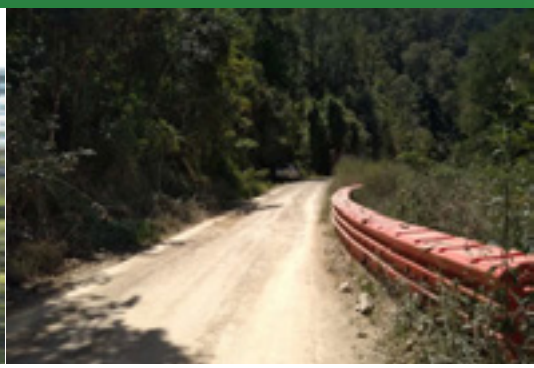
Appendix D

Biodiversity Assessment Report

Biodiversity Assessment Report

ARC Kempsey Road Restoration

Quality solutions. Sustainable future.

GeoLINK
environment | engineering | planning | design

GeoLINK Consulting Pty Ltd

PO Box 119
Lennox Head NSW 2478
T 02 6687 7666

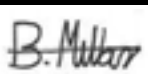
PO Box 1446
Coffs Harbour NSW 2450
T 02 6651 7666

PO Box 1267
Armidale NSW 2350
T 02 6772 0454

info@geolink.net.au

Prepared for: Armidale Regional Council

This document is in draft form. The contents, including any opinions, conclusions or recommendations contained in, or which may be implied from, this draft document must not be relied upon. GeoLINK reserves the right, at any time, without notice, to modify or retract any part or all of the draft document. To the maximum extent permitted by law, GeoLINK disclaims any responsibility or liability arising from or in connection with this draft document.

	Name	Signature	Date
Prepared by	Ben Millan		20/11/2023
Reviewed by	Troy Jennings		20/11/2023

UPR	Description	Issued By	Date Issued
4055 -1057	Version 1	Ben Millan	22/11/2023

Table of Contents

Illustrations

Tables

Plates

Appendices

Executive Summary

GeoLINK has been engaged to prepare a Biodiversity Assessment to assess the biodiversity impacts of road rehabilitation works along sections of Armidale-Kempsey Road and Lower Creek Road at Lower Creek. This report will accompany a Review of Environmental Factors (REF) for the Activity.

The site assessment found:

- No state or federally-listed threatened flora species or threatened ecological communities (TECs) listed under the NSW Biodiversity Conservation Act 2016 (BC Act) and/or the Australian Government Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) were recorded.
- One state-listed threatened fauna species (Southern Myotis) was recorded.
- Based on habitats present several threatened fauna species are considered potential occurrences on site.
- The Activity would remove the following native vegetation:
    - *PCT 3205 - Northern Escarpment New England Blackbutt-Tallowwood Wet Forest* - removal of up to 4.03 ha across CH 113300-118800 (Armidale-Kempsey Road).
    - *PCT 4073 - Lower North Hinterland River Oak Forest* - removal of up to 2.59 ha across CH 75200-99400 (Armidale-Kempsey Road) and CH 3600 (Lower Creek Road).
    - *PCT 3251 Northern Gorges Diverse Grassy Forest* - removal of up to 15.24 ha across CH 83800-113500 (Armidale-Kempsey Road) and CH400-4600 (Lower Creek Road).
    - *PCT 3240 - Lower North Escarpment Red Gum Grassy Forest* - removal of up to 27.11 ha across CH 73300-98600 (Armidale-Kempsey Road) and CH 2800 (Lower Creek Road).

Statutory assessments were completed for the Activity with regard to:

- *State Environmental Planning Policy (Biodiversity & Conservation) 2021*
- *BC Act*
- *Fisheries Management Act 1994*
- *EPBC Act*

Statutory assessments determined that:

- Chapter 3 of State Environmental Planning Policy (Biodiversity & Conservation) 2021 does not apply to the Activity and Armidale Regional Council (ARC) does not need to address this policy any further.
- The Activity is unlikely to result in a significant impact on threatened species or ecological communities listed under the BC Act or FM Act and therefore a Species Impact Statement or Biodiversity Development Assessment Report under the BC Act is not required.
- The Activity is unlikely to result in a significant impact on any Matters of National Environmental Significance (MNES) and therefore would not require referral to the Australian Government Department of Agriculture, Water and the Environment.

To minimise the environmental impacts of the Activity, a range of mitigation measures have been provided.

1. Introduction

1.1 Background

GeoLINK has been engaged to prepare a Biodiversity Assessment to assess the biodiversity impacts of road rehabilitation works along sections of Armidale-Kempsey Road and Lower Creek Road at Lower Creek. This report will accompany a Review of Environmental Factors (REF) for the Activity.

The aim of the Biodiversity Assessment is to identify any ecological constraints for the project, which may include:

- Presence of, or habitat for, threatened species and communities listed in the Biodiversity Conservation Act 2016 (BC Act), Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) and Fisheries Management Act 1994 (FM Act).
- Koala habitat as per State Environmental Planning Policy (Biodiversity & Conservation) 2021.
- Significant habitat trees or fauna habitat features.

1.2 Legislative Context

This Biodiversity Assessment has been prepared to meet the requirements of Part 5 of the *Environment Planning and Assessment Act 1979* (EP&A Act).

The works are permissible under *State Environmental Planning Policy (Transport and Infrastructure) 2021* (SEPP (Transport and Infrastructure)). Section 2.109 (development permitted without consent - general) of SEPP (Transport and Infrastructure) permits development on any land for the purpose of road or road infrastructure facilities activities to be carried out by or on behalf of a public authority without consent:

Road infrastructure facilities are defined in Section 2.108 of SEPP (Transport and Infrastructure) as:

(a) tunnels, ventilation shafts, emergency accessways, vehicle or pedestrian bridges, causeways, road-ferries, retaining walls, toll plazas, toll booths, security systems, bus lanes, transit lanes, transitways, transitway stations, rest areas and road related areas (within the meaning of the Road Transport Act 2013), and

(b) associated public transport facilities for roads used to convey passengers by means of regular bus services, and

(c) bus layovers that are integrated or associated with roads (whether or not the roads are used to convey passengers by means of regular bus services), and

(d) bus depots, and

(e) bus stops and bus shelters, and

(f) traffic control facilities (within the meaning of Part 6 of the Transport Administration Act 1988), TfNSW road safety training facilities and safety works, and

(g) premises used for the purposes of testing and inspecting heavy vehicles (within the meaning of the Road Transport Act 2013) under the TfNSW Heavy Vehicle Authorised Inspection Scheme.

As the proposed Activity involves works associated with roads and road-related areas to be undertaken by a public authority, the works are permitted without consent under Section 2.109 (development permitted without consent - general) of SEPP (Transport and Infrastructure).

Section 7.2 of the BC Act and Part 7A of FM Act require that the significance of the impact on threatened species and ecological communities is assessed using a Test of Significance (ToS). Where a significant impact is likely to occur, a species impact statement must be prepared in accordance with the Director-General's requirements, or a Biodiversity Development Assessment Report (BDAR) must be prepared by an accredited assessor in accordance with the Biodiversity Assessment Method (BAM).

1.3 The Site

The Activity would be carried out along approximately 45 km of Armidale-Kempsey Road, extending from chainage (CH) 73000 to 118000, and 5 km of Lower Creek Road from the intersection with Armidale-Kempsey Road, Lower Creek within the Armidale Local Government Area (LGA). The location of the Activity is shown in **Illustration 1.1** and an overview of the proposal is provided in **Illustration 1.2**.

The site is located across the Coffs Coast Escarpment Macleay Gorges and Macleay Hastings subregions of the NSW North Coast bioregion as per the Interim Biogeographic Regionalisation for Australia, Version 7 (DCCEEW 2023).

1.4 Previous Assessments

The following sites within the project boundary have been subject to previous assessment:

- 3667-1033 ARC Kempsey Road Stockpile Sites REF (December 2020).
- 3433-1015 ARC Kempsey Road Project 7 REF (November 2019).
- 3433-1016 ARC Kempsey Road Project 8 REF (November 2019).
- 3433-1030 ARC Kempsey Road Project 8 REF (Addendum) (September 2021).
- 4078-1011 ARC Kempsey Road Curves and Corn Patch Culvert REF (November 2021)

1.5 The Activity

The Activity is for the rehabilitation of the Armidale-Kempsey Road and Lower Creek Road as part of natural disaster recovery works within Armidale LGA. Key features of the Activity would include:

Site Establishment

- Establishment of major ancillaries.
- Installation of sediment and erosion controls.
- Establishment of stockpile and laydown areas.

Permanent Construction Works

- Temporary enabling works (including installation of traffic control).
- Upslope safety works (including tree removal works).
- Replacement of 165 existing pipe culverts and installation of 64 new pipe culverts.
- Inlet and outlet treatments at culverts.
- Longitudinal open drainage reinstatement.
- Scour protection at six bridge locations.
- Downslope slip remediation.

- Soil nail wall at 163 locations.
- Gravity retaining walls 26 locations.
- H1 slope at eight locations.

- Pavement reinstatement.
- Unbound pavement construction and bitumen sealing.

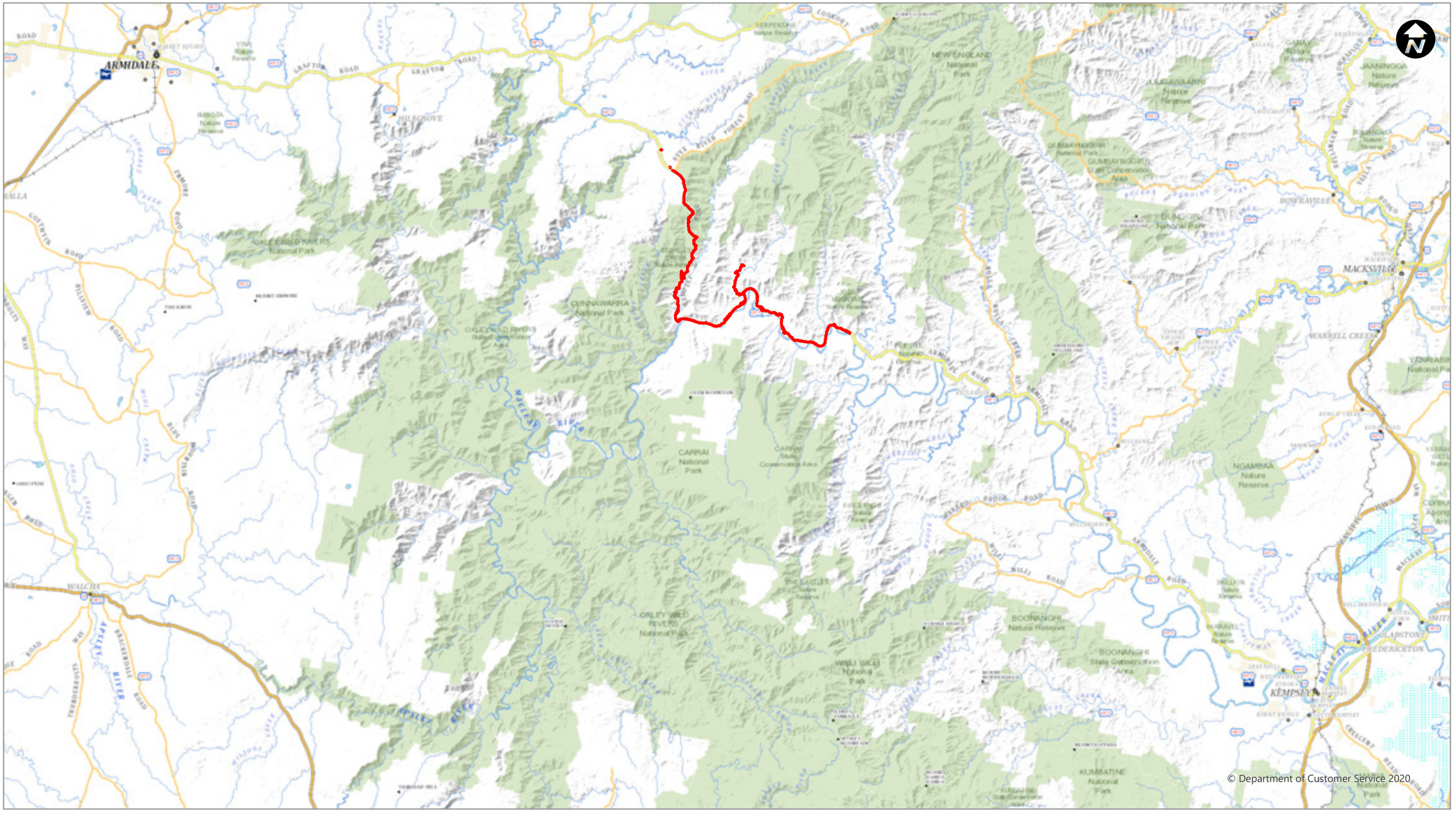
Temporary Construction Works

- Construction of temporary passing bays, U-turn bays.
- Utilisation of existing quarries.
- Removal and/or trimming trees where they pose a risk to workers safety.
- Upslope slip remediation (scaling, rock bolting, removal of boulders netting) where they pose a risk to worker's safety.

Site Disestablishment

- Removal of site compounds, camps, and ancillaries.
- Site remediation to remove waste, compounds and conduct rehabilitation of areas impacted.

The disturbance footprint for the Activity has been determined using the Activity boundary derived from the “PROJECT_BDY_K2A_REVA” SHP file provided to GeoLINK on 31 July 2023.



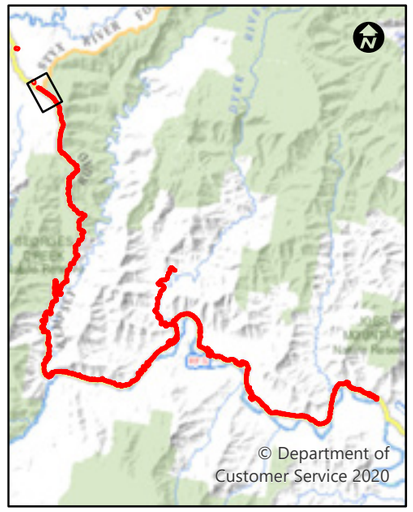
LEGEND

Activity boundary

0 7 Km

Site Locality - Illustration 2.1

Information shown is for illustrative purposes only
Drawn by: AB Checked by: RE Reviewed by: BJM
Source of base data: ESRI World Imagery
Date: 13/11/2023
Revision: D



Map Sheet Location

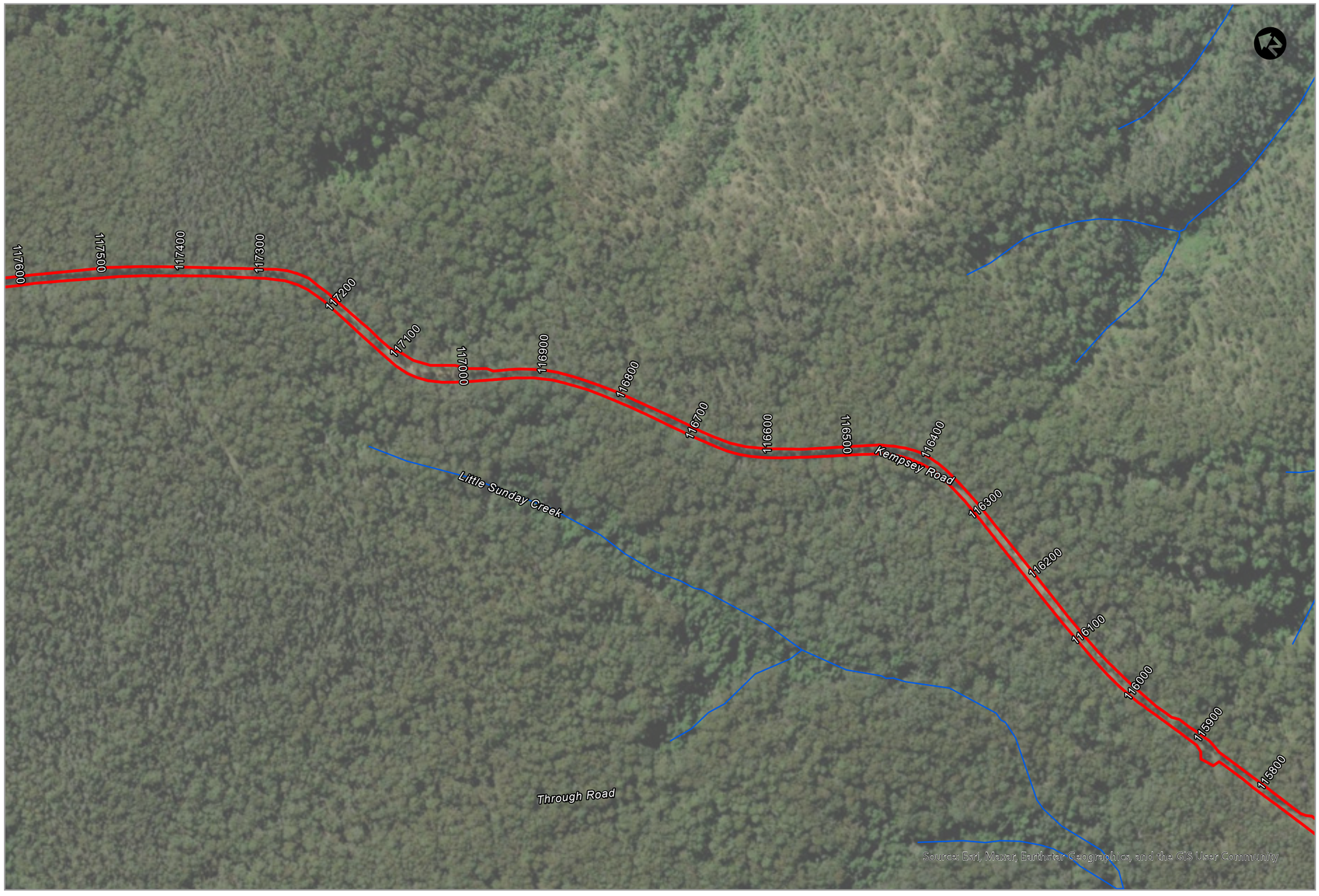
LEGEND

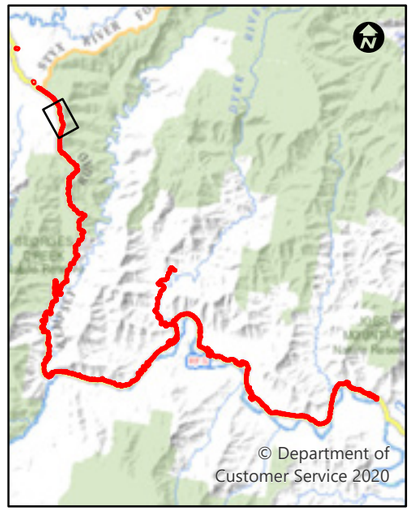
- Activity boundary
- Cadastre

0 100 Meters

The Site
Illustration 2.2 - Sheet 1 of 27

Information shown is for illustrative purposes only
Drawn by: AB Checked by: RE Reviewed by: BJM
Source of base data: ESRI World Imagery
Date: 13/11/2023
Revision: D





Map Sheet Location

LEGEND

- Activity boundary
- Cadastre
- Watercourse

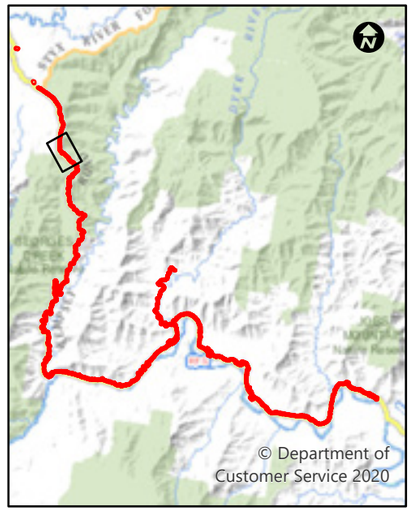
0 100 Meters

GeoLINK environment | engineering | planning | design

Biodiversity Assessment Report – ARC Kempsey Road Restoration
4055-1072

The Site
Illustration 2.2 - Sheet 2 of 27

Information shown is for illustrative purposes only
Drawn by: AB Checked by: RE Reviewed by: BJM
Source of base data: ESRI World Imagery
Date: 13/11/2023
Revision: D



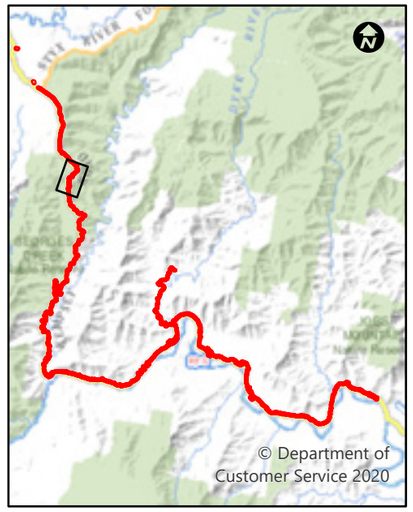
Map Sheet Location

LEGEND

- Activity boundary
- Cadastre
- Watercourse

0 100 Meters

Information shown is for illustrative purposes only
Drawn by: AB Checked by: RE Reviewed by: BJM
Source of base data: ESRI World Imagery
Date: 13/11/2023
Revision: D



Map Sheet Location

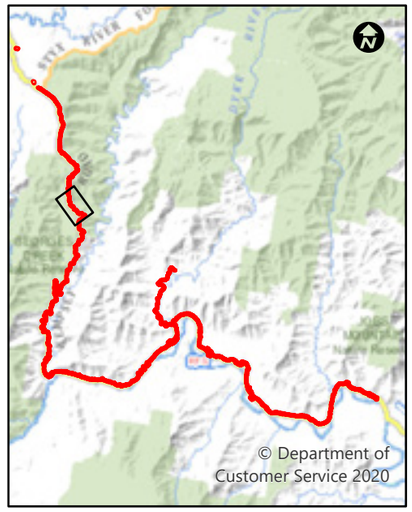
LEGEND

- Activity boundary
- Cadastre
- Watercourse

0 100 Meters

The Site
Illustration 2.2 - Sheet 4 of 27

Information shown is for illustrative purposes only
Drawn by: AB Checked by: RE Reviewed by: BJM
Source of base data: ESRI World Imagery
Date: 13/11/2023
Revision: D



Map Sheet Location

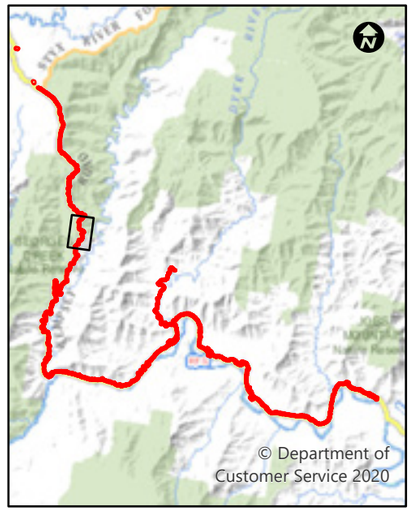
LEGEND

- Activity boundary
- Cadastre
- Watercourse

0 100 Meters

The Site
Illustration 2.2 - Sheet 5 of 27

Information shown is for illustrative purposes only
Drawn by: AB Checked by: RE Reviewed by: BJM
Source of base data: ESRI World Imagery
Date: 13/11/2023
Revision: D



Map Sheet Location

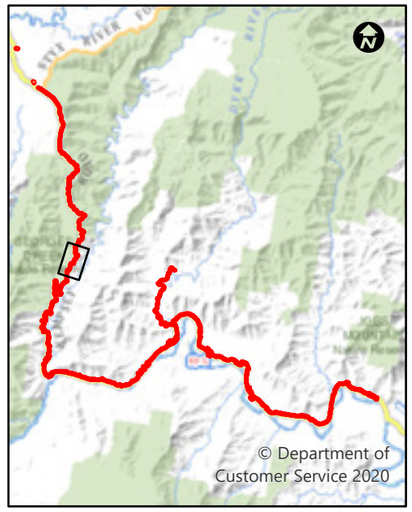
LEGEND

- Activity boundary
- Cadastre
- Watercourse

0 100 Meters

The Site
Illustration 2.2 - Sheet 6 of 27

Information shown is for illustrative purposes only
Drawn by: AB Checked by: RE Reviewed by: BJM
Source of base data: ESRI World Imagery
Date: 13/11/2023
Revision: D



Map Sheet Location

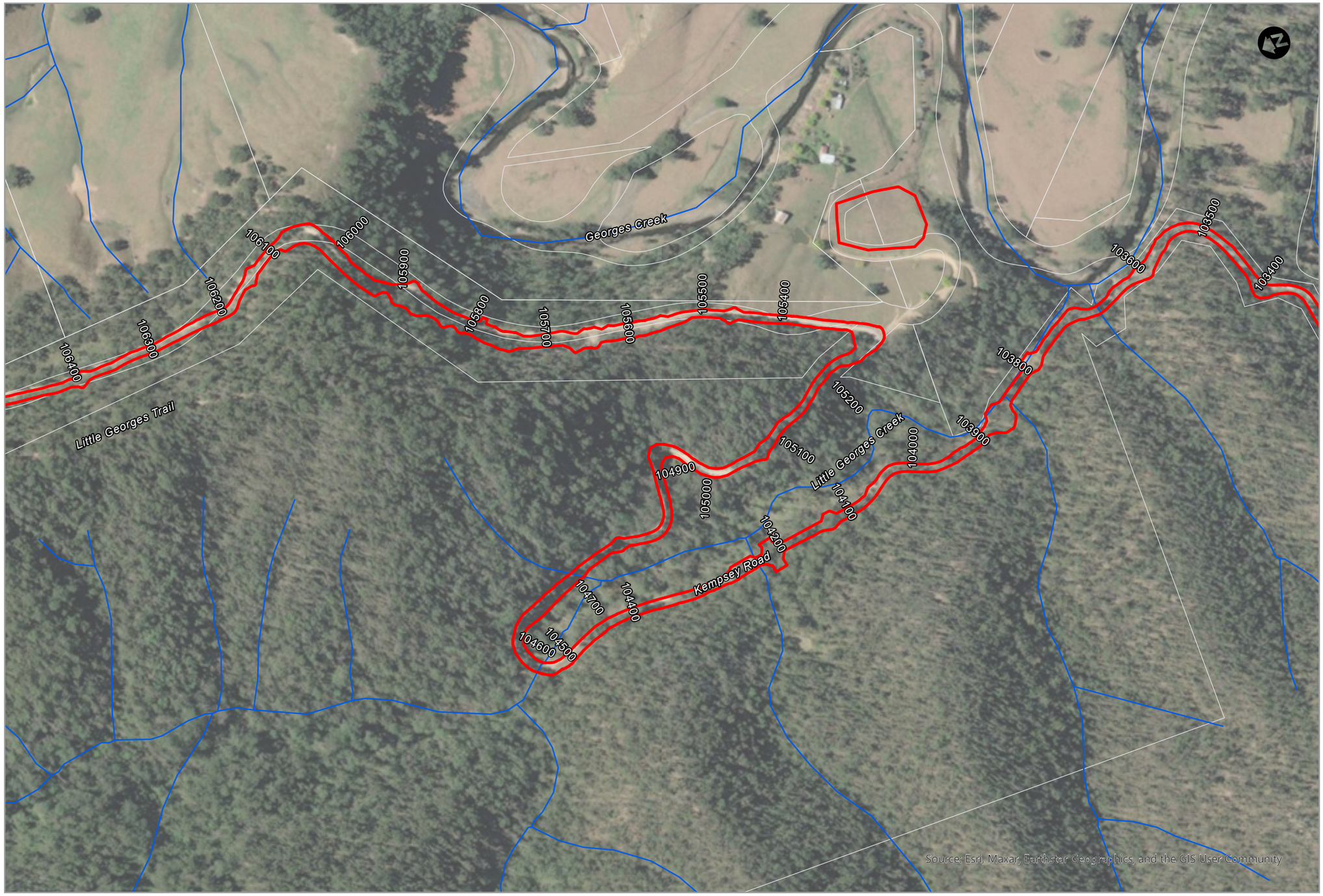
LEGEND

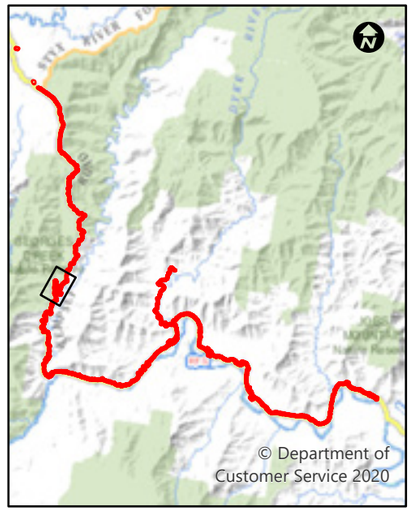
- Activity boundary
- Cadastre
- Watercourse

0 100 Meters

The Site
Illustration 2.2 - Sheet 7 of 27

Information shown is for illustrative purposes only
Drawn by: AB Checked by: RE Reviewed by: BJM
Source of base data: ESRI World Imagery
Date: 13/11/2023
Revision: D





Map Sheet Location

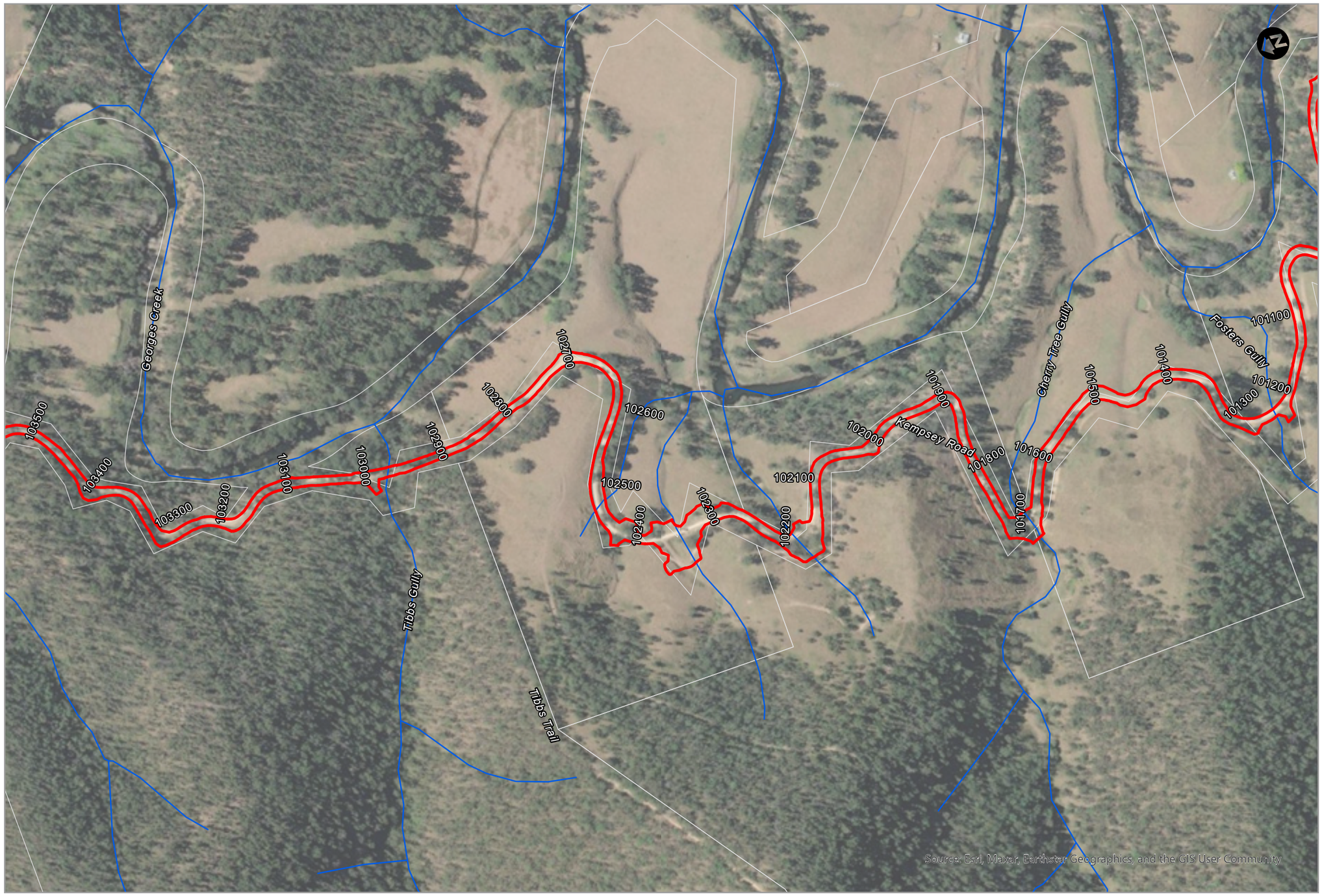
LEGEND

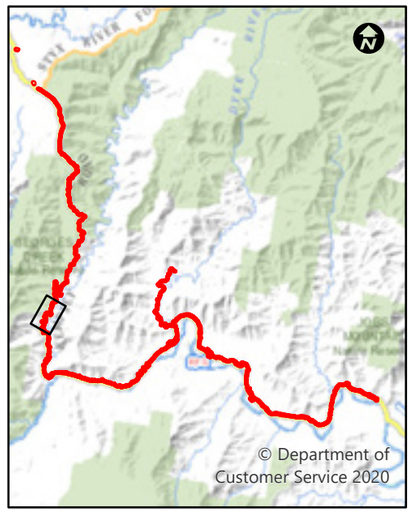
- Activity boundary
- Cadastre
- Watercourse

0 100 Meters

The Site
Illustration 2.2 - Sheet 8 of 27

Information shown is for illustrative purposes only
Drawn by: AB Checked by: RE Reviewed by: BJM
Source of base data: ESRI World Imagery
Date: 13/11/2023
Revision: D





Map Sheet Location

LEGEND

- Activity boundary
- Cadastre
- Watercourse

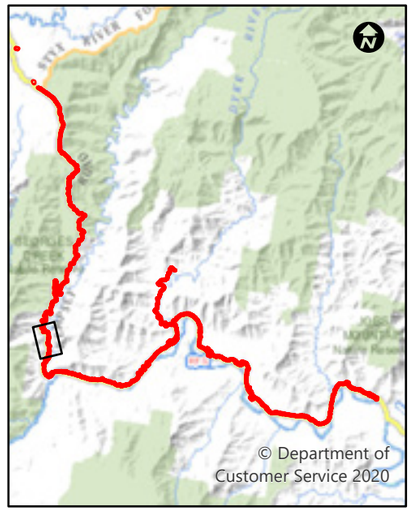
0 100 Meters

GeoLINK environment | engineering | planning | design

Biodiversity Assessment Report – ARC Kempsey Road Restoration
4055-1072

The Site
Illustration 2.2 - Sheet 9 of 27

Information shown is for illustrative purposes only
Drawn by: AB Checked by: RE Reviewed by: BJM
Source of base data: ESRI World Imagery
Date: 13/11/2023
Revision: D



Map Sheet Location

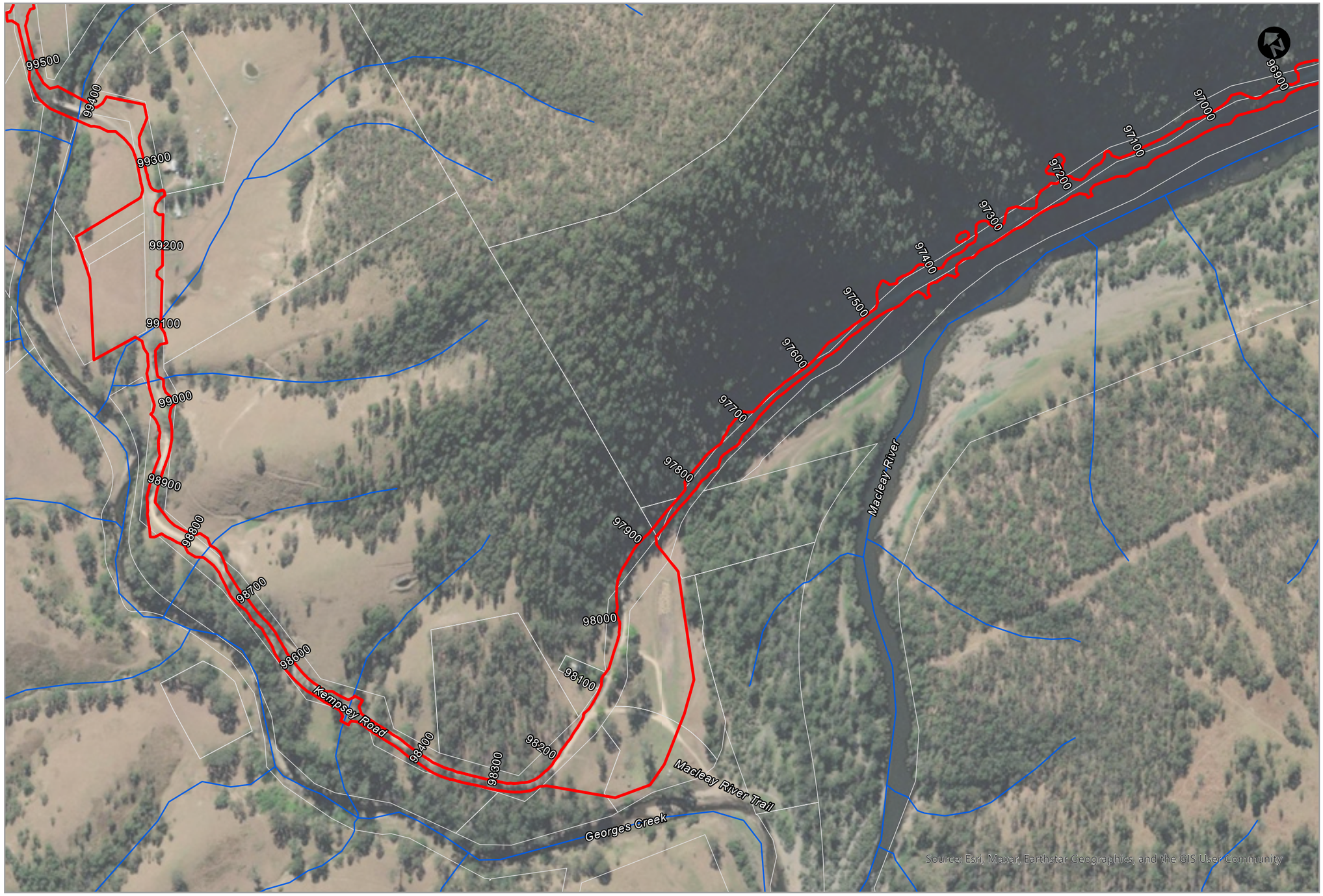
LEGEND

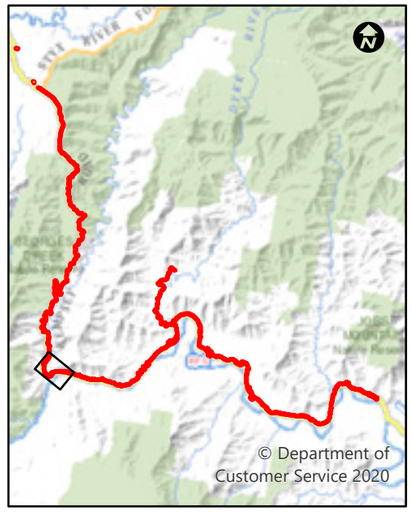
- Activity boundary
- Cadastre
- Watercourse

0 100 Meters

The Site
Illustration 2.2 - Sheet 10 of 27

Information shown is for illustrative purposes only
Drawn by: AB Checked by: RE Reviewed by: BJM
Source of base data: ESRI World Imagery
Date: 13/11/2023
Revision: D





Map Sheet Location

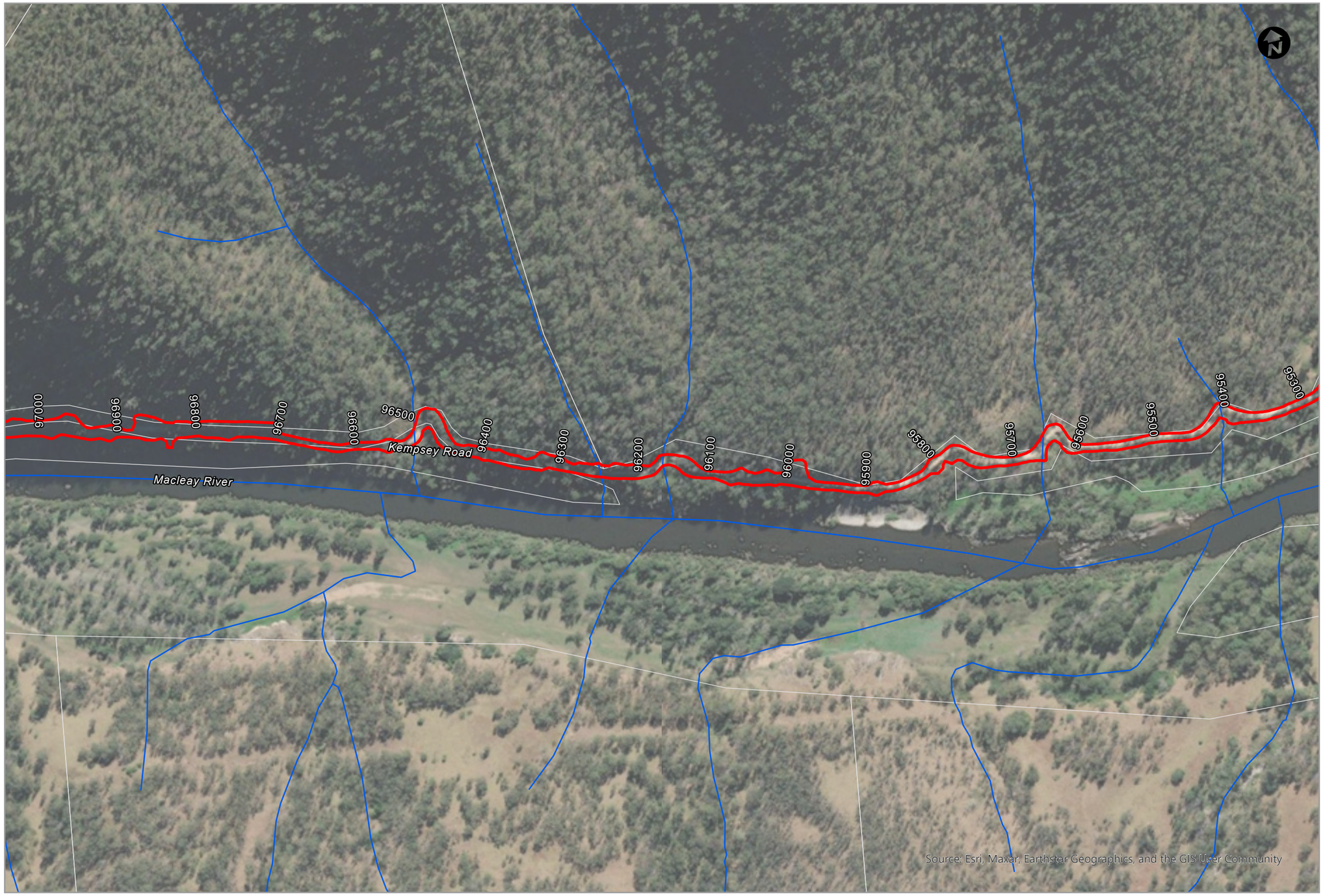
LEGEND

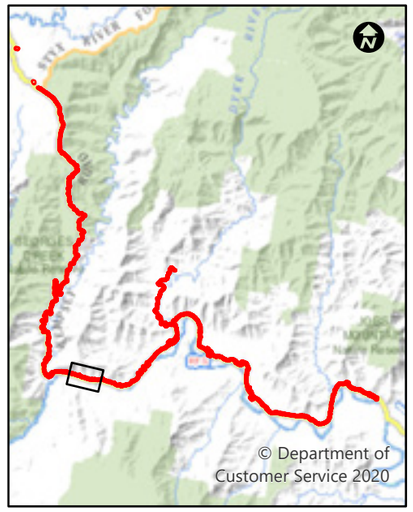
- Activity boundary
- Cadastre
- Watercourse

0 100 Meters

The Site
Illustration 2.2 - Sheet 11 of 27

Information shown is for illustrative purposes only
Drawn by: AB Checked by: RE Reviewed by: BJM
Source of base data: ESRI World Imagery
Date: 13/11/2023
Revision: D





Map Sheet Location

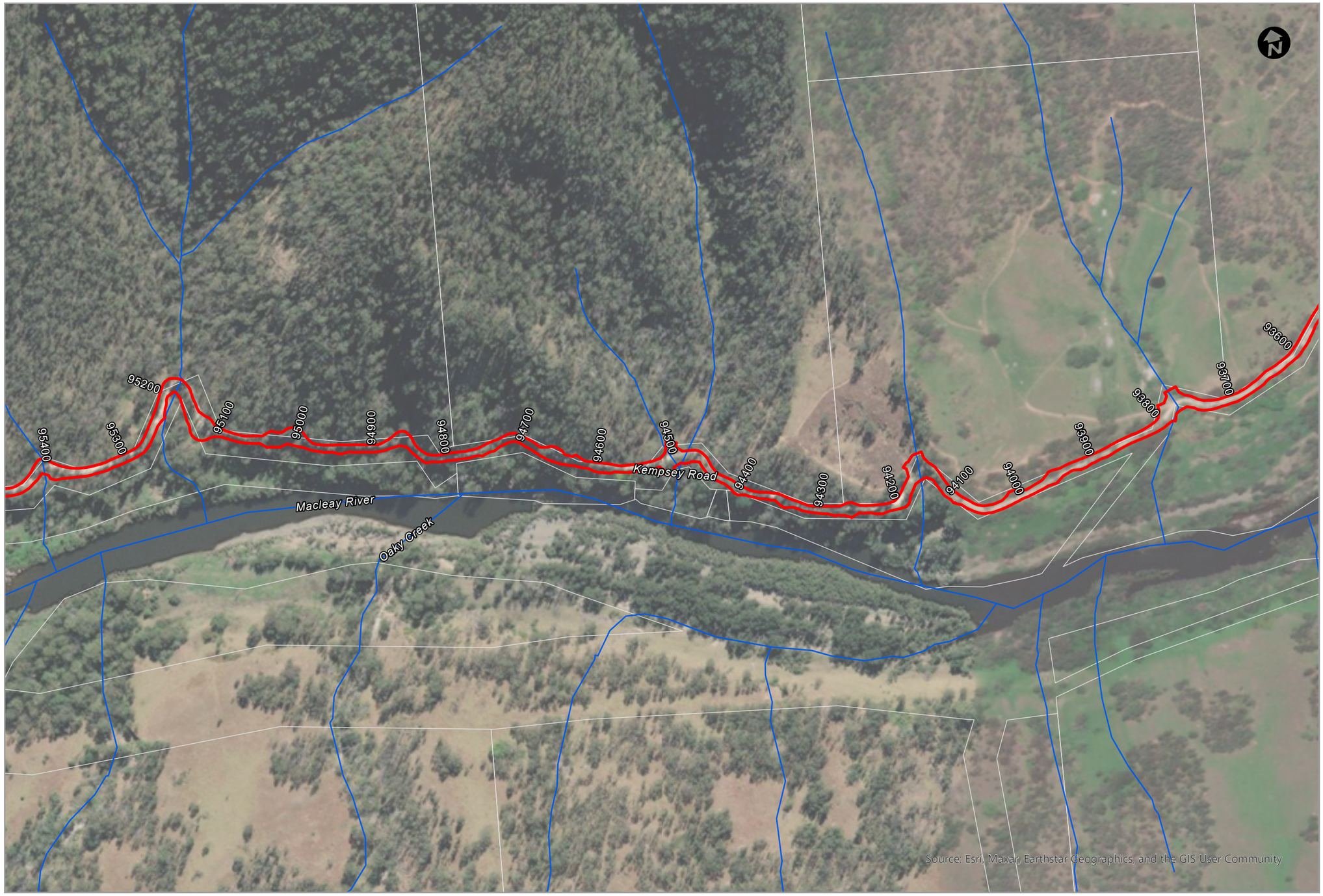
LEGEND

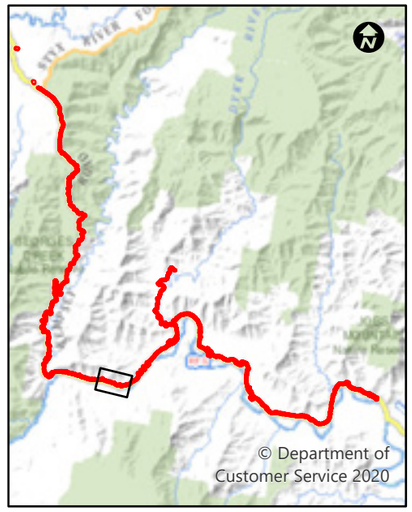
- Activity boundary
- Cadastre
- Watercourse

0 100 Meters

The Site
Illustration 2.2 - Sheet 12 of 27

Information shown is for illustrative purposes only
Drawn by: AB Checked by: RE Reviewed by: BJM
Source of base data: ESRI World Imagery
Date: 13/11/2023
Revision: D





Map Sheet Location

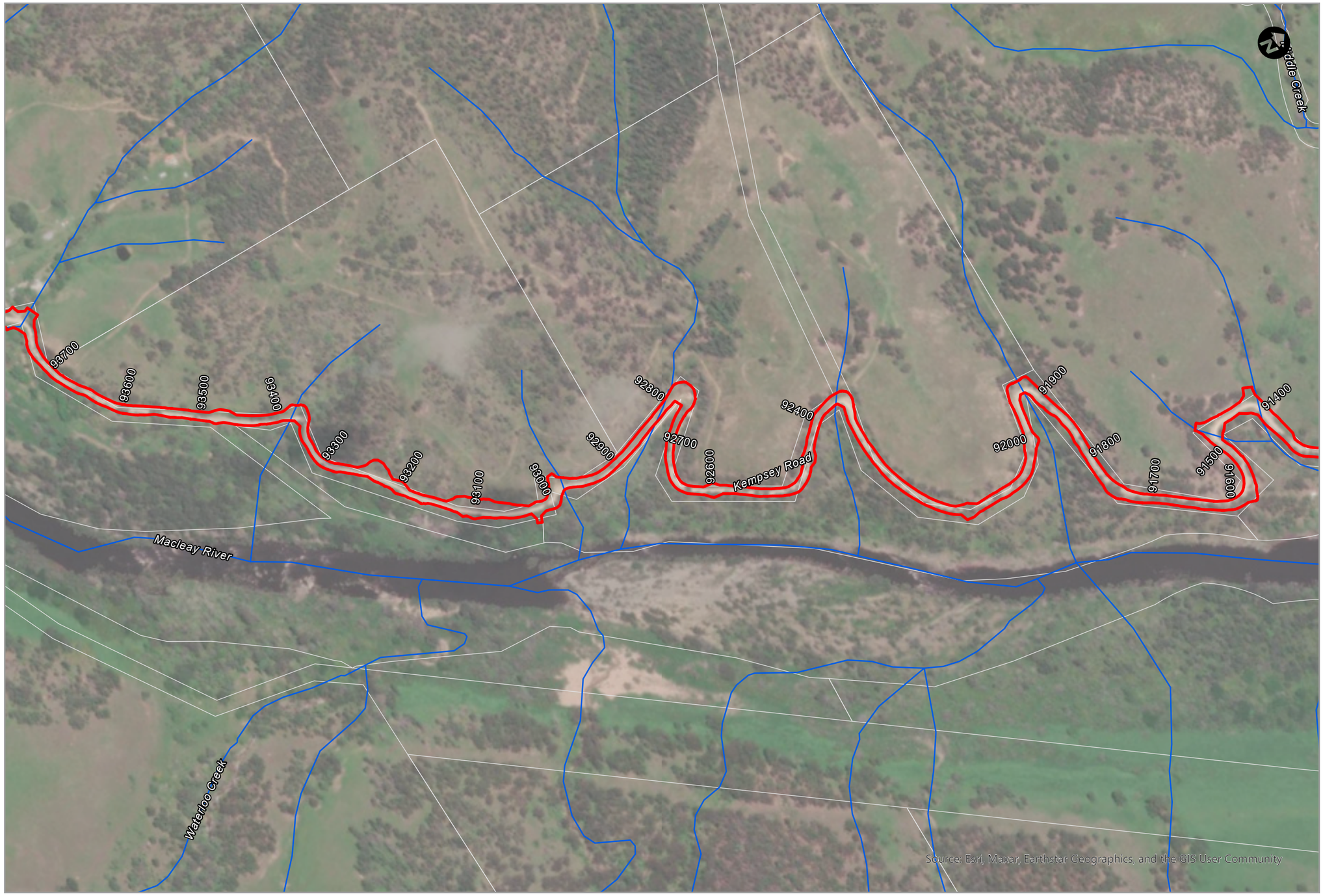
LEGEND

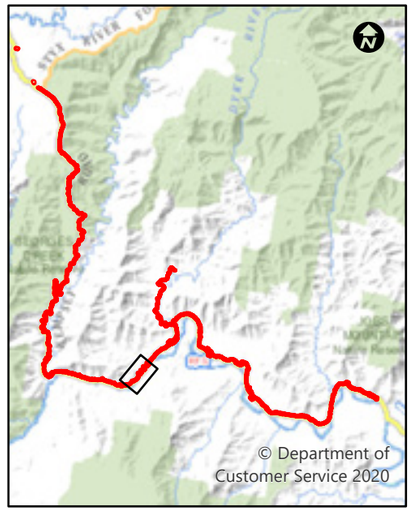
- Activity boundary
- Cadastre
- Watercourse

0 100 Meters

The Site
Illustration 2.2 - Sheet 13 of 27

Information shown is for illustrative purposes only
Drawn by: AB Checked by: RE Reviewed by: BJM
Source of base data: ESRI World Imagery
Date: 13/11/2023
Revision: D





Map Sheet Location

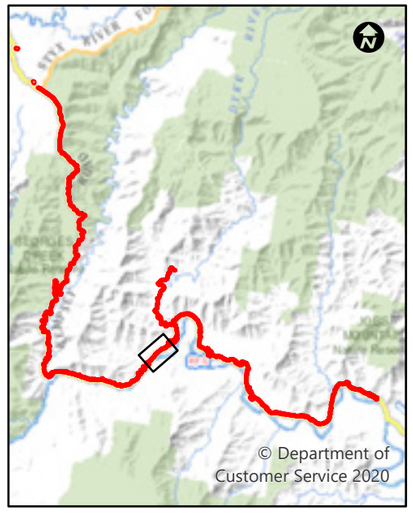
LEGEND

- Activity boundary
- Cadastre
- Watercourse

0 100 Meters

The Site
Illustration 2.2 - Sheet 14 of 27

Information shown is for illustrative purposes only
Drawn by: AB Checked by: RE Reviewed by: BJM
Source of base data: ESRI World Imagery
Date: 13/11/2023
Revision: D



Map Sheet Location

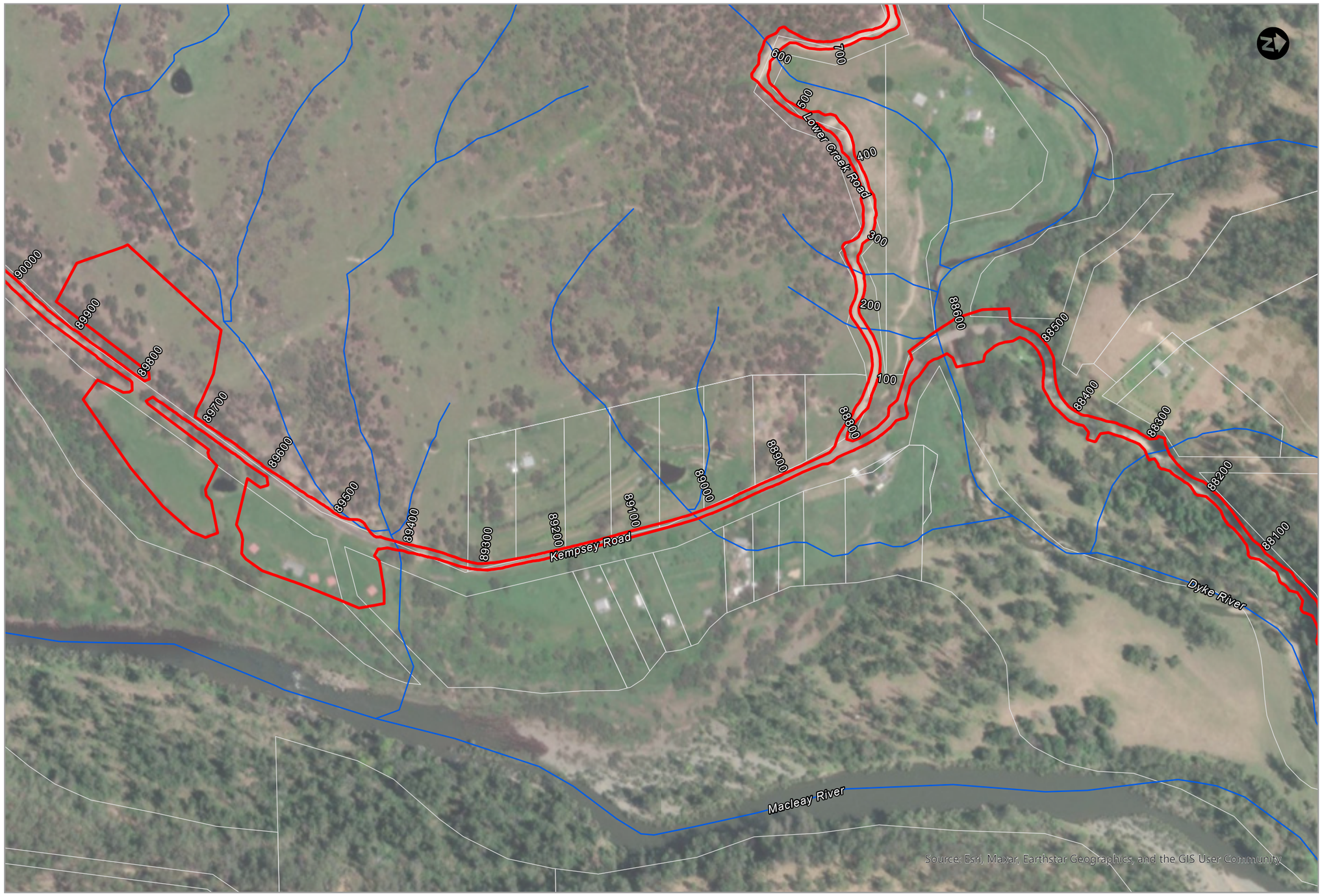
LEGEND

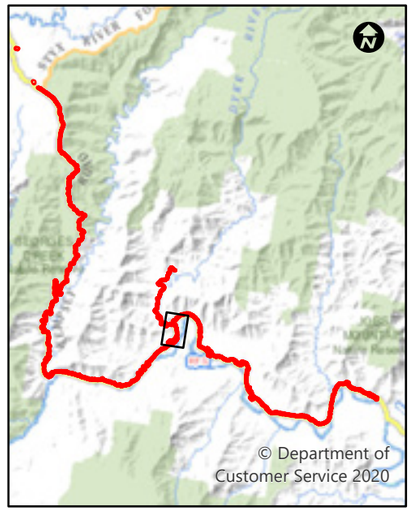
- Activity boundary
- Cadastre
- Watercourse

0 100 Meters

The Site
Illustration 2.2 - Sheet 15 of 27

Information shown is for illustrative purposes only
Drawn by: AB Checked by: RE Reviewed by: BJM
Source of base data: ESRI World Imagery
Date: 13/11/2023
Revision: D





Map Sheet Location

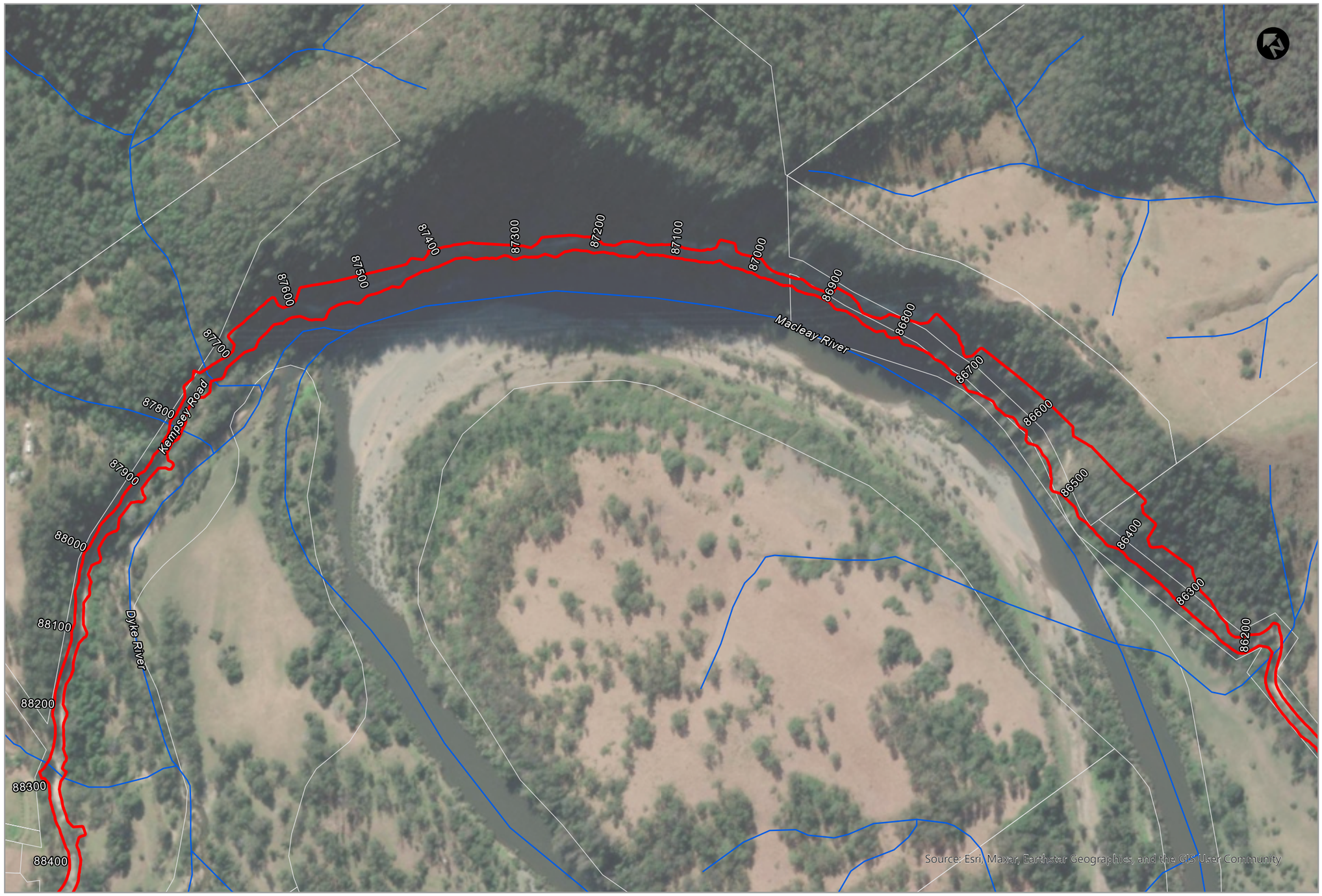
LEGEND

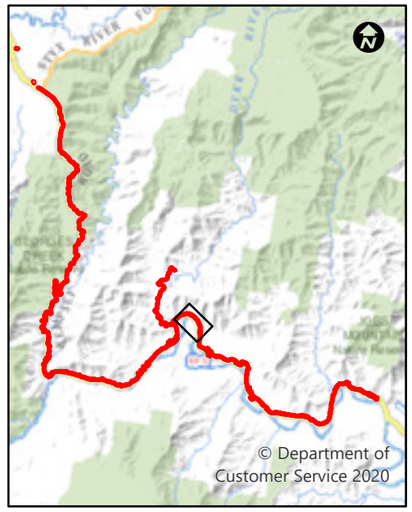
- Activity boundary
- Cadastre
- Watercourse

0 100 Meters

The Site
Illustration 2.2 - Sheet 16 of 27

Information shown is for illustrative purposes only
Drawn by: AB Checked by: RE Reviewed by: BJM
Source of base data: ESRI World Imagery
Date: 13/11/2023
Revision: D





Map Sheet Location

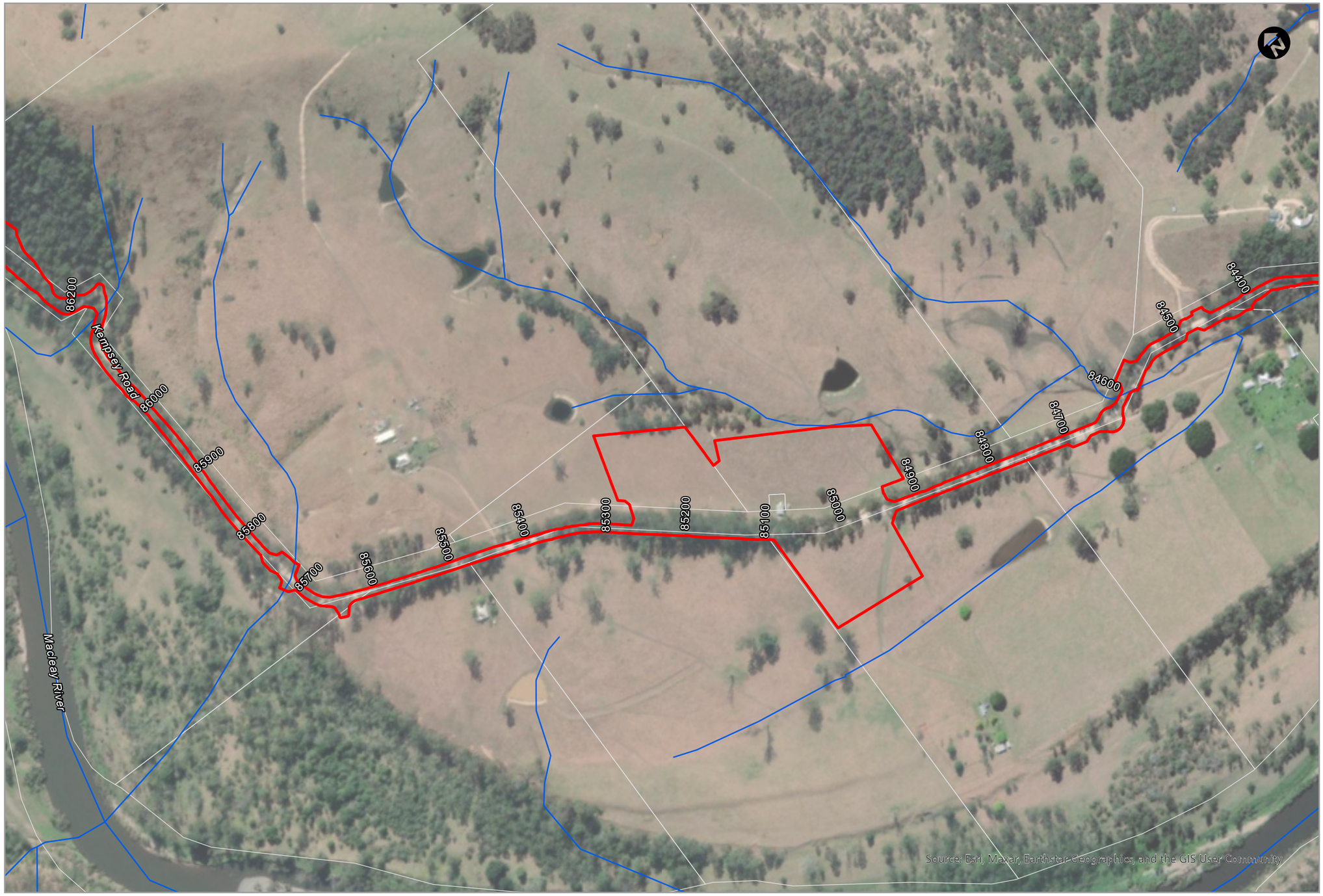
LEGEND

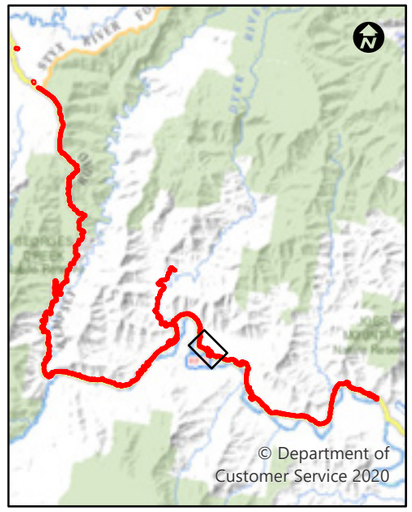
- Activity boundary
- Cadastre
- Watercourse

0 100 Meters

The Site
Illustration 2.2 - Sheet 17 of 27

Information shown is for illustrative purposes only
Drawn by: AB Checked by: RE Reviewed by: BJM
Source of base data: ESRI World Imagery
Date: 13/11/2023
Revision: D





Map Sheet Location

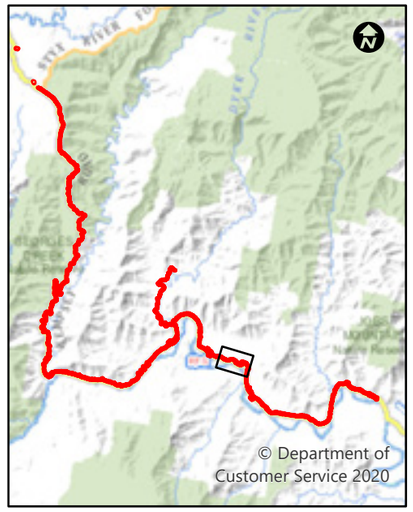
LEGEND

- Activity boundary
- Cadastre
- Watercourse

0 100 Meters

The Site
Illustration 2.2 - Sheet 18 of 27

Information shown is for illustrative purposes only
Drawn by: AB Checked by: RE Reviewed by: BJM
Source of base data: ESRI World Imagery
Date: 13/11/2023
Revision: D



Map Sheet Location

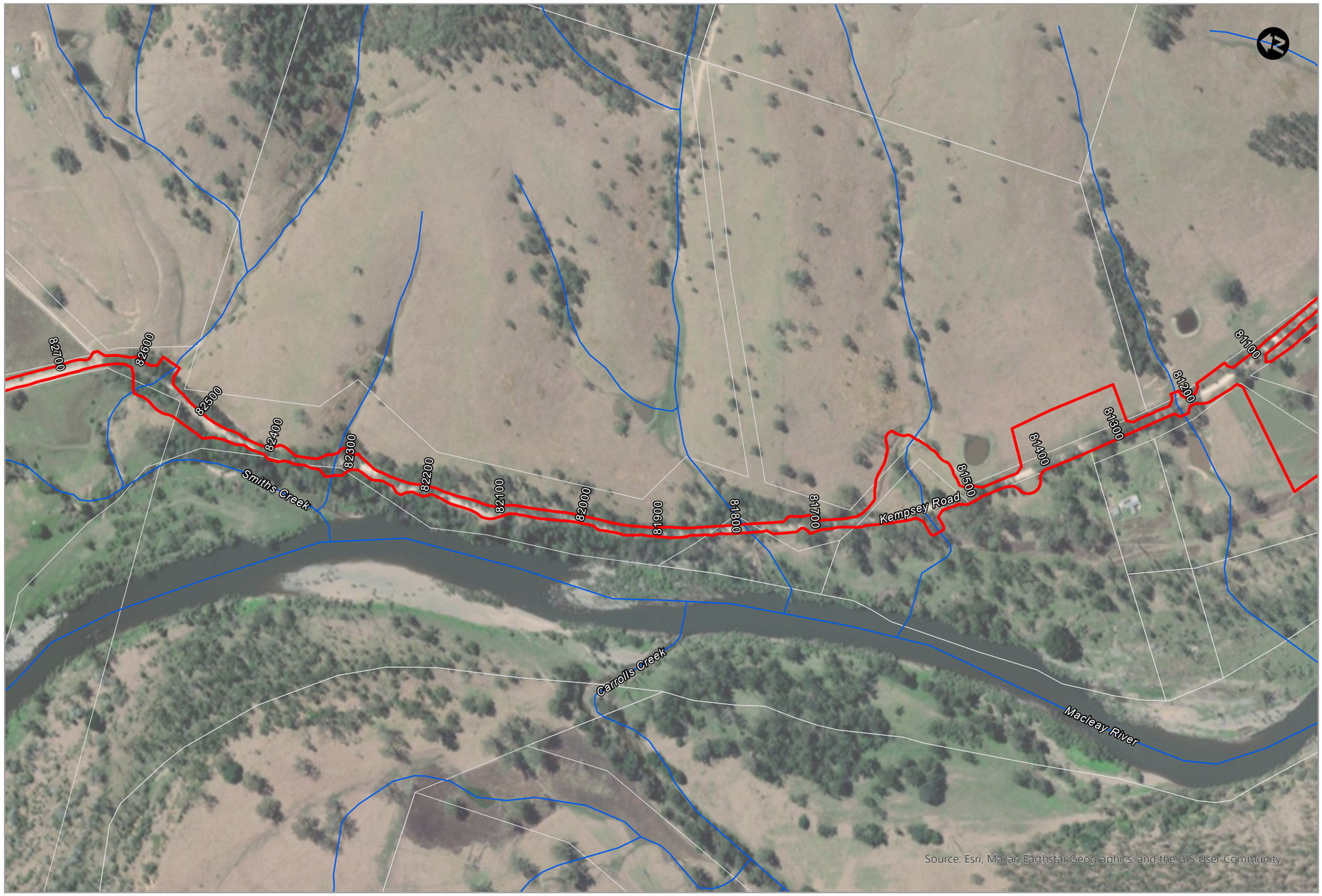
LEGEND

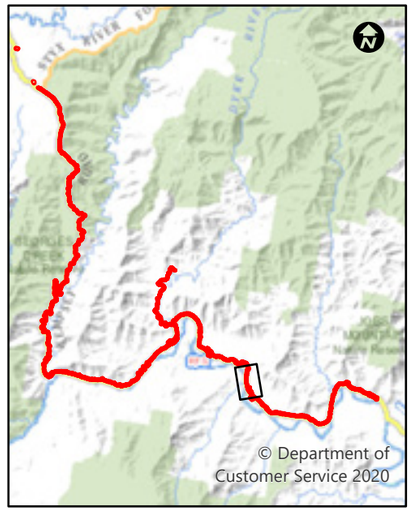
- Activity boundary
- Cadastre
- Watercourse

0 100 Meters

The Site
Illustration 2.2 - Sheet 19 of 27

Information shown is for illustrative purposes only
Drawn by: AB Checked by: RE Reviewed by: BJM
Source of base data: ESRI World Imagery
Date: 13/11/2023
Revision: D





Map Sheet Location

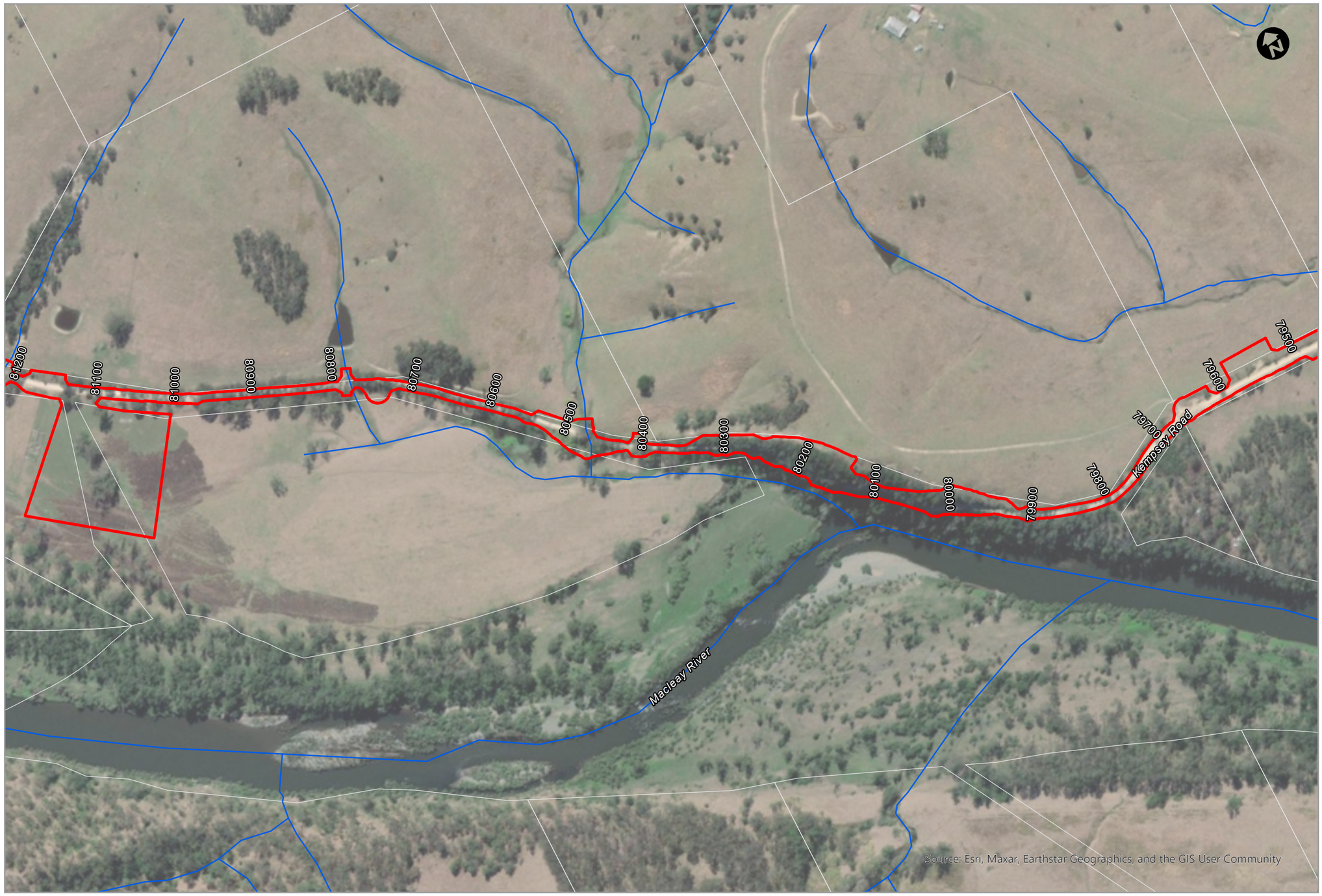
LEGEND

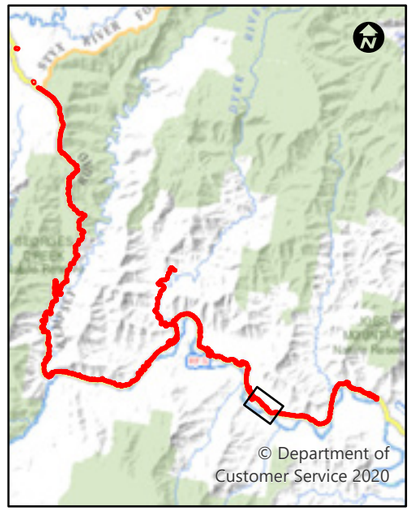
- Activity boundary
- Cadastre
- Watercourse

0 100 Meters

The Site
Illustration 2.2 - Sheet 20 of 27

Information shown is for illustrative purposes only
Drawn by: AB Checked by: RE Reviewed by: BJM
Source of base data: ESRI World Imagery
Date: 13/11/2023
Revision: D





Map Sheet Location

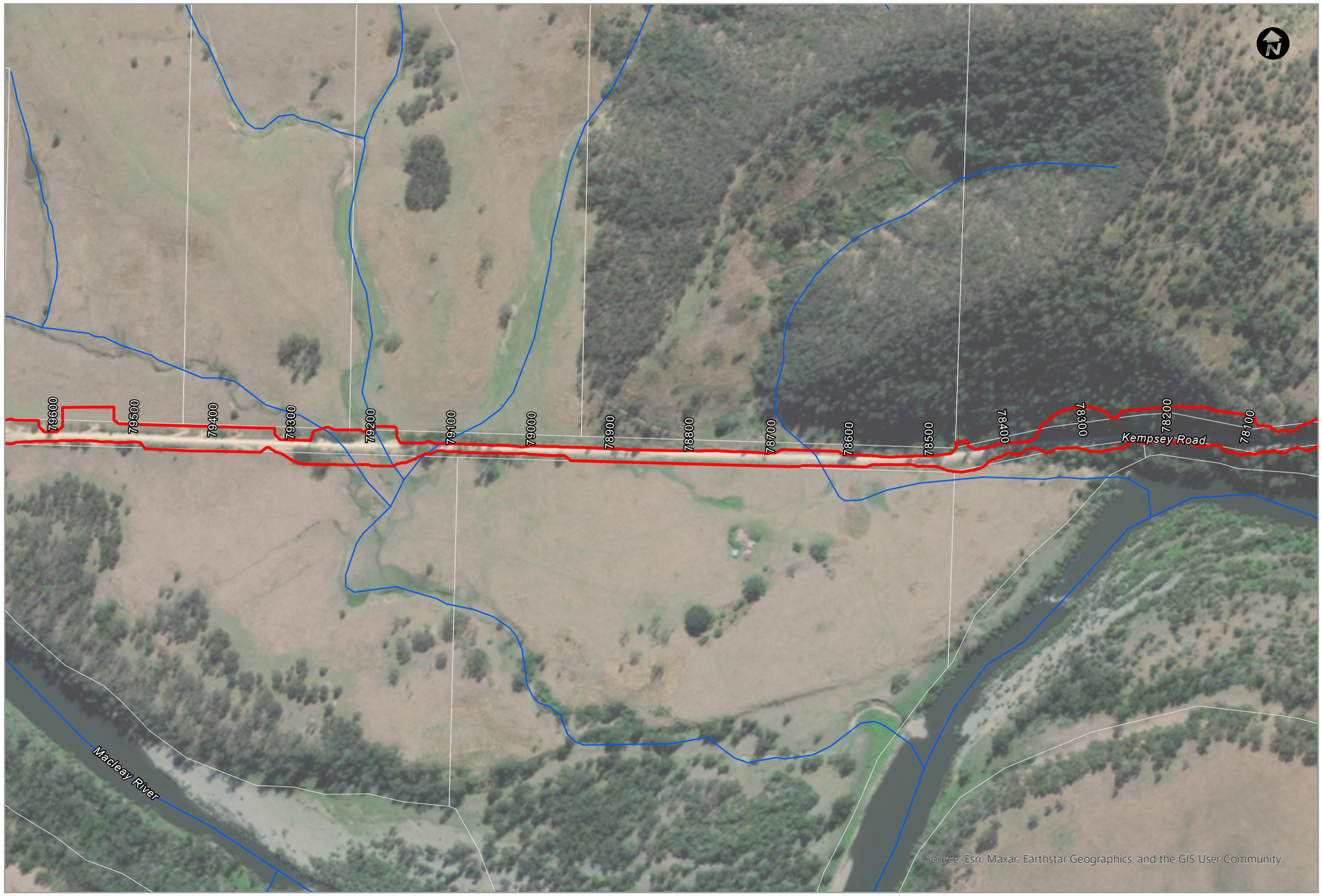
LEGEND

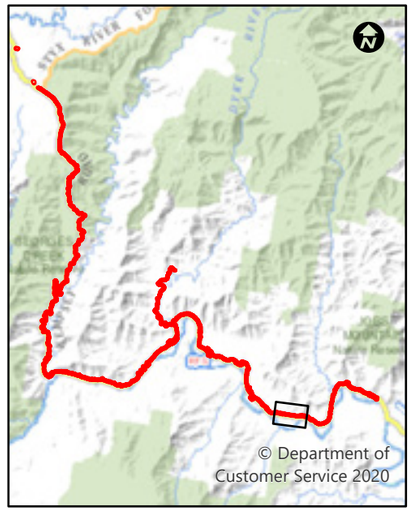
- Activity boundary
- Cadastre
- Watercourse

0 100 Meters

The Site
Illustration 2.2 - Sheet 21 of 27

Information shown is for illustrative purposes only
Drawn by: AB Checked by: RE Reviewed by: BJM
Source of base data: ESRI World Imagery
Date: 13/11/2023
Revision: D





Map Sheet Location

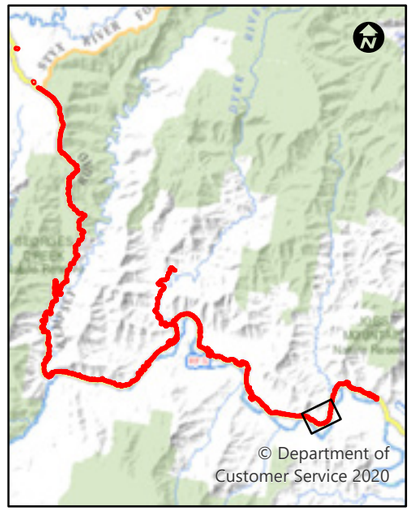
LEGEND

- Activity boundary
- Cadastre
- Watercourse

0 100 Meters

The Site
Illustration 2.2 - Sheet 22 of 27

Information shown is for illustrative purposes only
Drawn by: AB Checked by: RE Reviewed by: BJM
Source of base data: ESRI World Imagery
Date: 13/11/2023
Revision: D



Map Sheet Location

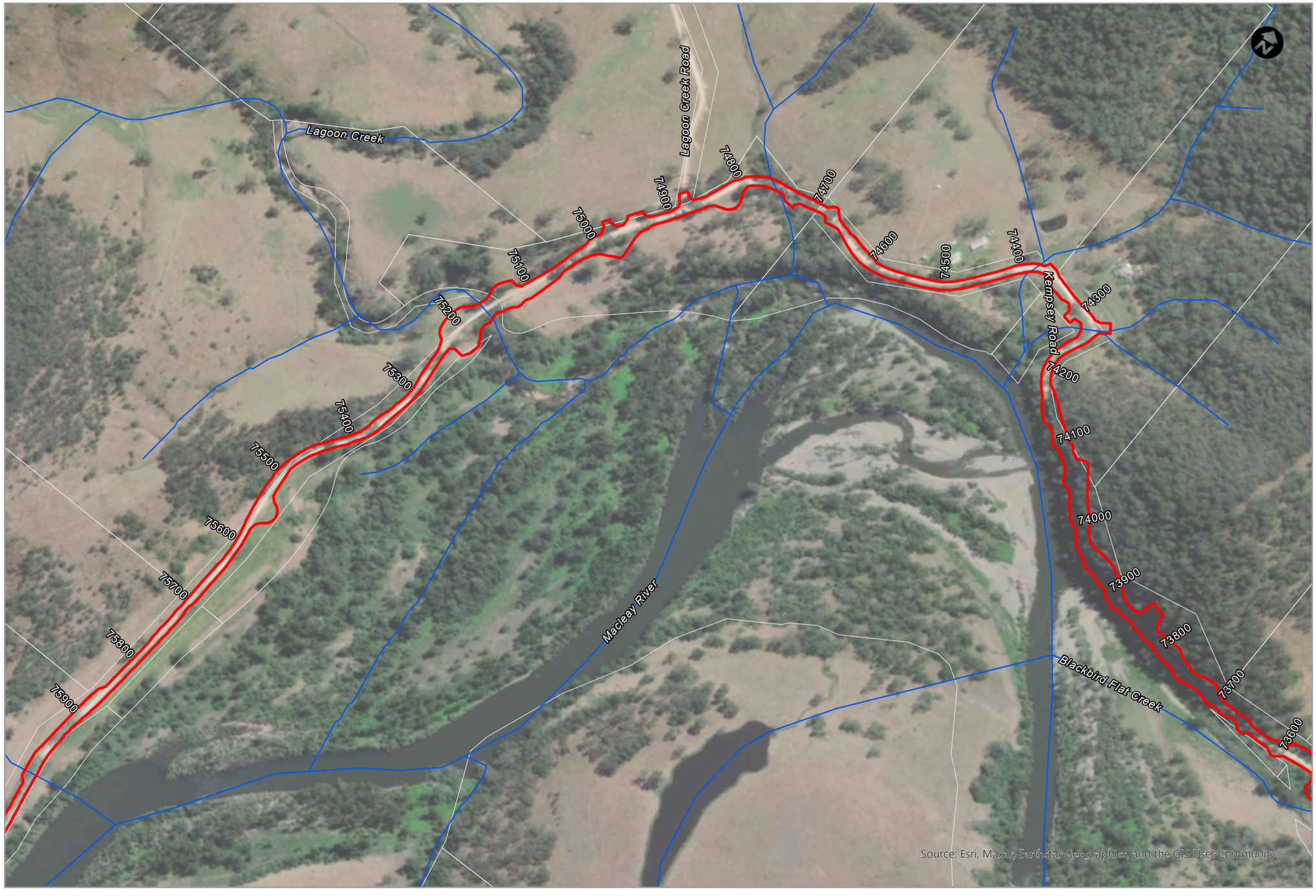
LEGEND

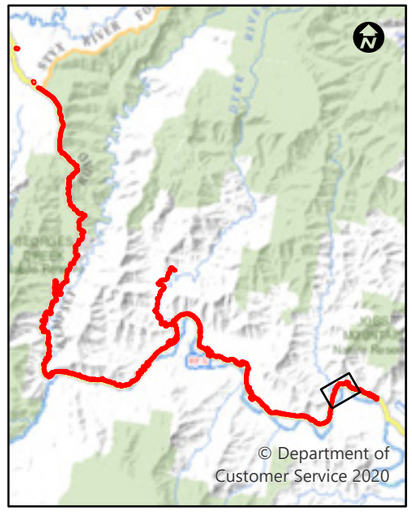
- Activity boundary
- Cadastre
- Watercourse

0 100 Meters

The Site
Illustration 2.2 - Sheet 23 of 27

Information shown is for illustrative purposes only
Drawn by: AB Checked by: RE Reviewed by: BJM
Source of base data: ESRI World Imagery
Date: 13/11/2023
Revision: D





Map Sheet Location

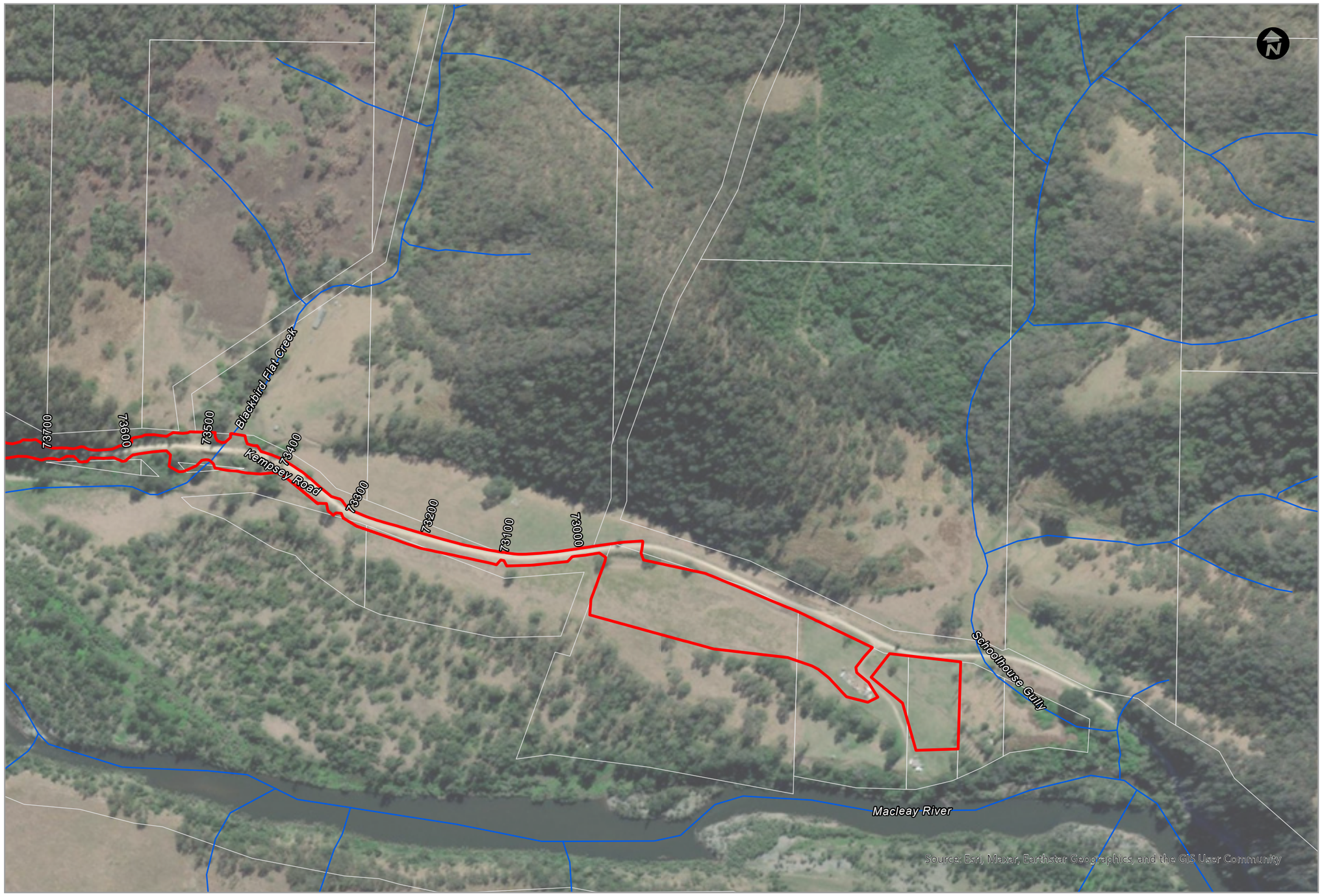
LEGEND

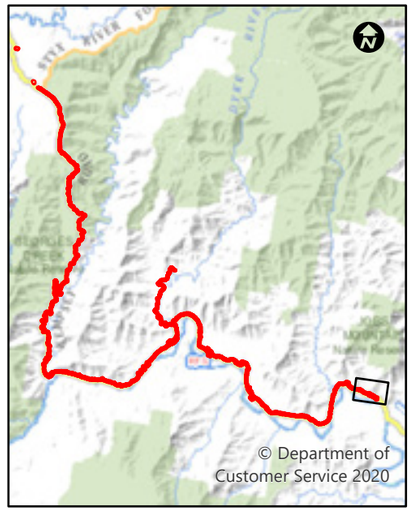
- Activity boundary
- Cadastre
- Watercourse

0 100 Meters

The Site
Illustration 2.2 - Sheet 24 of 27

Information shown is for illustrative purposes only
Drawn by: AB Checked by: RE Reviewed by: BJM
Source of base data: ESRI World Imagery
Date: 13/11/2023
Revision: D





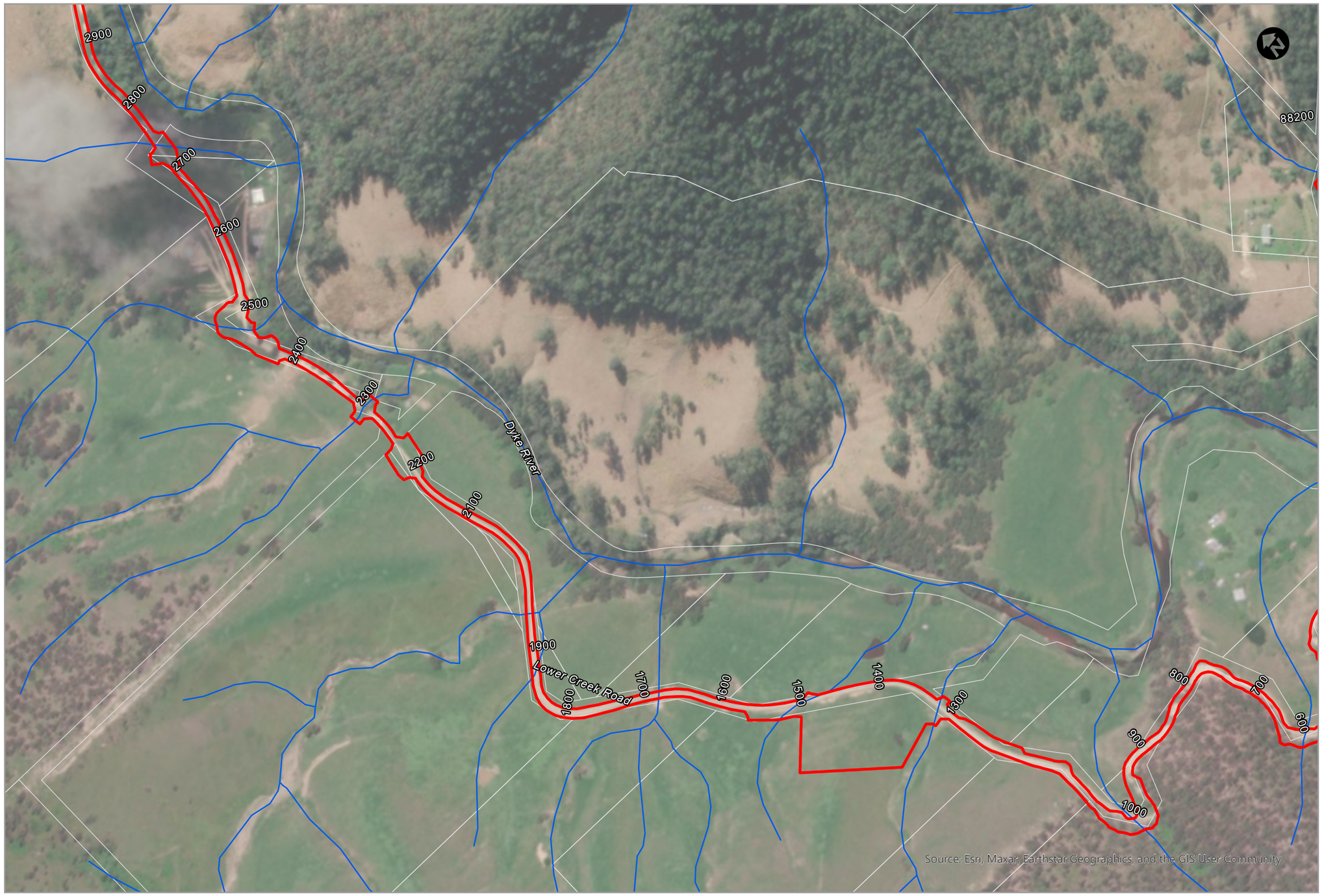
Map Sheet Location

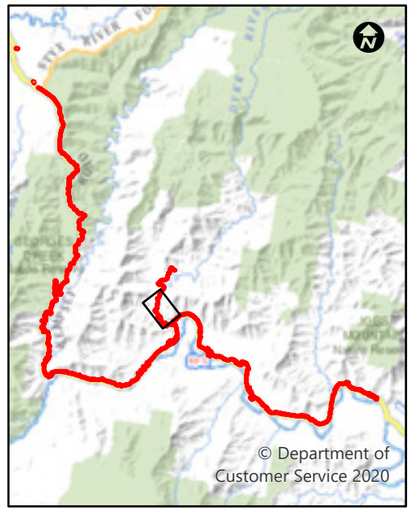
LEGEND

- Activity boundary
- Cadastre
- Watercourse

0 100 Meters

Information shown is for illustrative purposes only
Drawn by: AB Checked by: RE Reviewed by: BJM
Source of base data: ESRI World Imagery
Date: 13/11/2023
Revision: D





Map Sheet Location

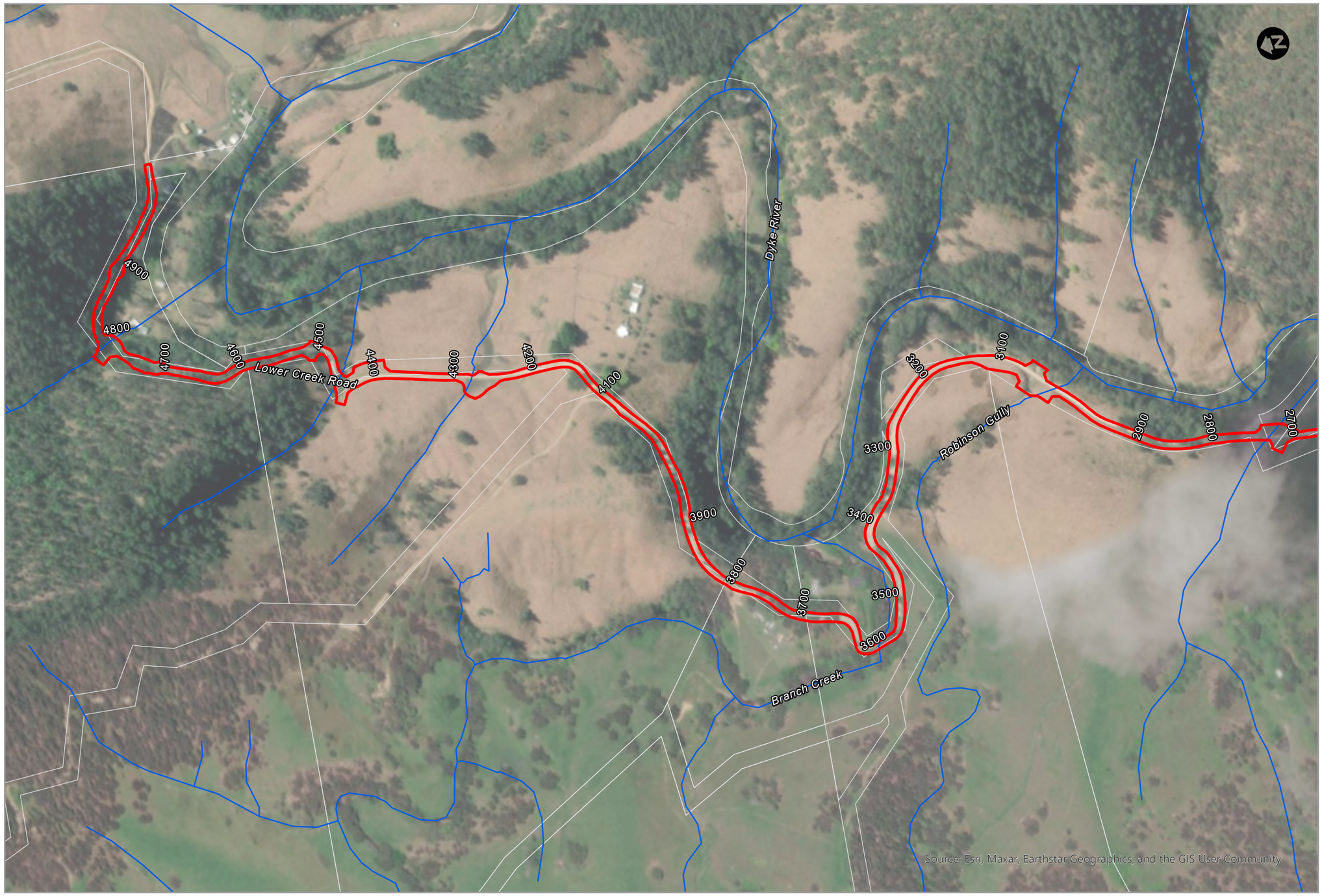
LEGEND

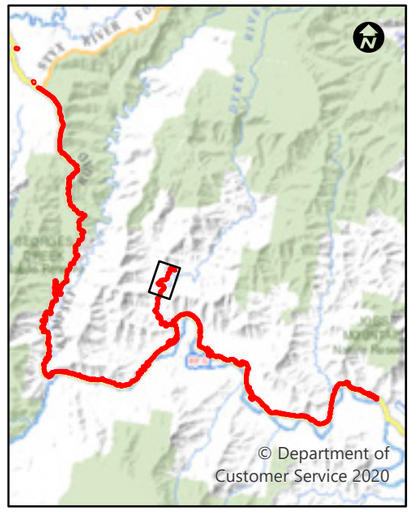
- Activity boundary
- Cadastre
- Watercourse

0 100 Meters

The Site
Illustration 2.2 - Sheet 26 of 27

Information shown is for illustrative purposes only
Drawn by: AB Checked by: RE Reviewed by: BJM
Source of base data: ESRI World Imagery
Date: 13/11/2023
Revision: D





Map Sheet Location

LEGEND

- Activity boundary
- Cadastre
- Watercourse

0 100 Meters

GeoLINK environment | engineering | planning | design

Biodiversity Assessment Report – ARC Kempsey Road Restoration
4055-1072

The Site
Illustration 2.2 - Sheet 27 of 27

Information shown is for illustrative purposes only
Drawn by: AB Checked by: RE Reviewed by: BJM
Source of base data: ESRI World Imagery
Date: 13/11/2023
Revision: D

2. Methodology

2.1 Desktop Review

The following desktop review was completed prior to field assessment:

- A search of the BioNet Wildlife Atlas within a 10 km radius of the site; completed September 2023 (refer to **Appendix A**).
- A search of the Protected Matters Search Tool (PMST) for Matters of National Environmental Significance (MNES) within a 10 km radius of the site; completed September 2023 (refer to **Appendix A**).
- Review of DPI Fisheries habitat mapping and fisheries spatial data portal for threatened freshwater species listed in the *Fisheries Management Act 1994* (completed 30 October 2023).
- Review of weeds listed under the *Biosecurity Act 2015* for the Armidale Regional LGA.
- Review of landscape features (e.g. World Heritage Sites, Ramsar Wetlands, Areas of Outstanding Biodiversity Value, geology etc.).

2.2 Field Assessment

The field assessments were completed by GeoLINK on the following days:

- 28 September 2021;
- 18 October 2021;
- 26 October 2021;
- 3 November 2021;
- 4 November 2021;
- 5 November 2021;
- 18 November 2022;
- 18 October 2023; and
- 19 October 2023.

The following methodology was undertaken:

- Vegetation assessment and mapping including identifying vegetation communities to BioNet Plant Community Types (PCTs).
- Targeted surveys for threatened flora (as identified in BioNet searches).
- Identification of TECs.
- Opportunistic survey for all fauna based on visual or aural observations.
- Identification and survey (by GPS) of any hollow-bearing trees.
- Microbat assessment and survey of drainage structures via direct torch observation.
- Opportunistic searches for Koala scats beneath mature Eucalypt trees.

Survey Limitations

Despite a thorough search, it is always the case that some cryptic flora species that are difficult to locate may have been overlooked in the survey. Due to the steep slopes present at most of the site and safety concerns, a random meander traverse to search for threatened flora species was often not possible. As the site was generally narrow (less than 10 m from the edge of the road formation), a visual survey was considered adequate to identify the majority of flora species, including threatened species. If there was any doubt as to whether smaller more cryptic flora species may be present these species were assumed present and a ToS for potential impacts of the Activity undertaken.

While highly mobile fauna species may be difficult to detect during site assessments, the survey techniques utilised provide suitable sampling for a range of fauna with an emphasis on targeting threatened species most likely to occur within the study area. Based on local fauna records, vegetation and habitats occurring in the study area, predictions of threatened fauna usage can be made with a relatively high level of confidence.

3. Vegetation Results

3.1 Desktop Analysis

3.1.1 Database Search Results

BioNet search results identified records of 11 threatened flora species listed under the BC Act (including ten species also listed under the EPBC Act) within the search area (refer to **Appendix A**). The search results also identified 16 TECs listed under the BC Act and three TECs listed under the EPBC Act with potential to occur in the site locality.

Protected Matters Search Tool results identified habitat for 28 threatened flora species and five threatened ecological communities within a 10 km radius of the site. The results of database searches are included in **Appendix A**.

3.2 Site Assessment

3.2.1 Vegetation

Vegetation occurring at the site is summarised below and illustrated in **Illustration 3.1**. A complete flora list is provided in **Appendix B**.

3.2.1.1 PCT 3205 – Northern Escarpment New England Blackbutt-Tallowwood Wet Forest

PCT 3205 occurs predominately in the sheltered gullies along the subject roads, covering a total area of approximately 4.03 ha.

Dominant trees occurring in this community include Tallowwood (*Eucalyptus microcorys*), New England Blackbutt (*Eucalyptus campanulata*), Sydney Blue Gum (*Eucalyptus saligna*), and Broad-leaved Stringybark (*Eucalyptus caliginosa*).

Dominant midstorey species include Forest Oak (*Allocasuarina torulosa*), Tree Heath (*Trochocarpa laurina*), Two-veined Hickory (*Acacia binervata*), *Persoonia media*, Long-leaf Wattle (*Acacia longissima*), Soft Treefern (*Dicksonia antarctica*), Coast Banksia (*Banksia integrifolia*), Native Raspberry (*Rubus parvifolius*), Wombat Berry (*Eustrephus latifolius*), and the occasional Burrawang (*Macrozamia communis*) on cliff edges. The groundcover comprises Blue Flax-lily (*Dianella caerulea*), False Sarsaparilla (*Hardenbergia violacea*), Spiny-headed Mat-rush (*Hardenbergia violacea*), Bracken (*Pteridium esculentum*), Blady Grass (*Imperata cylindrica*), Native Geranium (*Geranium solanderi*) and Germander Raspwort (*Gonocarpus teucrioides*).

A variety of weeds are also present in the road verge such as Red Natal Grass (*Melinis repens*), Molasses Grass (*Melinis minutiflora*), Pale Pigeon Grass (*Setaria pumila*), Fireweed (*Senecio madagascariensis*), Annual Ragweed (*Ambrosia artemisiifolia*), Farmer's Friend (*Bidens pilosa*), Blackberry Nightshade (*Solanum nigrum*) and Sida (*Sida rhombifolia*).

A variety of rainforest species are present sporadically along gully lines within this community and comprise Giant Stinging Tree (*Dendrocnide excelsa*), Tulip Satinwood (*Rhodosphaera rhodanthema*), Native Quince (*Alectryon subcinereus*), Rusty Fig (*Ficus rubiginosa*), Rough-leaved Elm (*Aphananthe philippinensis*), White Cedar (*Melia azedarach*), Red Kamala (*Mallotus philippensis*), Native Hibiscus (*Hibiscus heterophyllus*), Creek Sandpaper Fig (*Ficus coronata*), Cheese Tree (*Glochidion ferdinandi*), Sweet Pittosporum (*Pittosporum undulatum*), Wonga Wonga Vine (*Pandorea pandorana*) (yellow

flowered Macleay form) and Wombat Berry (*Eustrephus latifolius*). These species are common in gullies from CH 113700 to 114000.

This community is present in a low to moderate condition on site, with disturbances from previous vegetation clearing, road construction and weed infiltration evident. Moderate and high-condition occurrences occur outside of the site on surrounding land.

PCT 3205 occurring at the site is not consistent with the characteristics of any of the TECs listed under the BC Act or EPBC Act.

3.2.1.2 PCT 4073 – Lower North Hinterland River Oak Forest

PCT 4073 occurs along the Macleay River and its tributaries, covering a total area of approximately 2.59 ha.

The overstorey is dominated by River Oak (*Casuarina cunninghamiana* subsp. *cunninghamiana*) along with Rough-barked Apple (*Angophora floribunda*) and Broad-leaved Apple (*Angophora subvelutina*). Occasionally Weeping Bottlebrush (*Callistemon viminalis*) occurs in the midstorey.

A variety of rainforest species are present sporadically along gully lines within this community and comprise Giant Stinging Tree, Tulip Satinwood, Native Quince, Rusty Fig, Rough-leaved Elm, White Cedar, Red Kamala, Native Hibiscus, Creek Sandpaper Fig, Cheese Tree, Sweet Pittosporum, Wonga Wonga Vine (yellow flowered Macleay form) and Wombat Berry. These species are common in gullies from CH 75200 to 88400.

This community is present in a low to moderate condition on site, with disturbances from grazing, and historical road construction and weed infiltration evident at bridge locations. Moderate and high condition occurrences occur outside of the site along the permanent waterways.

PCT 4073 occurring at the site is not consistent with the characteristics of any TECs listed under the BC Act or EPBC Act.

3.2.1.3 PCT 3251 – Northern Gorges Diverse Grassy Forest

PCT 3251 occurs primarily across CH 83700-113500 on Armidale-Kempsey Road and CH 300-4900 on Lower Creek Road and covers a total area of approximately 15.24 ha.

Dominant trees in this community are Spotted Gum (*Corymbia maculata*) and Forest Oak (*Allocasuarina torulosa*) with the occasional New England Blackbutt (*Eucalyptus campanulata*). The midstorey and groundcover is sparse, and consists of Many-flowered Mat-rush (*Lomandra multiflora* subsp. *multiflora*), Forest Nightshade (*Solanum prinophyllum*), Dusky Coral Pea (*Kennedia rubicunda*) and Australian Indigo (*Indigofera australis*).

Various exotic grasses and herbs are present in the understorey including Pale Pigeon Grass (*Setaria pumila*), Molasses Grass (*Melinis minutiflora*), Farmer's Friend (*Bidens pilosa*) and Sida (*Sida rhombifolia*).

A variety of rainforest species are present sporadically along gully lines within this community and comprise Giant Stinging Tree, Tulip Satinwood, Native Quince, Rusty Fig, Rough-leaved Elm, White Cedar, Red Kamala, Native Hibiscus, Creek Sandpaper Fig, Cheese Tree, Sweet Pittosporum, Wonga Wonga Vine (yellow flowered Macleay form) and Wombat Berry. These species are common in gullies from CH 68200 to 88400 and 104500 to 104650.

This community is present in low to moderate condition, with disturbances from previous vegetation clearing, road construction, stock grazing and weed infiltration evident. Better quality examples occur outside of the site on surrounding land.

PCT 3251 occurring at the site is not consistent with the characteristics of any TECs listed under the BC Act or EPBC Act.

3.2.1.4 PCT 3240 - Lower North Escarpment Red Gum Grassy Forest

PCT 3240 occurs from CH 98800 to the Kempsey LGA boundary on the Armidale-Kempsey Road and CH 2800 on Lower Creek Road, covering a total area of approximately 27.11 ha.

Dominant trees in this community include Thin-leaved Stringybark (*Eucalyptus eugenioides*), Broad-leaved Apple (*Angophora subvelutina*) and Tallowwood (*E. microcorys*). Occasional Brush Box (*Lophostemon confertus*), Forest Red Gum (*E. tereticornis*), Pink Bloodwood (*Corymbia intermedia*), and River Oak (*Casuarina cunninghamiana* subsp. *cunninghamiana*) also occur.

Dominant native understorey species include Kangaroo Grass (*Themeda triandra*), Blue Flax-lily (*Dianella* sp.), Spiny-headed Mat-rush (*Lomandra longifolia*), Austral Sarsaparilla (*Smilax australe*), Wombat Berry (*Eustrephus latifolius*), and Bluebell (*Wahlenbergia spp.*). A variety of weeds are also present in the understorey such as Red Natal Grass (*Melinus repens*), Molasses Grass (*Melinus minutiflora*), Pale Pigeon Grass (*Setaria pumila*), Fireweed (*Solanum madagascariensis*), Annual Ragweed (*Ambrosia artemisiifolia*), Farmer's Friend (*Bidens pilosa*), Blackberry Nightshade (*Solanum nigrum*) and Sida (*Sida rhombifolia*).

A variety of rainforest species are present sporadically along gully lines within this community and comprise Giant Stinging Tree, Tulip Satinwood, Native Quince, Rusty Fig, Rough-leaved Elm, White Cedar, Red Kamala, Native Hibiscus, Creek Sandpaper Fig, Cheese Tree, Sweet Pittosporum, Wonga Wonga Vine (yellow flowered Macleay form) and Wombat Berry. These species are common in gullies from CH 73300 to 94700.

This community is present in a low to moderate condition on site, with disturbances from previous vegetation clearing, road construction and weed infiltration evident. Moderate and high condition occurrences occur outside of the site on surrounding land.

PCT 3240 occurring at the site is not consistent with the characteristics of any TECs listed under the BC Act or EPBC Act.

3.2.1.5 Exotic-dominated Vegetation

This vegetation occurs along the immediate roadside verge and in cleared areas associated with the site.

Common weed species include Purpletop (*Verbena bonariensis*), Scarlet Pimpernel (*Lysimachia arvensis*), Blackberry Nightshade (*Solanum nigrum*), Sida (*Sida rhombifolia*), Annual Ragweed (*Ambrosia artemisiifolia*), Fireweed (*Solanum madagascariensis*), Tobacco Bush (*Solanum mauritianum*), Lantana (*Lantana camara*) and Common Sowthistle (*Sonchus oleraceus*). A similar suite of species is also present in disturbed areas of understorey within the other communities occurring at the site.

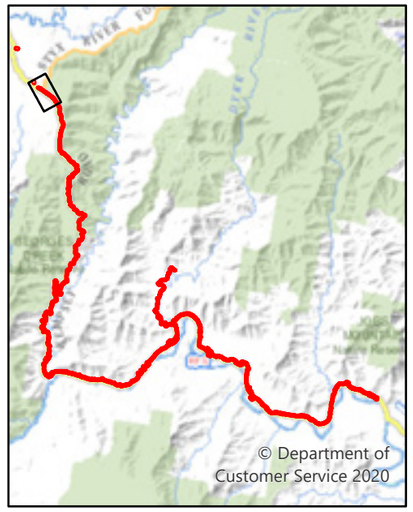
This vegetation occurring at the site is not consistent with the characteristics of any TECs listed under the BC Act or EPBC Act.

3.2.1.6 Cliff-face/ Batter Vegetation

This vegetation occurs between CH 97200-73100. Many of the constituent plant species occurring in this community grow within crevices within the cliff-face/ downslope batter. The cliff-face/ downslope batter typically occurs on the upslope and downslope of the road cutting. This vegetation does not conform to a single PCT, and instead is consistent with cliff-face terrain within the existing PCTs.

Native species occurring in this vegetation include Cockspur Flower (*Plectranthus parviflorus*), Poison Rock Fern (*Chelianthes sieberi*) and Native Geranium (*Geranium solanderi*). Exotic species are also present including Molasses Grass (*Melinis minutifolia*) and Cat's Claw Creeper (*Dolichandra unguis-cati*).

This vegetation occurring at the site is not consistent with the characteristics of any TECs listed under the BC Act or EPBC Act.



Map Sheet Location

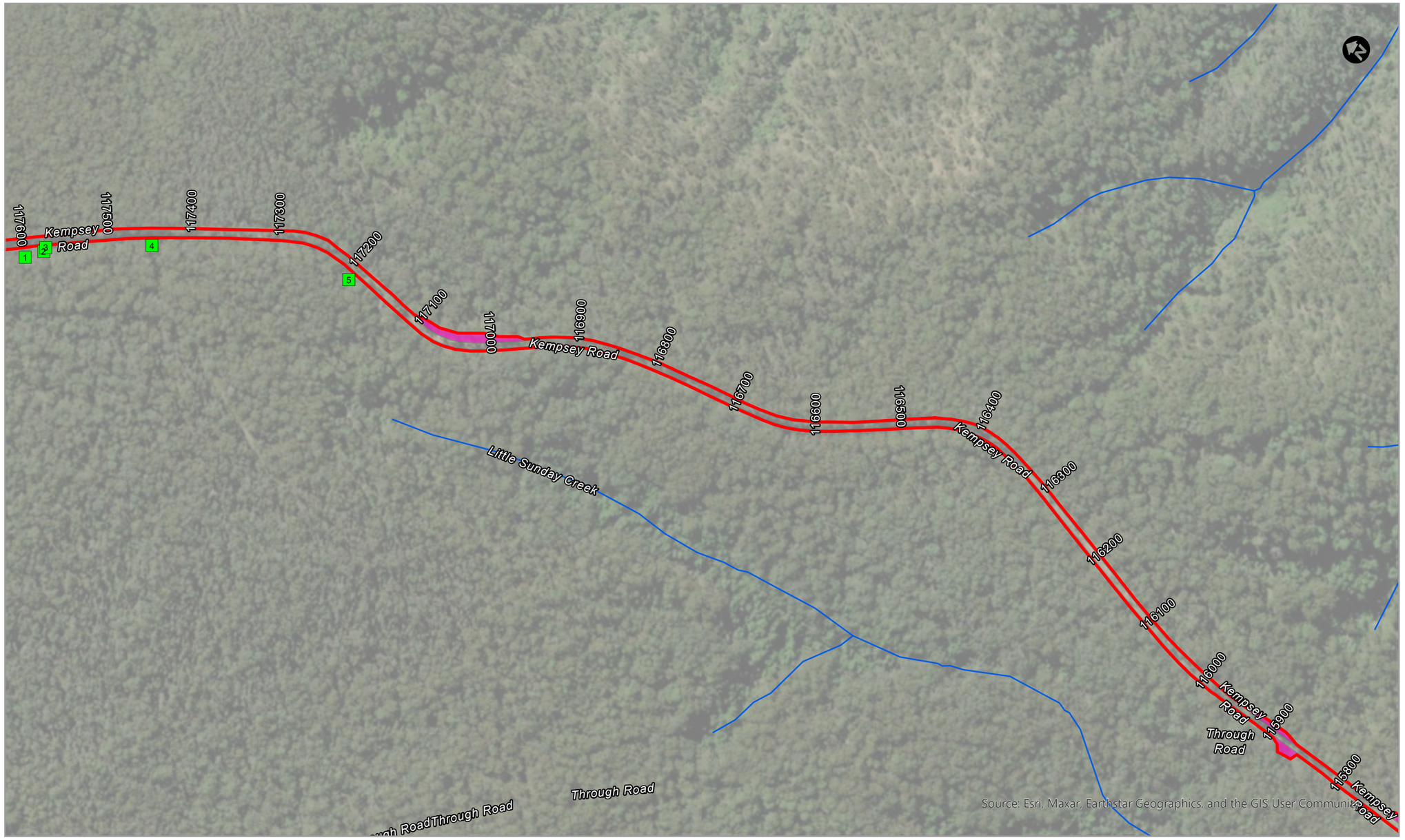
LEGEND

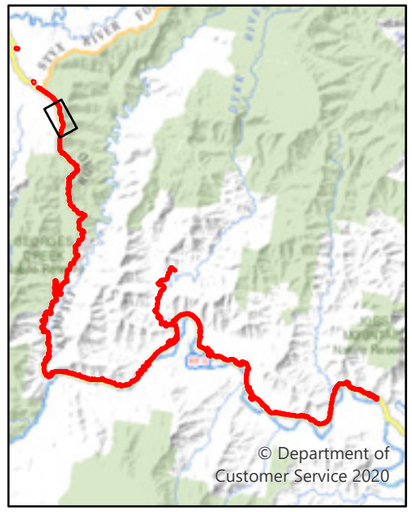
- Activity boundary
- Cadastre
- PCT 3205 - Northern Escarpment New England Blackbutt-Tallowwood Wet Forest
- Lantana infestation
- Watercourse
- Habitat tree

0 100 Meters

Vegetation Mapping
Illustration 3.1 - Sheet 1 of 27

Information shown is for illustrative purposes only
Drawn by: AB Checked by: RE Reviewed by: BJM
Source of base data: ESRI World Imagery
Date: 14/11/2023
Revision: D





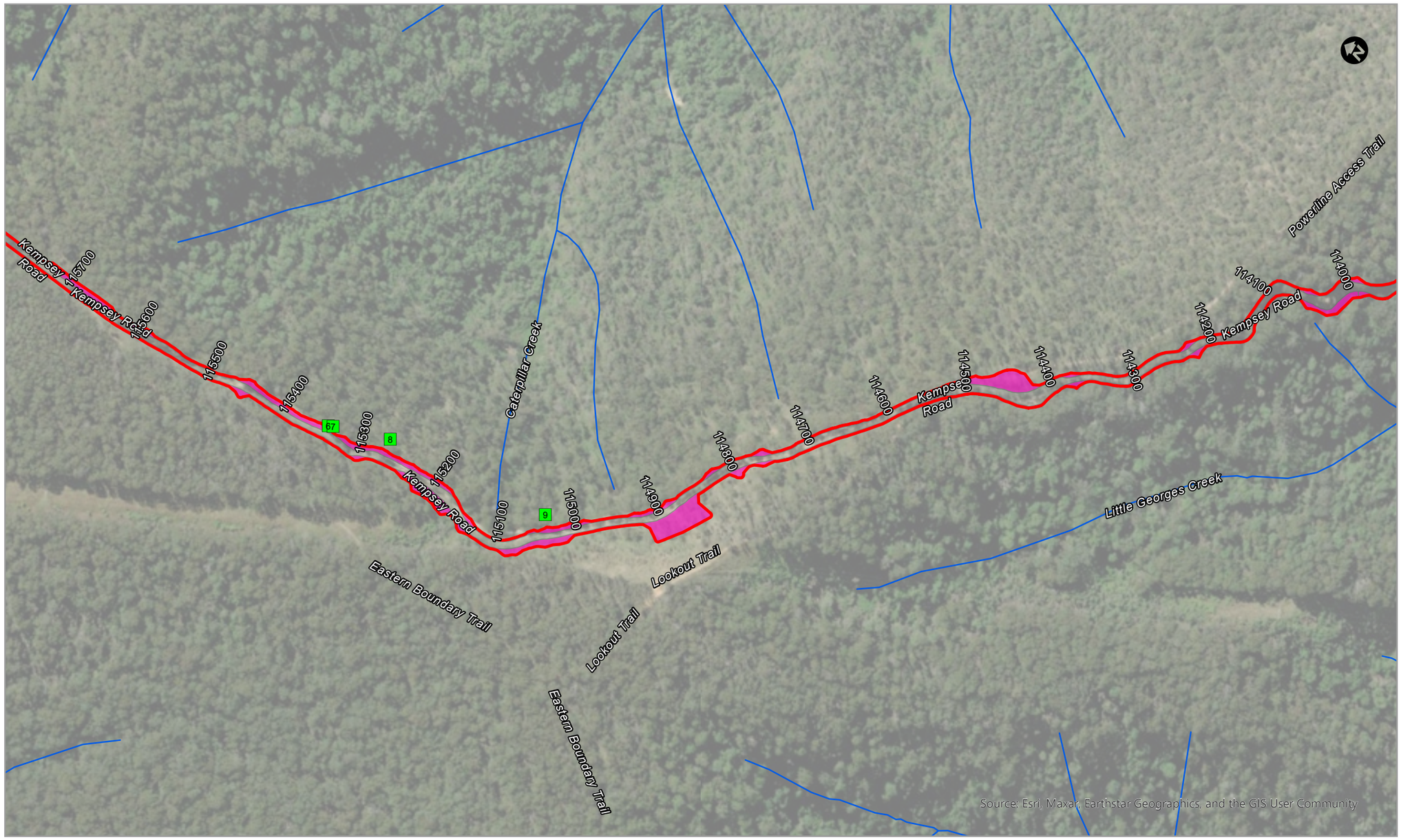
Map Sheet Location

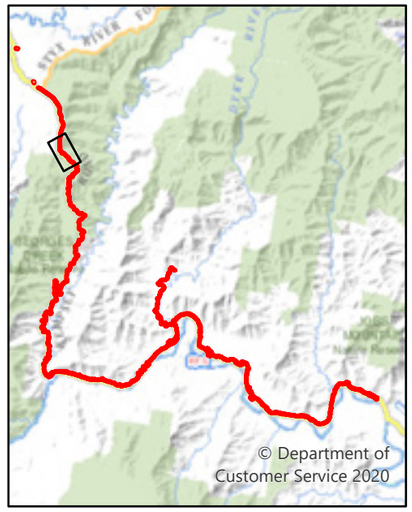
LEGEND

- Activity boundary
- Cadastre
- PCT 3205 - Northern Escarpment New England Blackbutt-Tallowwood Wet Forest
- Lantana infestation
- Watercourse
- Habitat tree

0 100 Meters

Information shown is for illustrative purposes only
Drawn by: AB Checked by: RE Reviewed by: BJM
Source of base data: ESRI World Imagery
Date: 14/11/2023
Revision: D





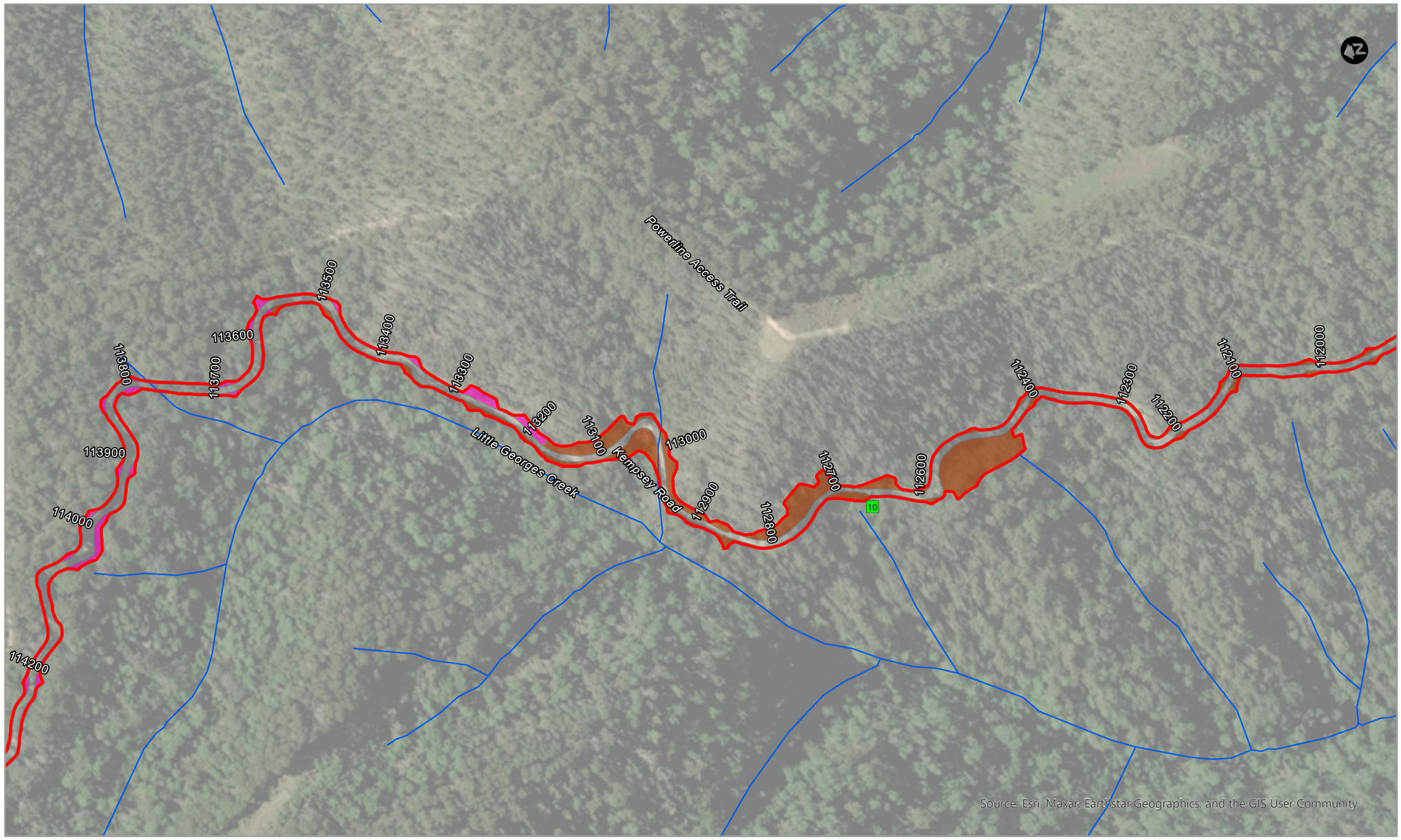
Map Sheet Location

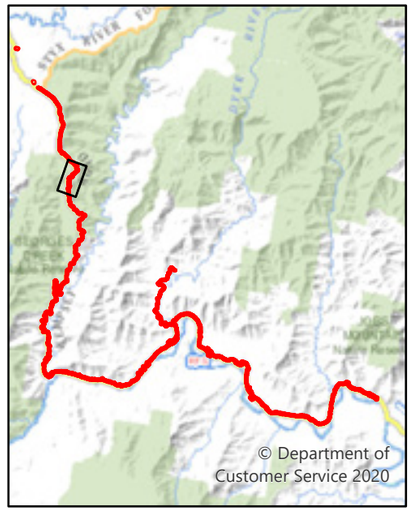
LEGEND

- Activity boundary
- Cadastre
- PCT 3205 - Northern Escarpment New England Blackbutt-Tallowwood Wet Forest
- Lantana infestation
- Watercourse
- Habitat tree

0 100 Meters

Information shown is for illustrative purposes only
Drawn by: AB Checked by: RE Reviewed by: BJM
Source of base data: ESRI World Imagery
Date: 14/11/2023
Revision: D





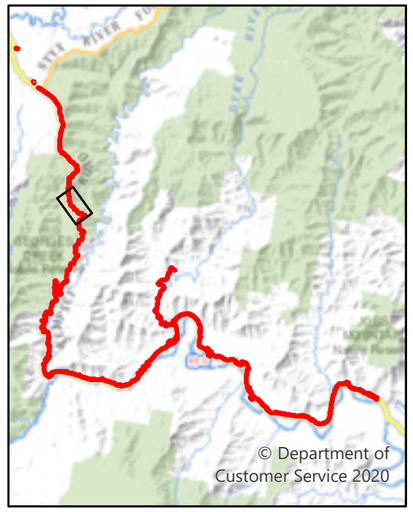
Map Sheet Location

LEGEND

- Activity boundary
- Cadastre
- PCT 3205 - Northern Escarpment New England Blackbutt-Tallowwood Wet Forest
- PCT 3251 - Northern Gorges Diverse Grassy Forest
- Lantana infestation
- Watercourse
- Habitat tree

0 100 Meters

Information shown is for illustrative purposes only
Drawn by: AB Checked by: RE Reviewed by: BJM
Source of base data: ESRI World Imagery
Date: 14/11/2023
Revision: D



Map Sheet Location

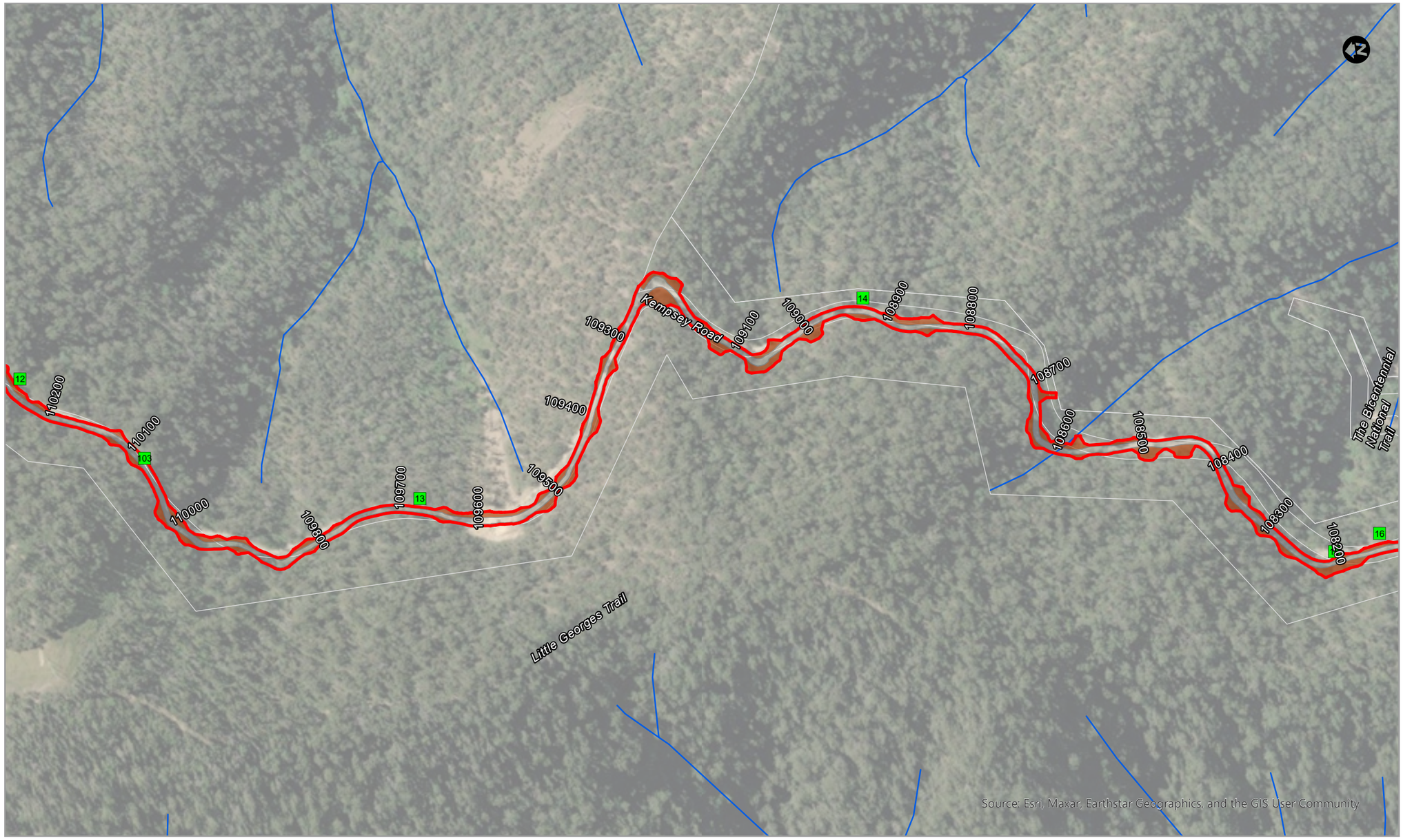
LEGEND

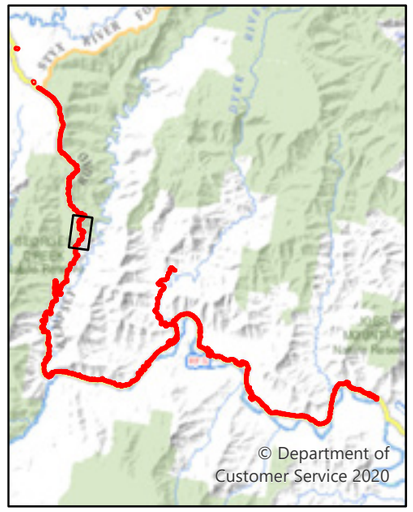
- Activity boundary
- Cadastre
- PCT 3251 - Northern Gorges Diverse Grassy Forest
- Lantana infestation
- Watercourse
- Habitat tree

0 100 Meters

Vegetation Mapping
Illustration 3.1 - Sheet 5 of 27

Information shown is for illustrative purposes only
Drawn by: AB Checked by: RE Reviewed by: BJM
Source of base data: ESRI World Imagery
Date: 14/11/2023
Revision: D





Map Sheet Location

LEGEND

- Activity boundary
- Cadastre
- PCT 3251 - Northern Gorges Diverse Grassy Forest
- Lantana infestation
- Watercourse
- Habitat tree

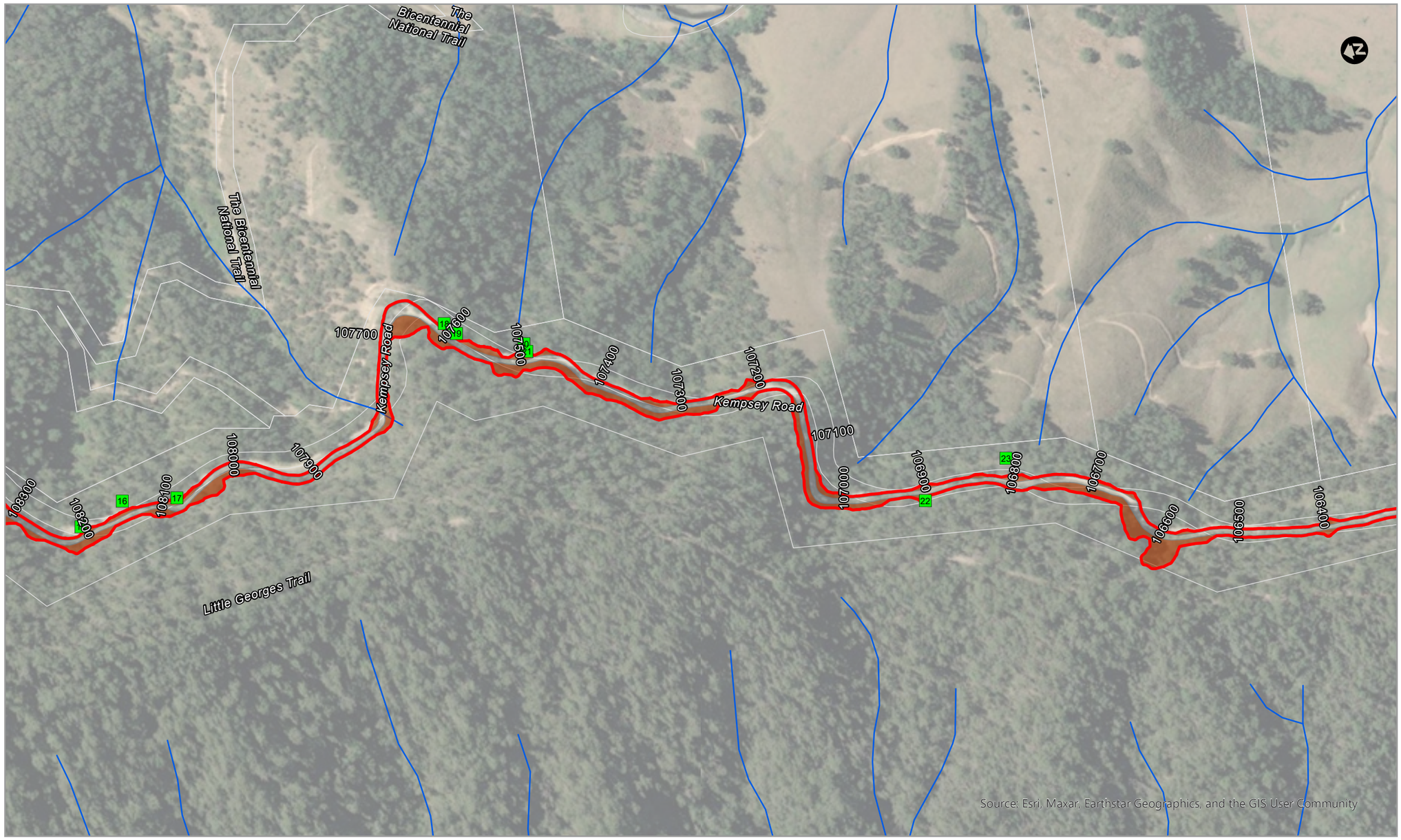
0 100 Meters

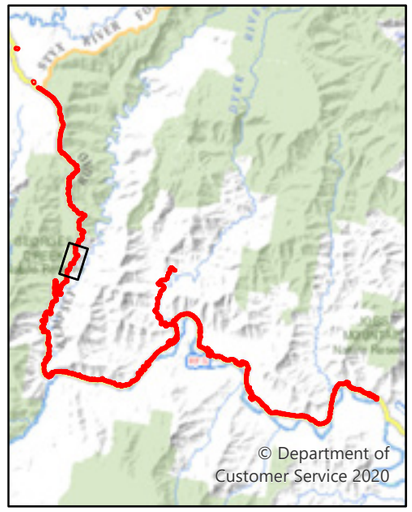
GeoLINK environment | engineering | planning | design

Biodiversity Assessment Report – ARC Kempsey Road Restoration
4055-1072

Vegetation Mapping
Illustration 3.1 - Sheet 6 of 27

Information shown is for illustrative purposes only
Drawn by: AB Checked by: RE Reviewed by: BJM
Source of base data: ESRI World Imagery
Date: 14/11/2023
Revision: D





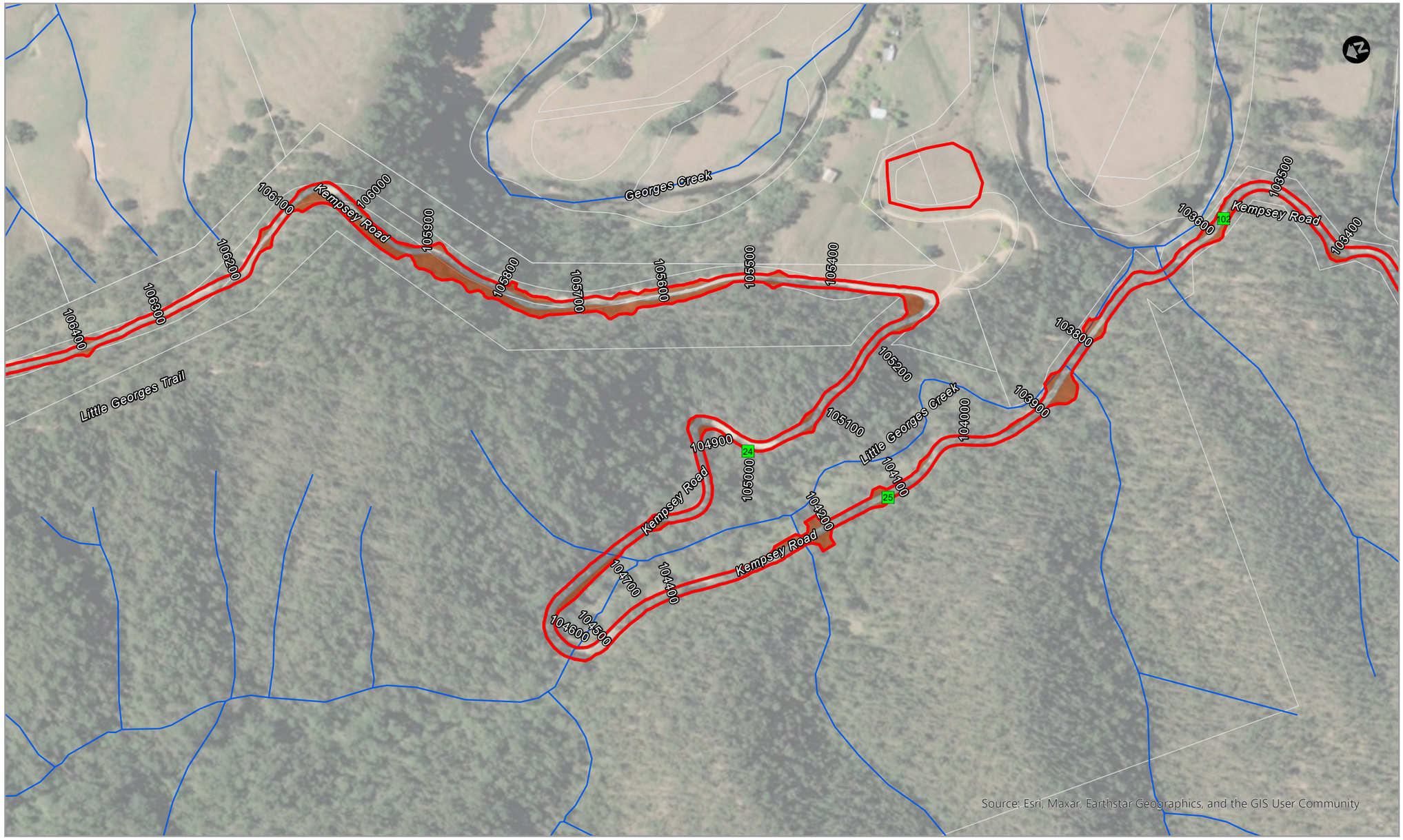
Map Sheet Location

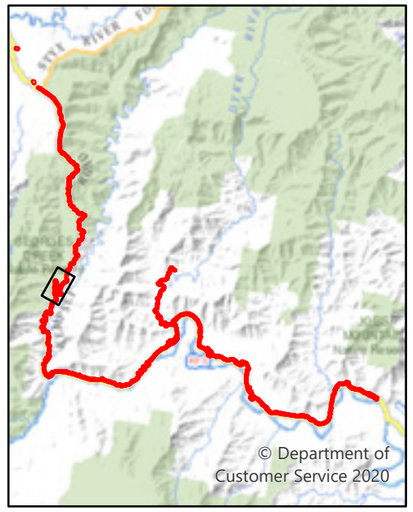
LEGEND

- Activity boundary
- Cadastre
- PCT 3251 - Northern Gorges Diverse Grassy Forest
- Lantana infestation
- Watercourse
- Habitat tree

0 100 Meters

Information shown is for illustrative purposes only
Drawn by: AB Checked by: RE Reviewed by: BJM
Source of base data: ESRI World Imagery
Date: 14/11/2023
Revision: D





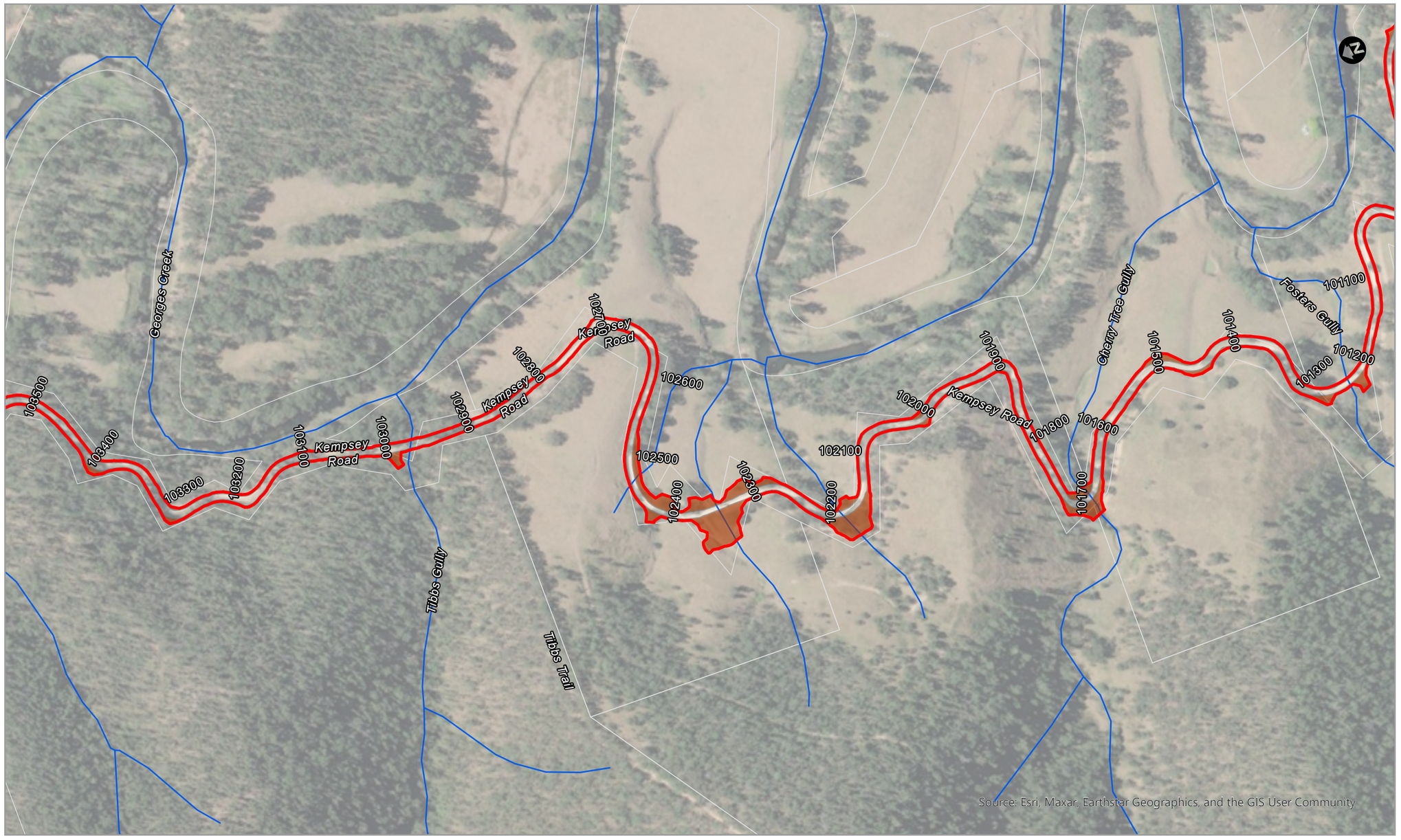
Map Sheet Location

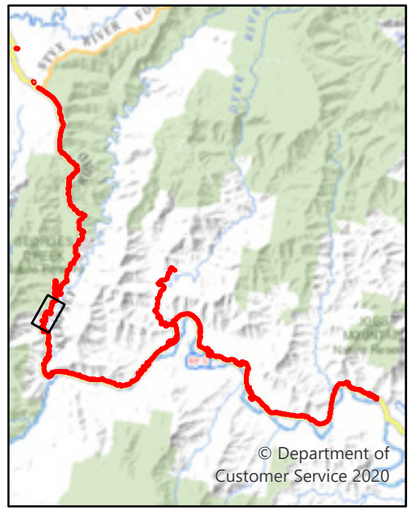
LEGEND

- Activity boundary
- Cadastre
- PCT 3251 - Northern Gorges Diverse Grassy Forest
- Lantana infestation
- Watercourse
- Habitat tree

0 100 Meters

Information shown is for illustrative purposes only
Drawn by: AB Checked by: RE Reviewed by: BJM
Source of base data: ESRI World Imagery
Date: 14/11/2023
Revision: D





Map Sheet Location

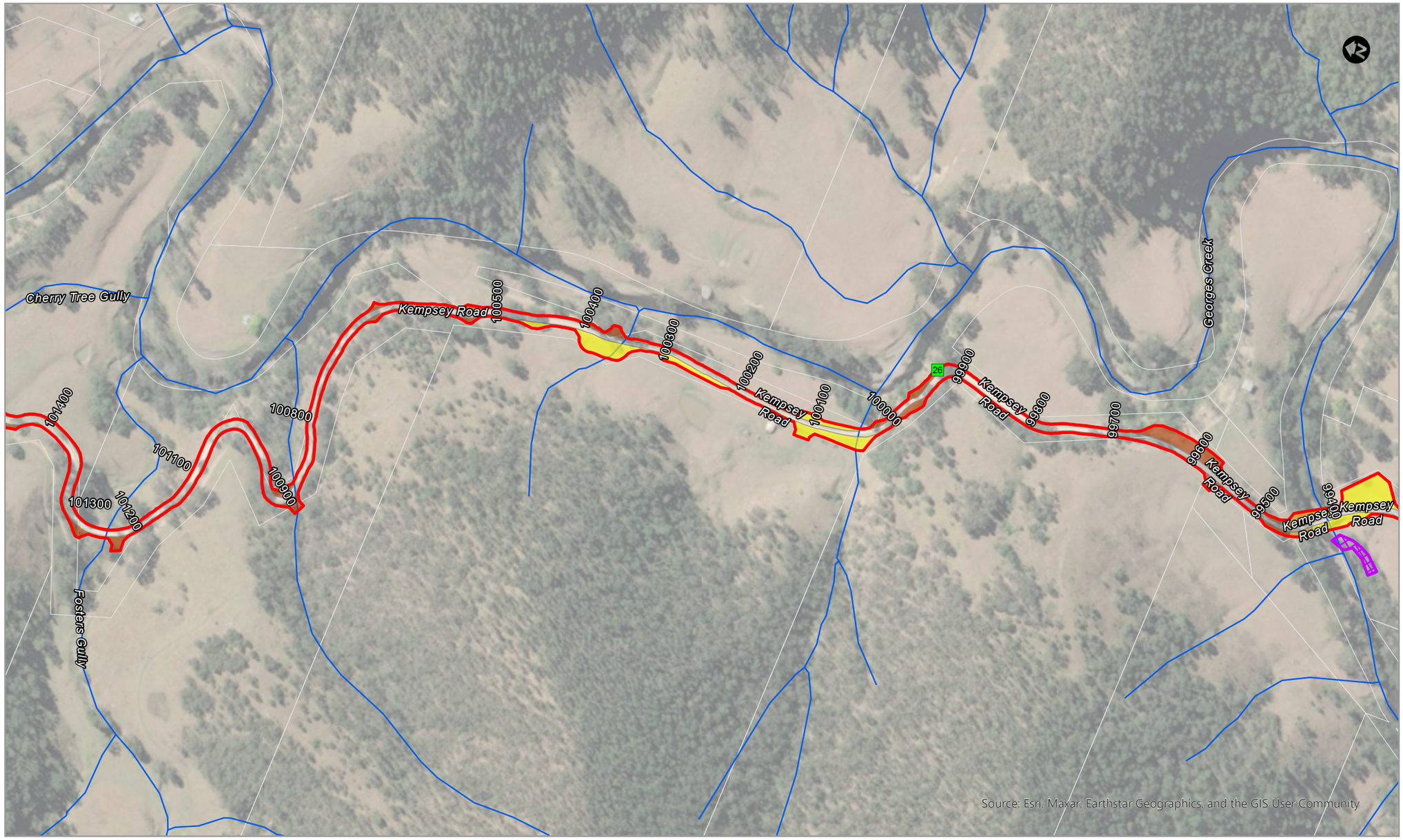
LEGEND

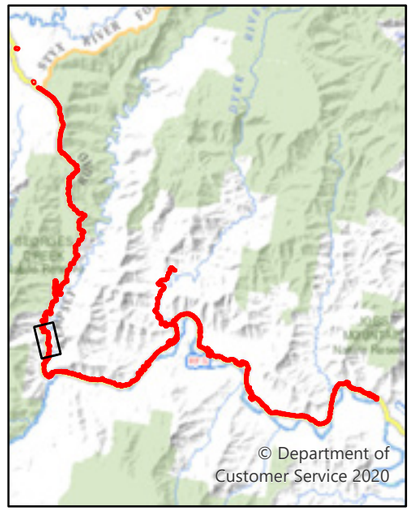
- Activity boundary
- Cadastre
- PCT 3251 - Northern Gorges Diverse Grassy Forest
- Lantana infestation
- Watercourse
- Habitat tree

0 100 Meters

Vegetation Mapping
Illustration 3.1 - Sheet 9 of 27

Information shown is for illustrative purposes only
Drawn by: AB Checked by: RE Reviewed by: BJM
Source of base data: ESRI World Imagery
Date: 14/11/2023
Revision: D





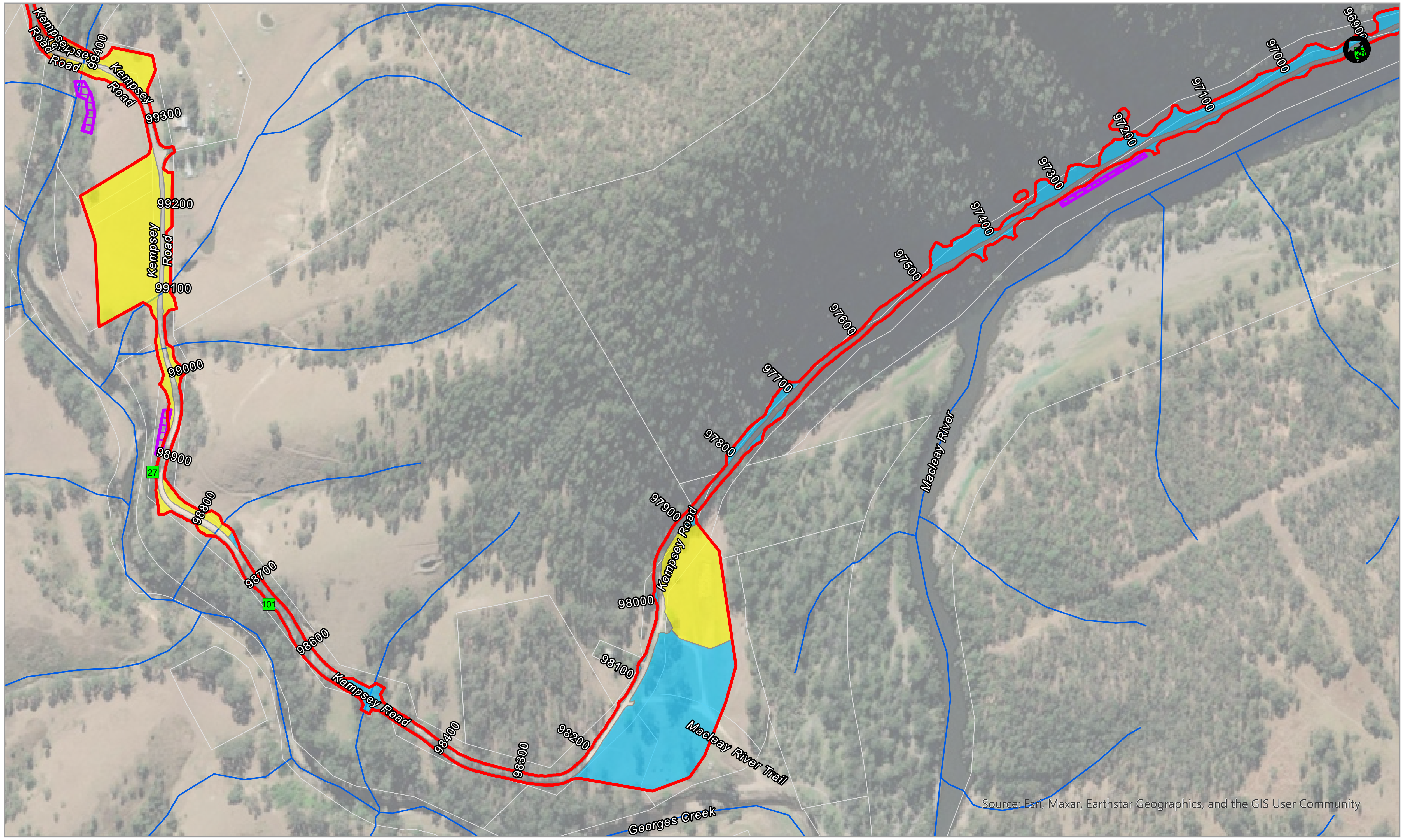
Map Sheet Location

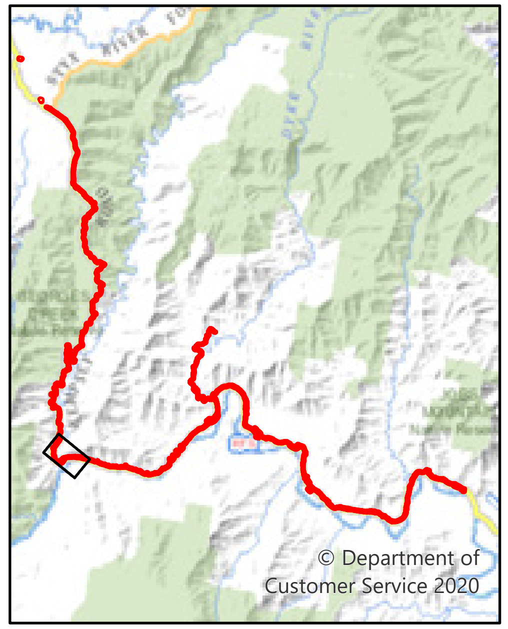
LEGEND

- Activity boundary
- Cadastre
- Cleared
- PCT 3251 - Northern Gorges Diverse Grassy Forest
- PCT 4073 - Lower North Hinterland River Oak Forest
- Lantana infestation
- Watercourse
- Habitat tree

0 100 Meters

Information shown is for illustrative purposes only
Drawn by: AB Checked by: RE Reviewed by: BJM
Source of base data: ESRI World Imagery
Date: 14/11/2023
Revision: D





Map Sheet Location

LEGEND

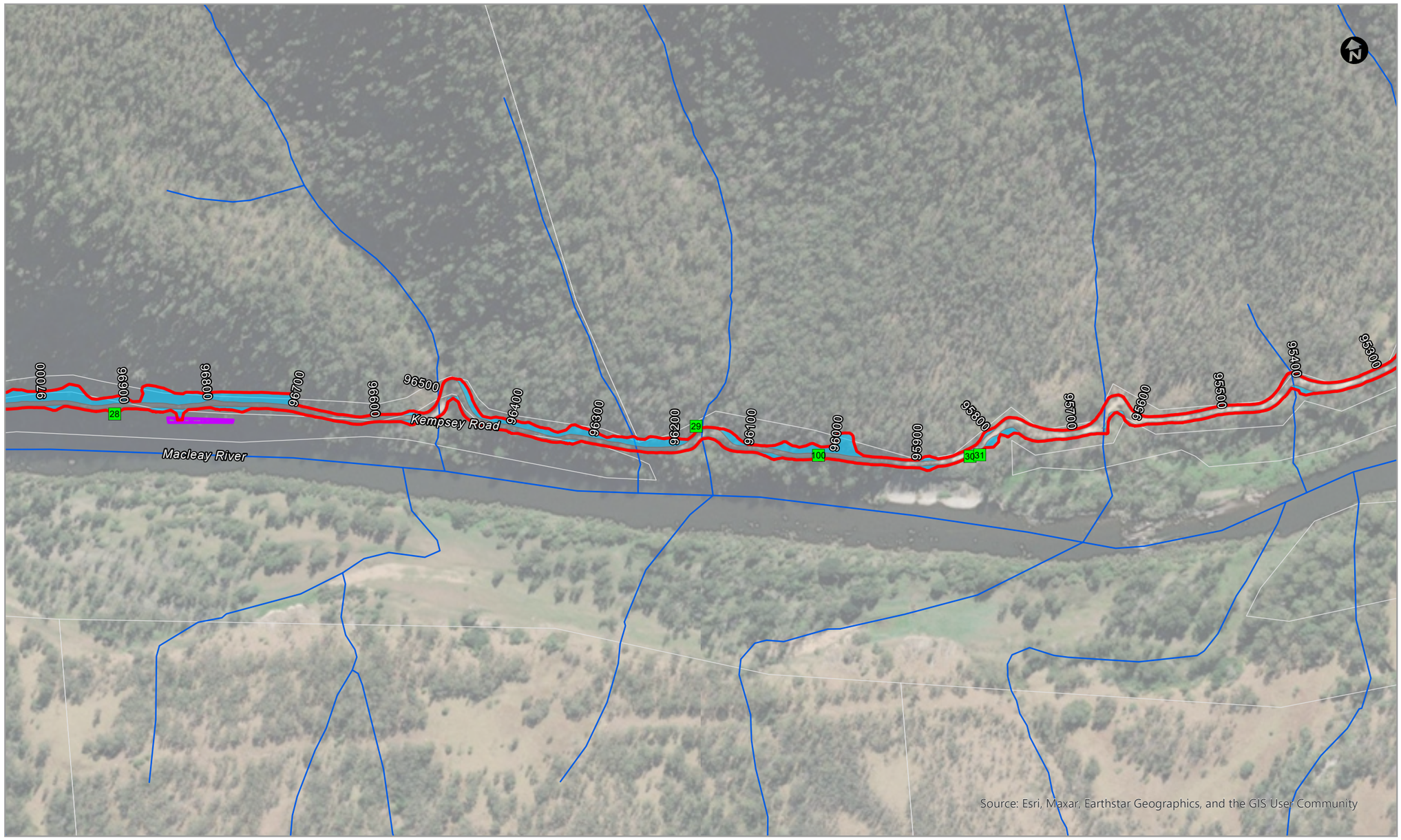
Activity boundary	Cleared
Cadastre	PCT 3240 - Lower North Escarpment Red Gum Grassy Forest
	PCT 3251 - Northern Gorges Diverse Grassy Forest
	PCT 4073 - Lower North Hinterland River Oak Forest
	Lantana infestation
	Watercourse
	Habitat tree

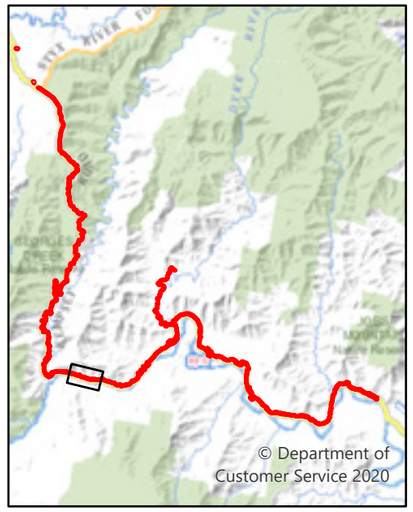
0 100 Meters

Vegetation Mapping
Illustration 3.1 - Sheet 11 of 27

Biodiversity Assessment Report – ARC Kempsey Road Restoration
4055-1072

Information shown is for illustrative purposes only
Drawn by: AB Checked by: RE Reviewed by: BJM
Source of base data: ESRI World Imagery
Date: 14/11/2023
Revision: D





Map Sheet Location

LEGEND

- Activity boundary
- Cadastre
- PCT 3240 - Lower North Escarpment Red Gum Grassy Forest
- Lantana infestation
- Watercourse
- Habitat tree

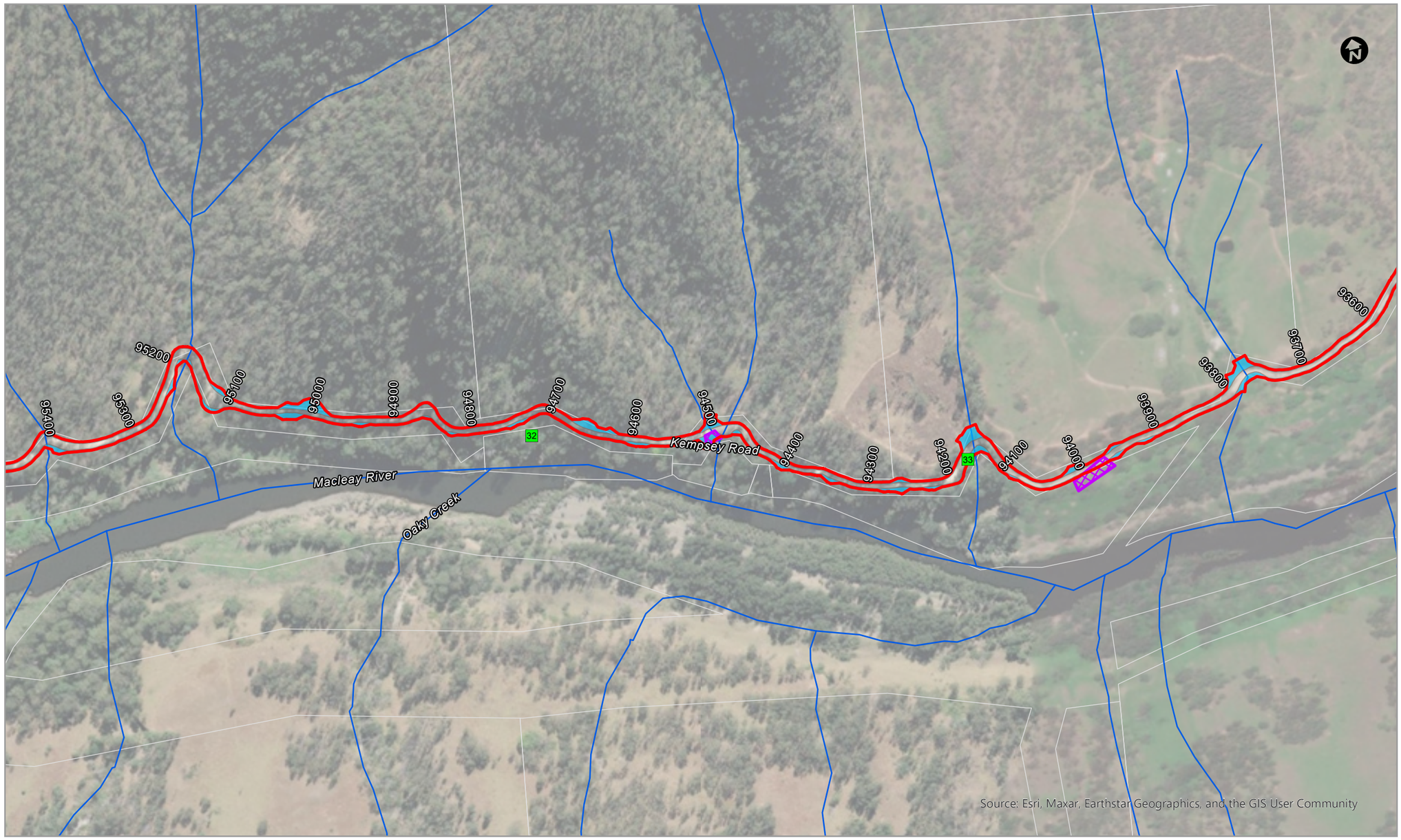
0 100 Meters

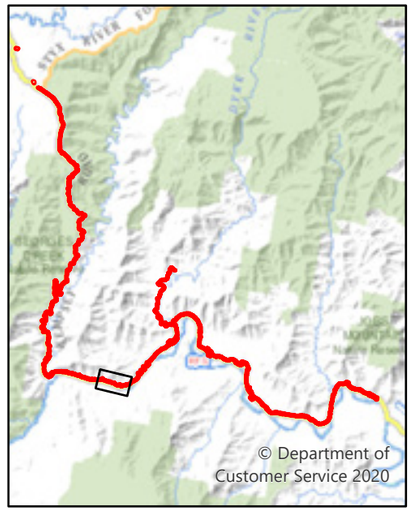
GeoLINK environment | engineering | planning | design

Biodiversity Assessment Report – ARC Kempsey Road Restoration
4055-1072

Vegetation Mapping
Illustration 3.1 - Sheet 12 of 27

Information shown is for illustrative purposes only
Drawn by: AB Checked by: RE Reviewed by: BJM
Source of base data: ESRI World Imagery
Date: 14/11/2023
Revision: D





Map Sheet Location

LEGEND

- Activity boundary
- Cadastre
- PCT 3240 - Lower North Escarpment Red Gum Grassy Forest
- Lantana infestation
- Watercourse
- Habitat tree

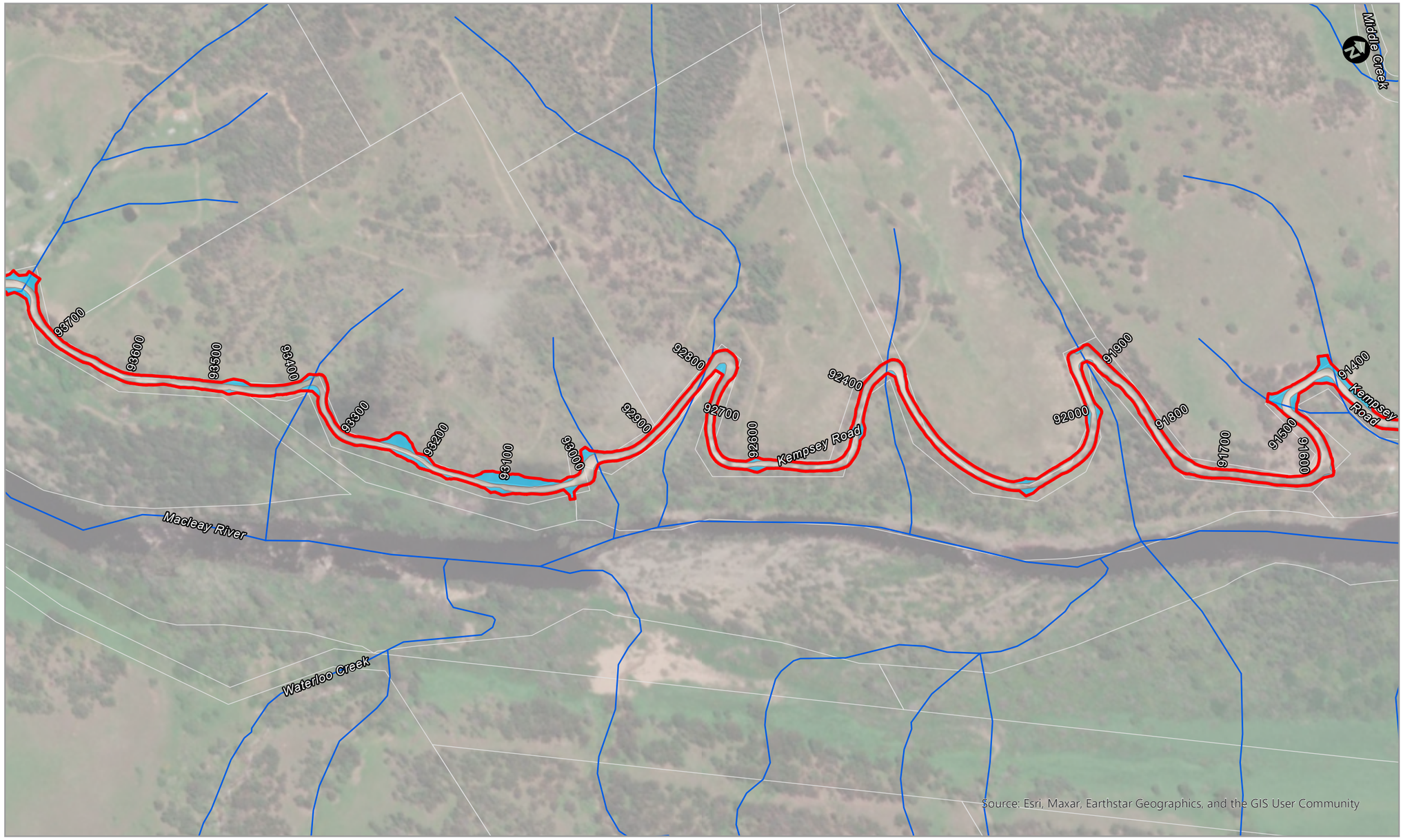
0 100 Meters

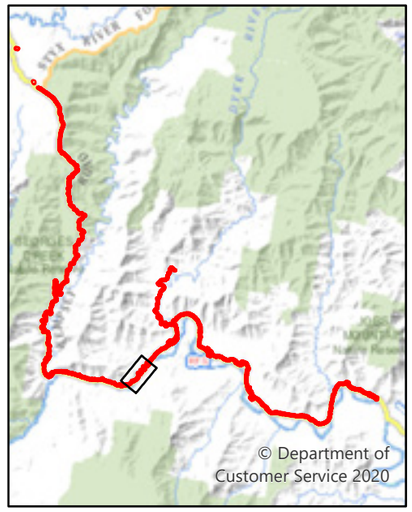
GeoLINK environment | engineering | planning | design

Biodiversity Assessment Report – ARC Kempsey Road Restoration
4055-1072

Vegetation Mapping
Illustration 3.1 - Sheet 13 of 27

Information shown is for illustrative purposes only
Drawn by: AB Checked by: RE Reviewed by: BJM
Source of base data: ESRI World Imagery
Date: 14/11/2023
Revision: D





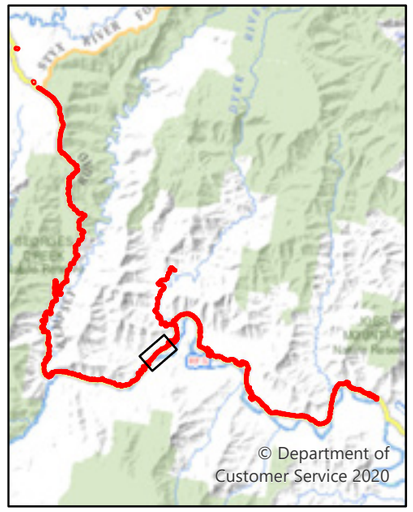
Map Sheet Location

LEGEND

- Activity boundary
- Cadastre
- PCT 3240 - Lower North Escarpment Red Gum Grassy Forest
- Lantana infestation
- Watercourse
- Habitat tree

0 100 Meters

Information shown is for illustrative purposes only
Drawn by: AB Checked by: RE Reviewed by: BJM
Source of base data: ESRI World Imagery
Date: 14/11/2023
Revision: D



Map Sheet Location

LEGEND

- Activity boundary
- Cadastre
- PCT 3240 - Lower North Escarpment Red Gum Grassy Forest
- PCT 4073 - Lower North Hinterland River Oak Forest
- Lantana infestation
- Watercourse
- Habitat tree

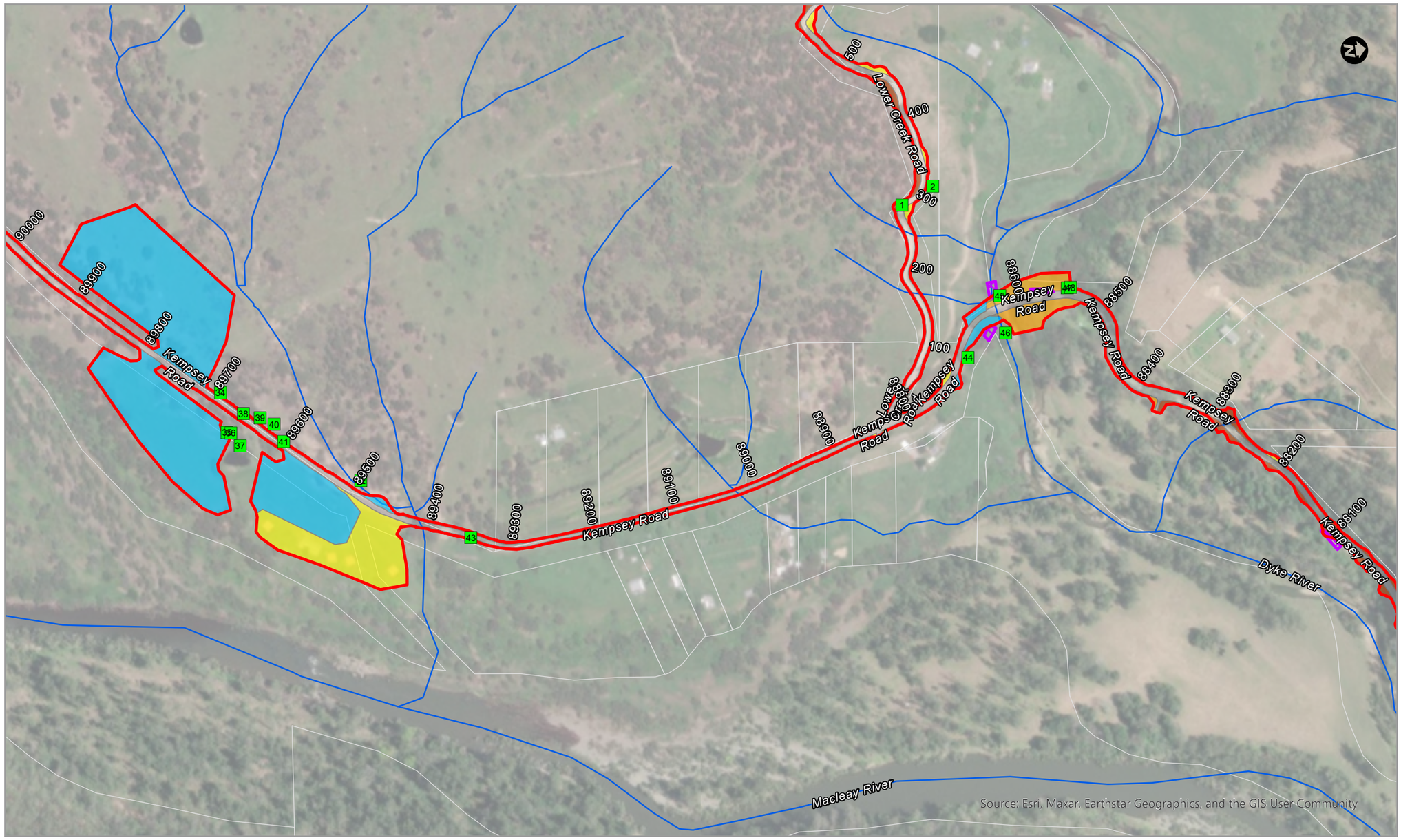
0 100 Meters

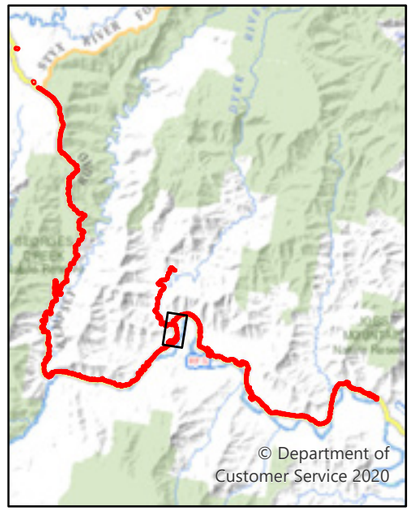
GeoLINK environment | engineering | planning | design

Biodiversity Assessment Report – ARC Kempsey Road Restoration
4055-1072

Vegetation Mapping
Illustration 3.1 - Sheet 15 of 27

Information shown is for illustrative purposes only
Drawn by: AB Checked by: RE Reviewed by: BJM
Source of base data: ESRI World Imagery
Date: 14/11/2023
Revision: D





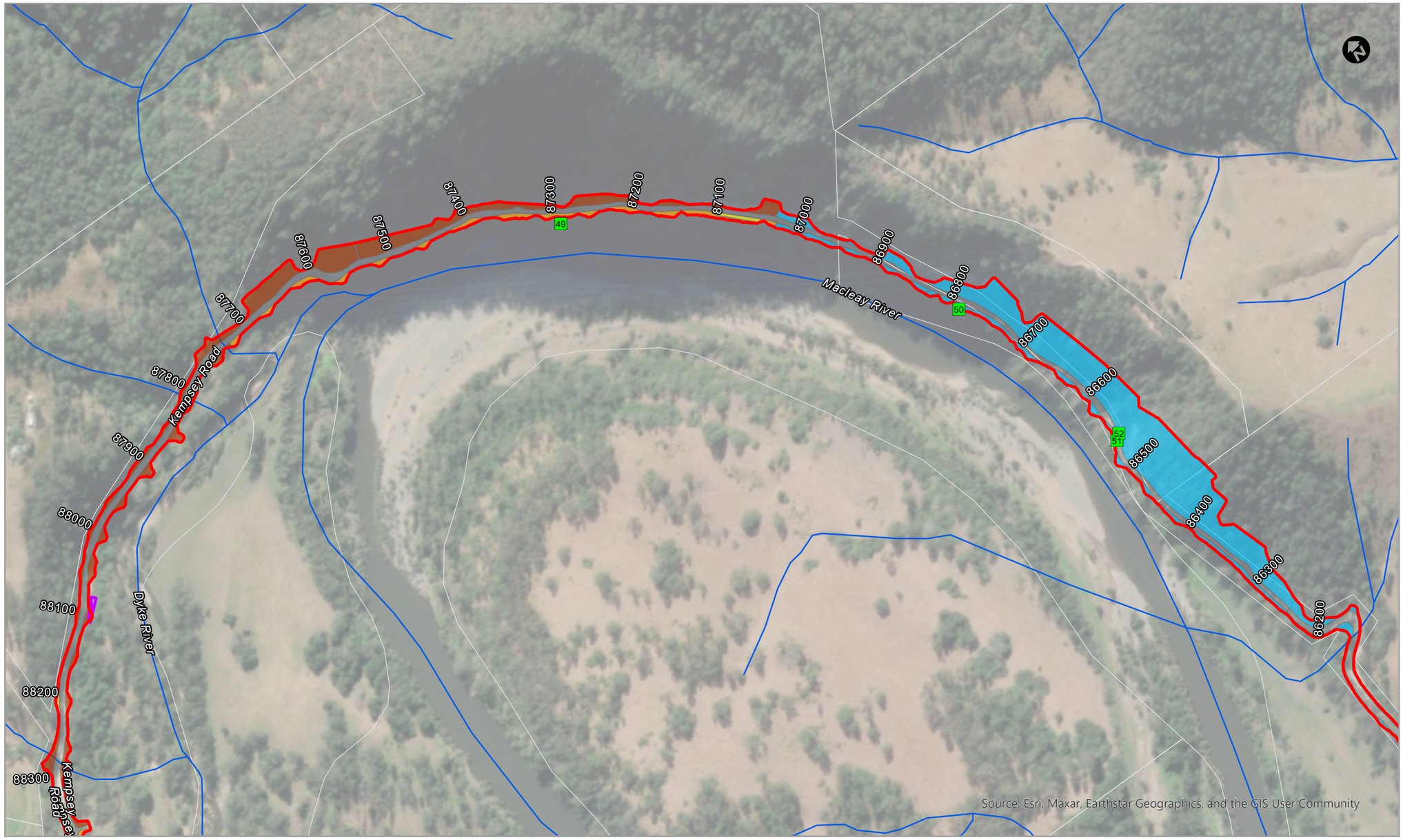
Map Sheet Location

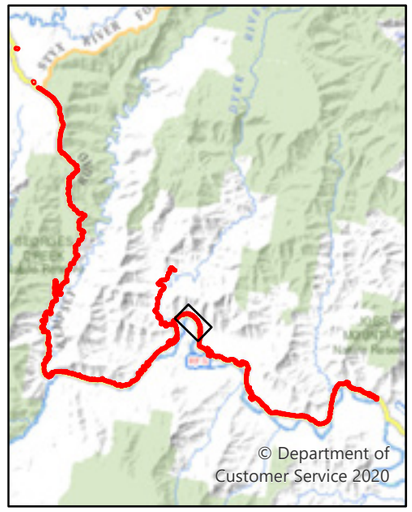
LEGEND

- Activity boundary
- Cadastre
- Cleared
- PCT 3240 - Lower North Escarpment Red Gum Grassy Forest
- PCT 3251 - Northern Gorges Diverse Grassy Forest
- PCT 4073 - Lower North Hinterland River Oak Forest
- Lantana infestation
- Watercourse
- Habitat tree

0 100 Meters

Information shown is for illustrative purposes only
Drawn by: AB Checked by: RE Reviewed by: BJM
Source of base data: ESRI World Imagery
Date: 14/11/2023
Revision: D





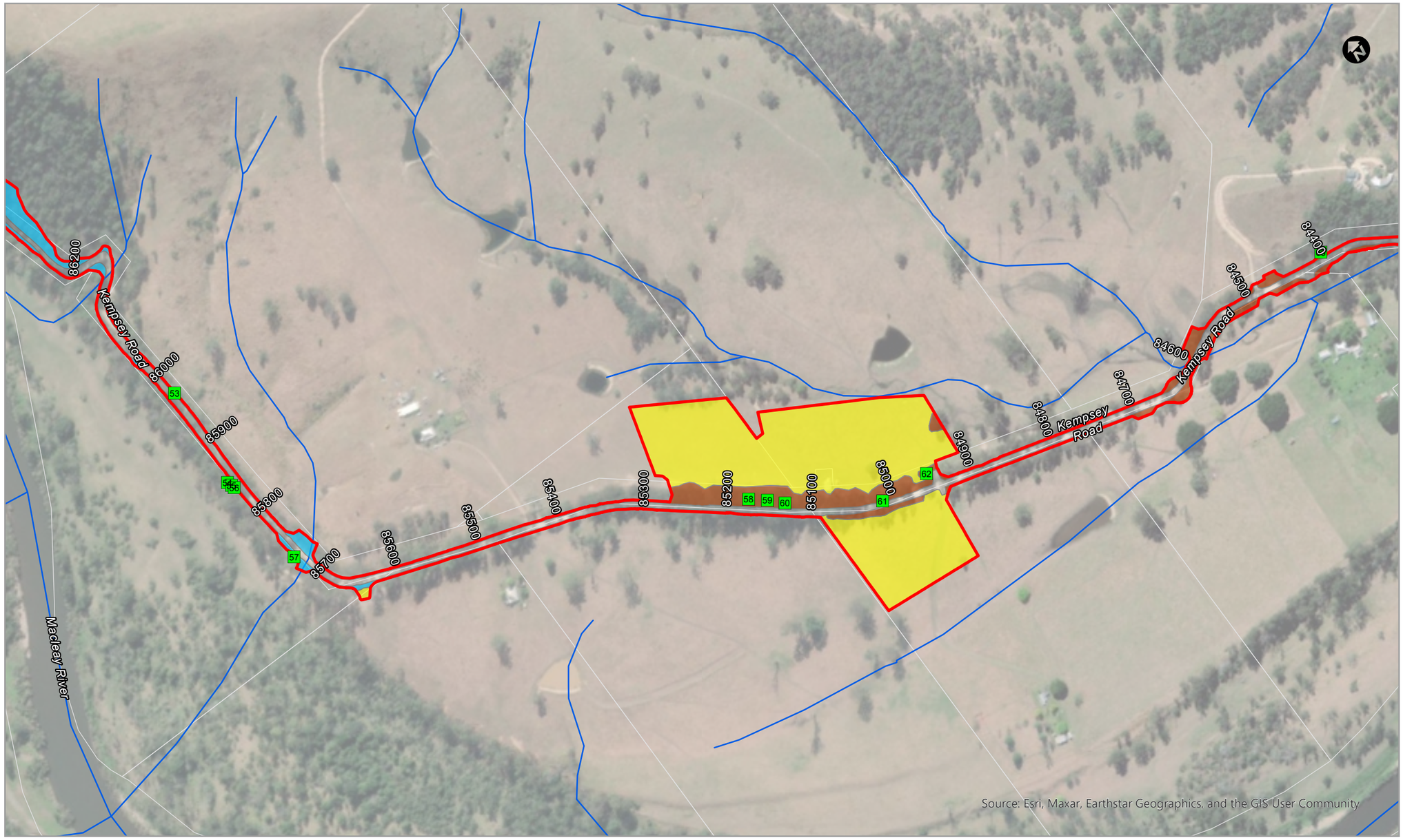
Map Sheet Location

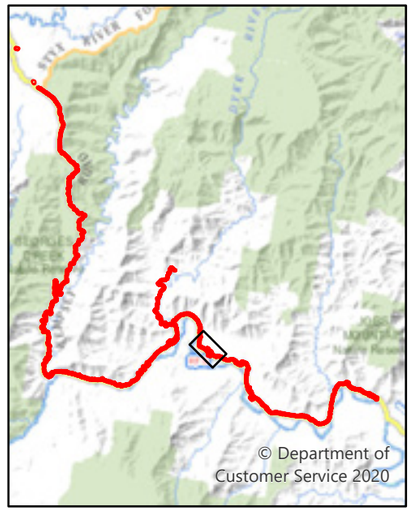
LEGEND

- Activity boundary
- Cadastre
- Cleared
- PCT 3240 - Lower North Escarpment Red Gum Grassy Forest
- PCT 3251 - Northern Gorges Diverse Grassy Forest
- PCT 4073 - Lower North Hinterland River Oak Forest
- Lantana infestation
- Watercourse
- Habitat tree

0 100 Meters

Information shown is for illustrative purposes only
Drawn by: AB Checked by: RE Reviewed by: BJM
Source of base data: ESRI World Imagery
Date: 14/11/2023
Revision: D



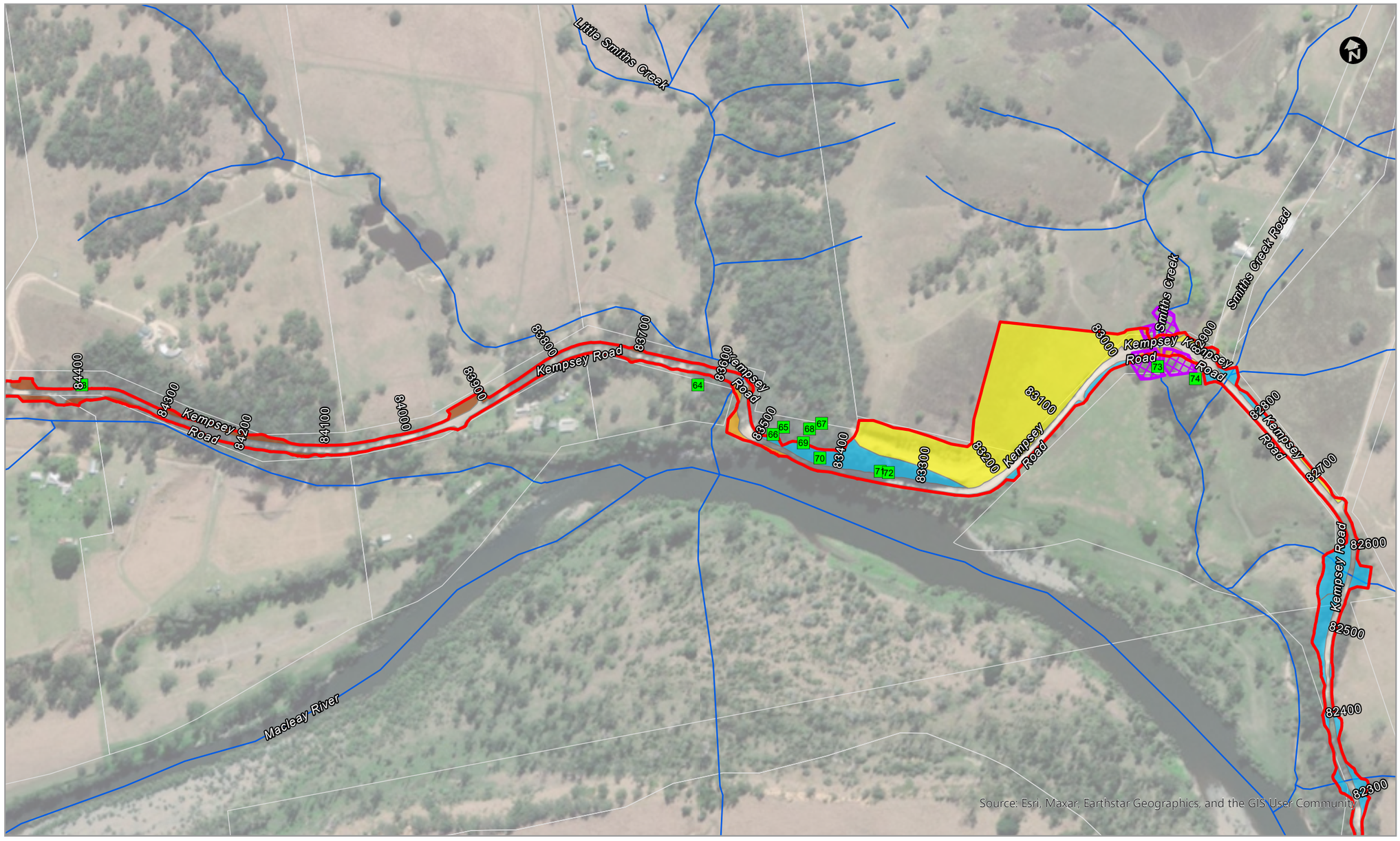


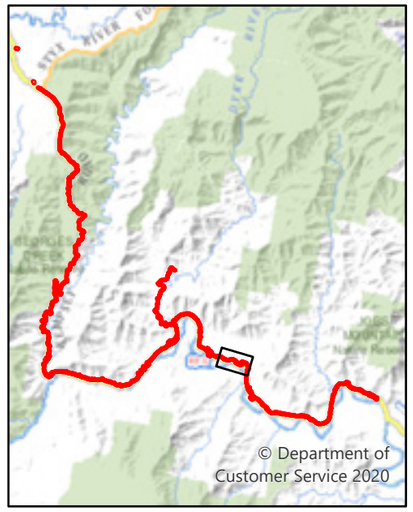
Map Sheet Location

LEGEND

- Activity boundary
- Cadastre
- Cleared
- PCT 3240 - Lower North Escarpment Red Gum Grassy Forest
- PCT 3251 - Northern Gorges Diverse Grassy Forest
- Lantana infestation
- Watercourse
- Habitat tree

0 100 Meters





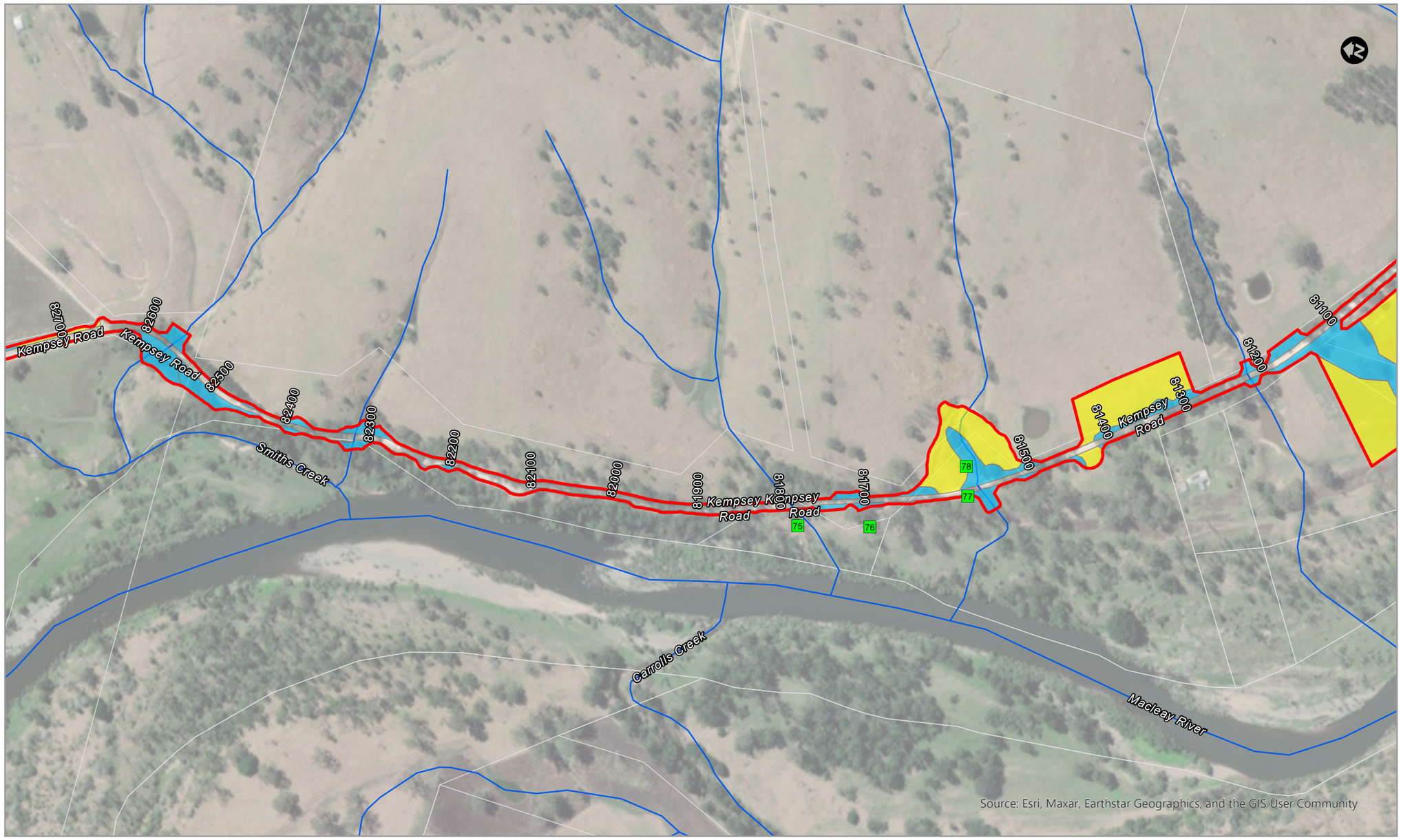
Map Sheet Location

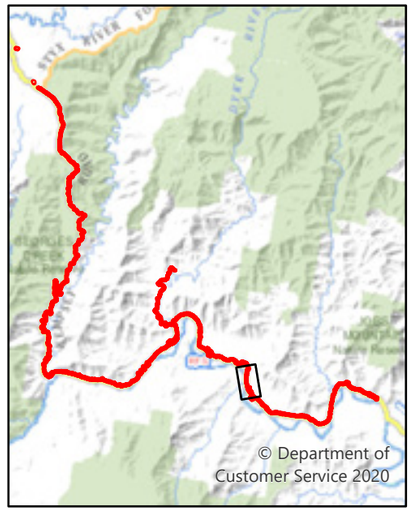
LEGEND

- Activity boundary
- Cadastre
- Cleared
- PCT 3240 - Lower North Escarpment Red Gum Grassy Forest
- PCT 3251 - Northern Gorges Diverse Grassy Forest
- PCT 4073 - Lower North Hinterland River Oak Forest
- Lantana infestation
- Watercourse
- Habitat tree

0 100 Meters

Information shown is for illustrative purposes only
Drawn by: AB Checked by: RE Reviewed by: BJM
Source of base data: ESRI World Imagery
Date: 14/11/2023
Revision: D





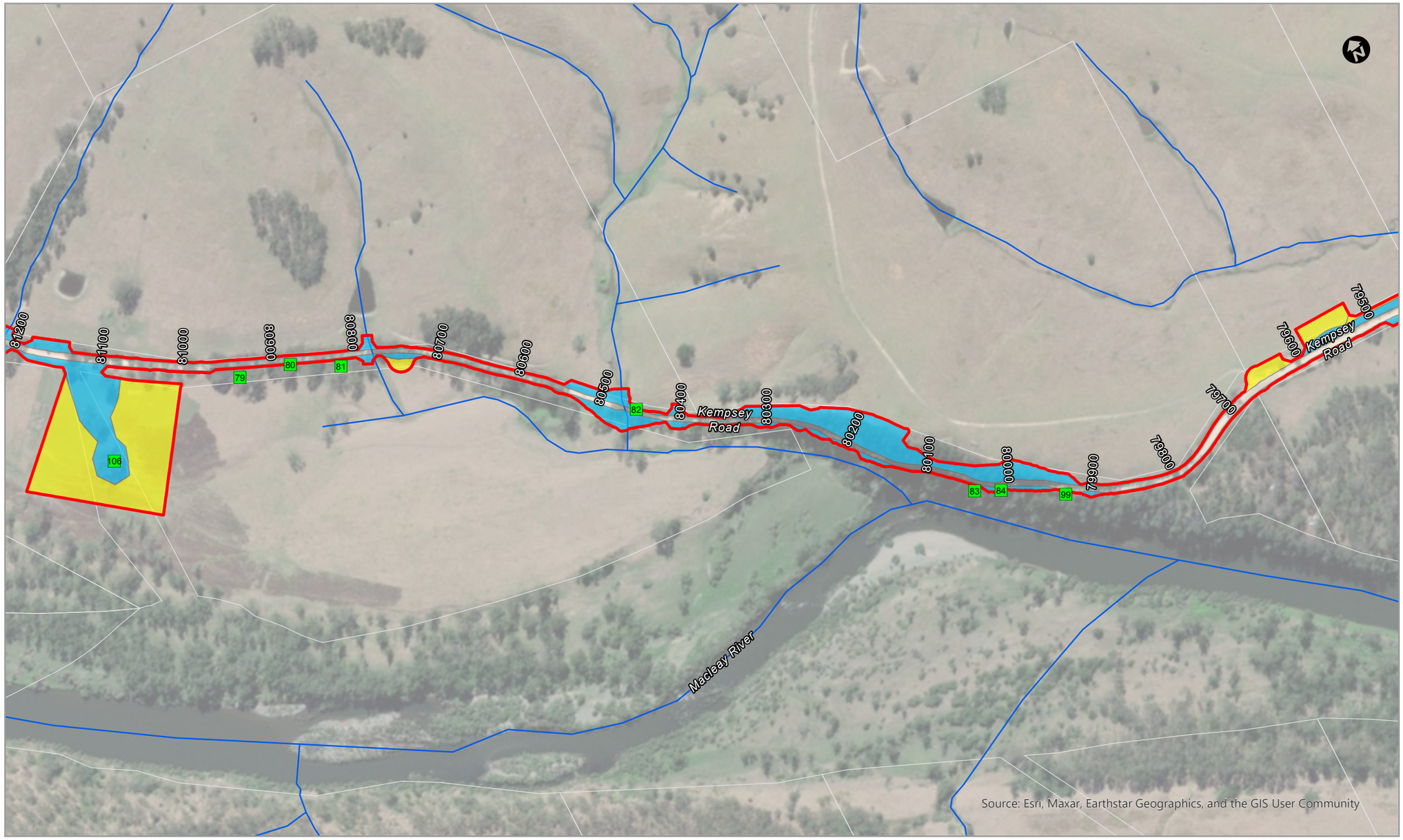
Map Sheet Location

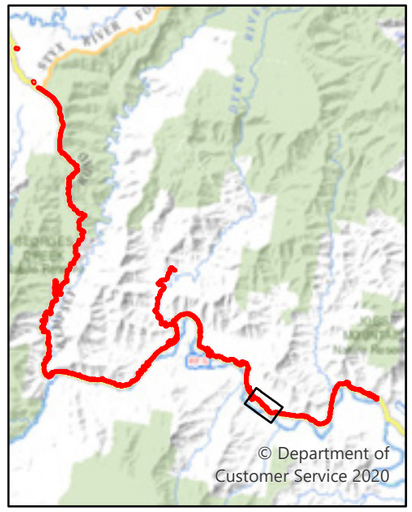
LEGEND

- Activity boundary
- Cadastre
- Cleared
- PCT 3240 - Lower North Escarpment Red Gum Grassy Forest
- Lantana infestation
- Watercourse
- Habitat tree

0 100 Meters

Information shown is for illustrative purposes only
Drawn by: AB Checked by: RE Reviewed by: BJM
Source of base data: ESRI World Imagery
Date: 14/11/2023
Revision: D





Map Sheet Location

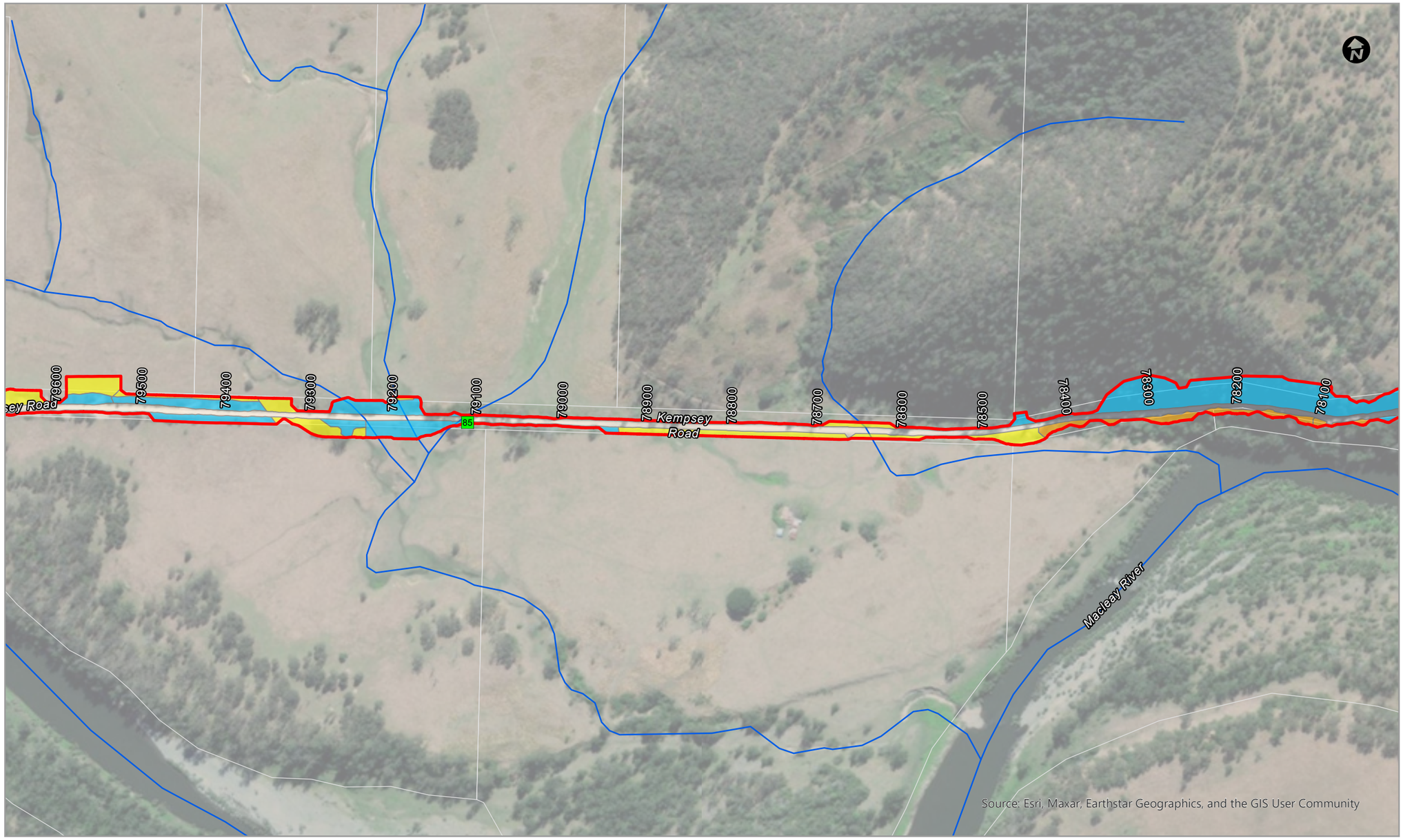
LEGEND

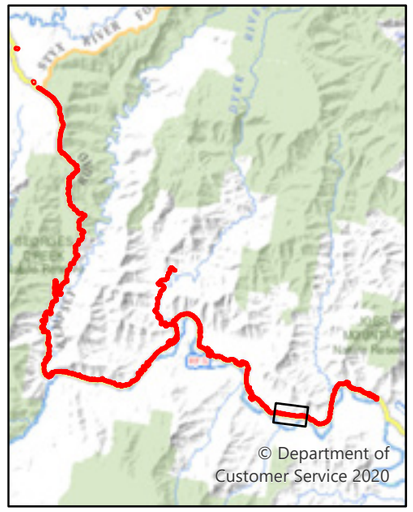
- Activity boundary
- Cadastre
- Cleared
- PCT 3240 - Lower North Escarpment Red Gum Grassy Forest
- Lantana infestation
- Watercourse
- Habitat tree

0 100 Meters

Vegetation Mapping
Illustration 3.1 - Sheet 21 of 27

Information shown is for illustrative purposes only
Drawn by: AB Checked by: RE Reviewed by: BJM
Source of base data: ESRI World Imagery
Date: 14/11/2023
Revision: D





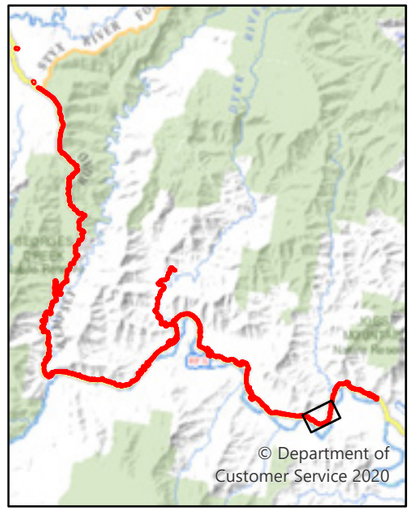
Map Sheet Location

LEGEND

- Activity boundary
- Cadastre
- Cleared
- PCT 3240 - Lower North Escarpment Red Gum Grassy Forest
- PCT 4073 - Lower North Hinterland River Oak Forest
- Lantana infestation
- Watercourse
- Habitat tree

0 100 Meters

Information shown is for illustrative purposes only
Drawn by: AB Checked by: RE Reviewed by: BJM
Source of base data: ESRI World Imagery
Date: 14/11/2023
Revision: D



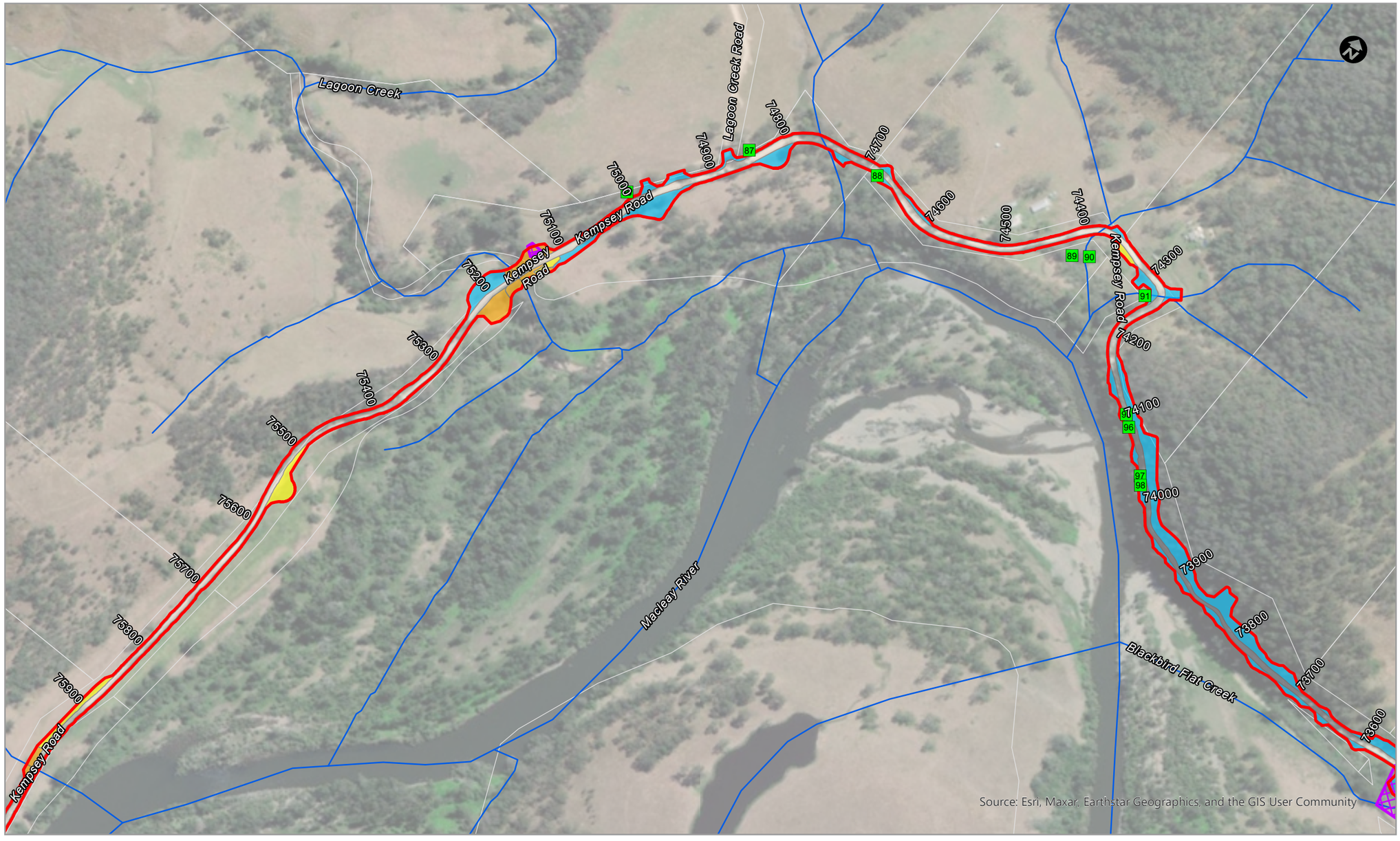
Map Sheet Location

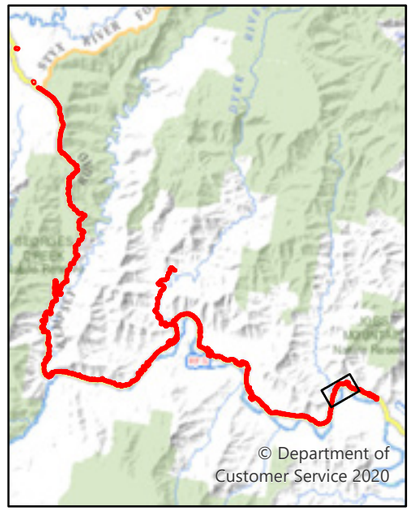
LEGEND

- Activity boundary
- Cadastre
- Cleared
- PCT 3240 - Lower North Escarpment Red Gum Grassy Forest
- PCT 4073 - Lower North Hinterland River Oak Forest
- Lantana infestation
- Watercourse
- Habitat tree

0 100 Meters

Information shown is for illustrative purposes only
Drawn by: AB Checked by: RE Reviewed by: BJM
Source of base data: ESRI World Imagery
Date: 14/11/2023
Revision: D





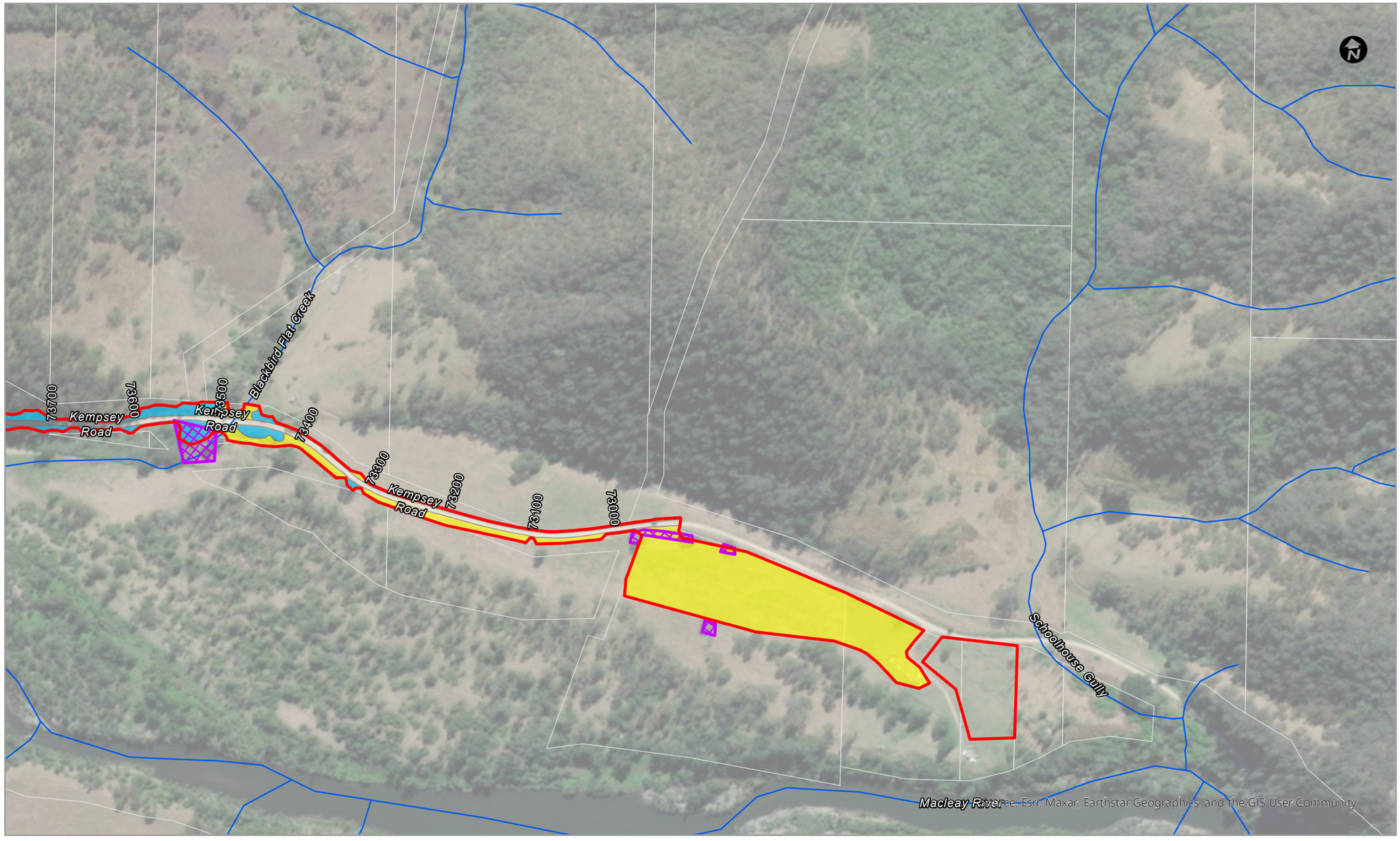
Map Sheet Location

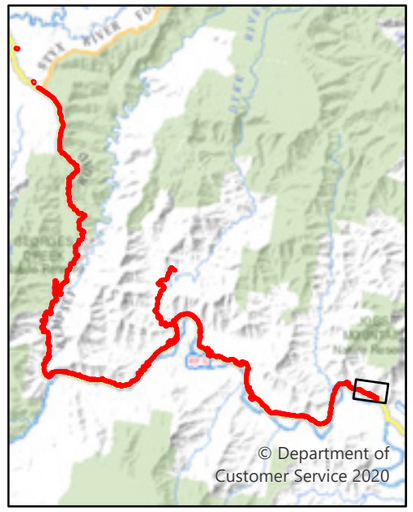
LEGEND

- Activity boundary
- Cadastre
- Cleared
- PCT 3240 - Lower North Escarpment Red Gum Grassy Forest
- PCT 4073 - Lower North Hinterland River Oak Forest
- Lantana infestation
- Watercourse
- Habitat tree

0 100 Meters

Information shown is for illustrative purposes only
Drawn by: AB Checked by: RE Reviewed by: BJM
Source of base data: ESRI World Imagery
Date: 14/11/2023
Revision: D





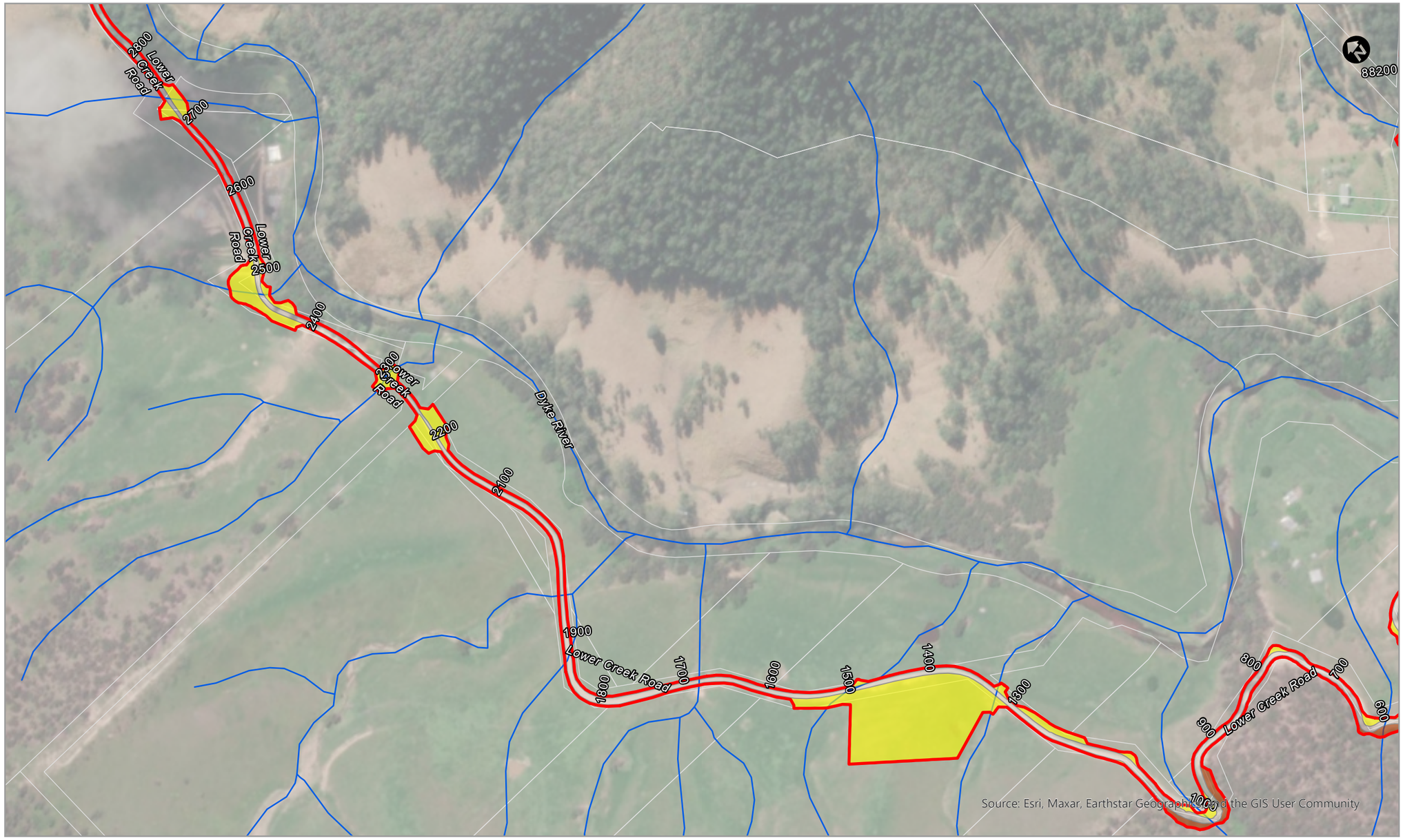
Map Sheet Location

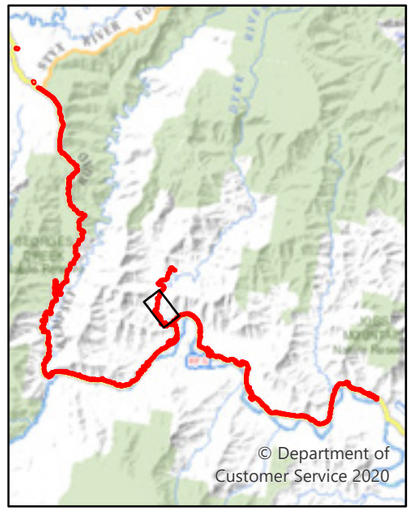
LEGEND

- Activity boundary
- Cadastre
- Cleared
- PCT 3240 - Lower North Escarpment Red Gum Grassy Forest
- Lantana infestation
- Watercourse
- Habitat tree

0 100 Meters

Information shown is for illustrative purposes only
Drawn by: AB Checked by: RE Reviewed by: BJM
Source of base data: ESRI World Imagery
Date: 14/11/2023
Revision: D





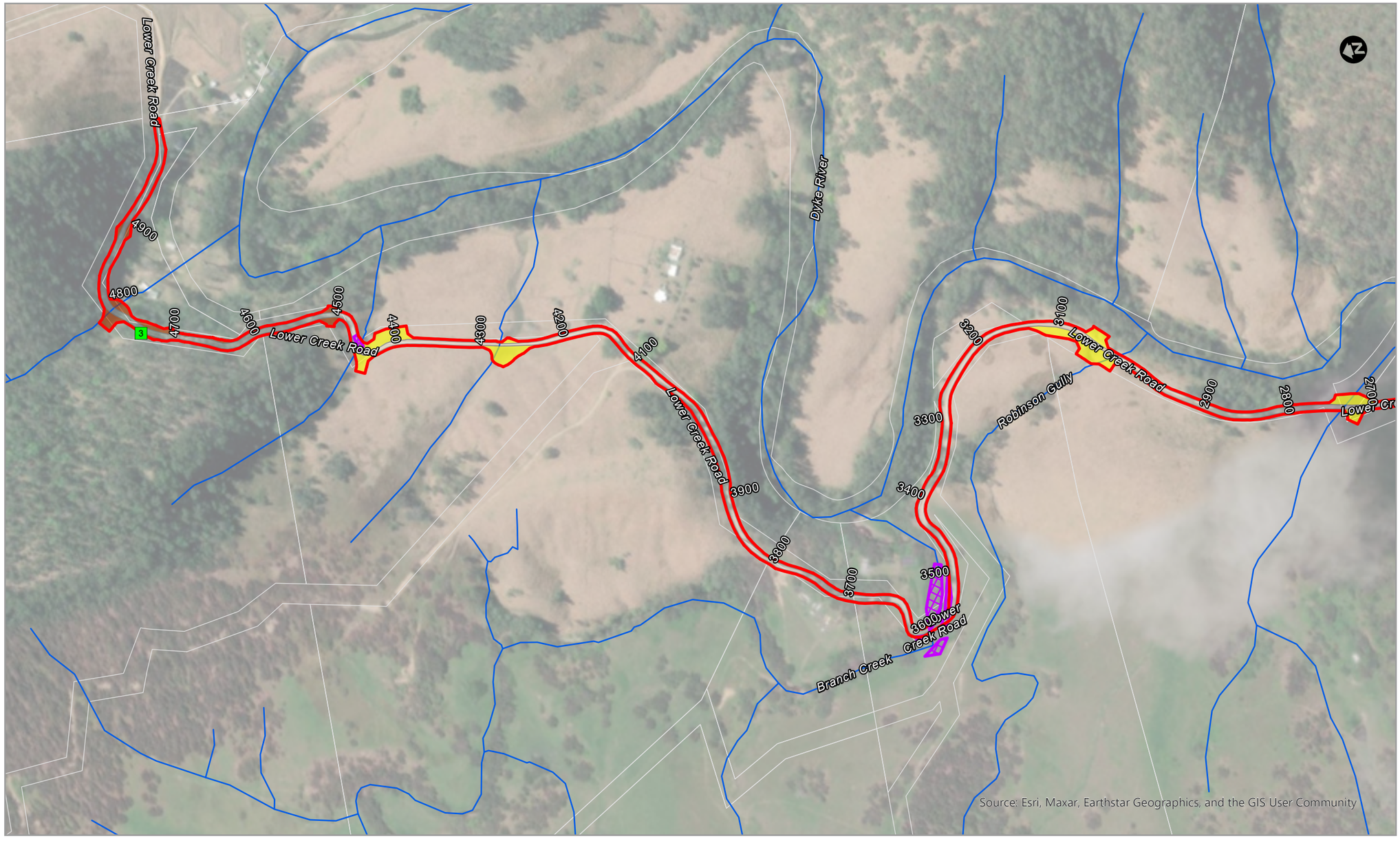
Map Sheet Location

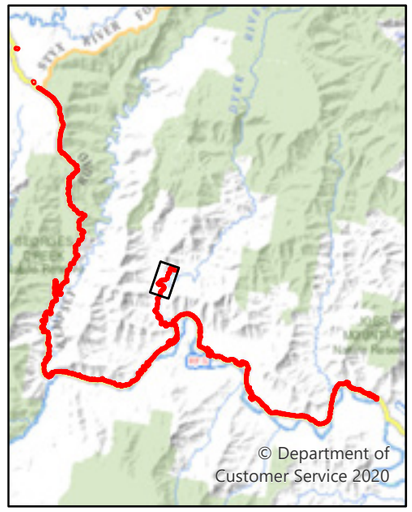
LEGEND

- Activity boundary
- Cadastre
- Cleared
- PCT 3240 - Lower North Escarpment Red Gum Grassy Forest
- PCT 3251 - Northern Gorges Diverse Grassy Forest
- Lantana infestation
- Watercourse
- Habitat tree

0 100 Meters

Information shown is for illustrative purposes only
Drawn by: AB Checked by: RE Reviewed by: BJM
Source of base data: ESRI World Imagery
Date: 14/11/2023
Revision: D





Map Sheet Location

LEGEND

- Activity boundary
- Cadastre
- Cleared
- PCT 3240 - Lower North Escarpment Red Gum Grassy Forest
- PCT 3251 - Northern Gorges Diverse Grassy Forest
- PCT 4073 - Lower North Hinterland River Oak Forest
- Lantana infestation
- Watercourse
- Habitat tree

0 100 Meters

Information shown is for illustrative purposes only
Drawn by: AB Checked by: RE Reviewed by: BJM
Source of base data: ESRI World Imagery
Date: 14/11/2023
Revision: D

Plate 3.1 PCT 3205 Northern Escarpment New England Blackbutt-Tallowwood Wet Forest

Plate 3.2 PCT 3251 Northern Gorges Diverse Grassy Forest

Plate 3.3 PCT 3240 Lower North Escarpment Red Gum Grassy Forest

Plate 3.4 PCT 4073 Lower North Hinterland River Oak Forest

3.2.2 Threatened Flora

No threatened flora species listed under the BC Act or EPBC Act were recorded at the site.

Based on the desktop analysis and habitats present, the following threatened flora species have at least a moderate potential to occur at the site (refer to potential occurrence assessment in **Appendix C**):

- White-flowered Wax Plant (*Cynanchum elegans*).
- Slender Milkvine (*Marsdenia longiloba*).
- Cryptic Forest Twiner (*Tylophora woollsii*).
- Nightcap Plectranthus (*Plectranthus nitidus*).
- Trailing Woodruff (*Asperula asthenes*).

3.2.3 Threatened Ecological Communities

None of the vegetation communities occurring at the site is consistent with the characteristics of any TECs listed under the BC Act or EPBC Act.

3.2.4 Priority Weeds

The site includes a number of agricultural and environmental weeds as well as the following Priority Weeds as listed in the Biosecurity Act 2015:

- Fireweed (*Senecio madagascariensis*) - minor infestation in the roadside verge.
- Annual Ragweed (*Ambrosia artemisiifolia*) - minor infestation in the roadside verge.
- Lantana (*Lantana camara*) - minor infestations in all communities.
- Noogoora Burr (*Xanthium occidentale*) - common in the roadside verge, particularly close to the river.
- Cat's Claw Creeper (*Dolichandra unguis-cati*) - minor to moderate infestation in between CH 78200-73100 in PCT 4073, gully vegetation and rock cut batter vegetation.
- Madeira Vine (*Anredera cordifolia*) - minor to moderate infestation in PCT 4073 gully vegetation.
- Small-leaved Privet (*Ligustrum sinense*) - minor occurrence in gullies.
- Blackberry (*Rubus fruticosus spp. agg.*) - minor occurrence throughout the site.
- Tropical soda apple (*Solanum viarum*) - minor occurrence throughout the site.

Relevant biosecurity duties must be enacted by land managers for weeds listed as Priority Weeds under the *Biosecurity Act 2015*.

4. Fauna Habitat

4.1 Desktop Analysis

BioNet search results identified records of 47 threatened fauna species listed under the BC Act (including fifteen species listed in the EPBC Act) within the search area.

Protected Matters Search Tool results identified:

- Habitat for 39 threatened fauna species within 10 km of the site; and
- Habitat for 15 migratory fauna species within 10 km of the site.

A potential occurrence assessment was undertaken for threatened fauna species derived from the database searches (refer to **Appendix C**).

4.2 Site Features

4.2.1 Habitat Values

The site has habitat features for native fauna in the form of foraging and breeding habitat (including potential habitat for several threatened fauna species). The foraging habitat has been subjected to past disturbances including clearing, weed infiltration, stock grazing and road construction and maintenance.

4.2.1.1 Hollow-bearing Trees, Nests, and Features

Up to thirty-one hollow-bearing trees (HBTs), two trees containing stick nests and one tree containing a fissure would be affected by the works. Refer to summary at **Table 4.1** and list of trees at **Appendix D**.

An additional 75 hollow-bearing trees and/or nests were identified at the site (refer to **Appendix D**). No possum dreys were identified at the site.

The Macleay River is adjacent to the site and provides riparian and aquatic habitat to a range of fauna species including potential threatened fauna species (e.g. White-bellied Sea-Eagle). The riparian vegetation and aquatic habitat associated with this waterway will not be directly impacted by the Activity and safeguards provided in this report and the corresponding REF would minimise the risk of indirect impacts. Tributaries and waterways associated with the site are discussed in **Section 4.2.1.3**.

Table 4.1 Habitat Trees Within Construction Boundary

Tree ID	Common name	Scientific Name	Hollow-bearing tree	Tree Height (m)	DBH (cm)	Total Hollows	Nests
Kempsey Road							
25	Forest Red Gum	*Eucalyptus tereticornis*	Yes	25	60	1	-
30	Stag	-	Yes	15	60	2	-
38	Spotted Gum	*Corymbia maculata*	Yes	20	100	2	-
43	Forest Red Gum	*Eucalyptus tereticornis*	Yes	18	140	1	1
45	Forest Red Gum	*Eucalyptus tereticornis*	Yes	18	80	2	-
47	Forest Red Gum	*Eucalyptus tereticornis*	Yes	18	70	1	-
48	Forest Red Gum	*Eucalyptus tereticornis*	Yes	18	70	1	-

Tree ID	Common name	Scientific Name	Hollow-bearing tree	Tree Height (m)	DBH (cm)	Total Hollows	Nests
Kempsey Road							
51	Forest Red Gum	*Eucalyptus tereticornis*	Yes	10	30	1	-
52	Stag	-	Yes	8	40	1	-
53	Forest Red Gum	*Eucalyptus tereticornis*	Yes	6	60	1	-
58	Stag	-	Yes	12	100	1	-
59	Spotted Gum	*Corymbia maculata*	Yes	22	200	2	-
60	Spotted Gum	*Corymbia maculata*	Yes	18	100	2	-
61	Spotted Gum	*Corymbia maculata*	Yes	14	200	0	1
62	Spotted Gum	*Corymbia maculata*	Yes	16	150	1	-
70	Rough-barked Apple	*Angophora floribunda*	Yes	15	80	1	-
71	Stag	-	Yes	10	80	1	-
72	Stag	-	Yes	15	100	1	-
78	Forest Red Gum	*Eucalyptus tereticornis*	Yes	30	120	1	-
82	Forest Red Gum	*Eucalyptus tereticornis*	No	16	100	0	1
85	Broad-leaved Apple	*Angophora subvelutina*	Yes	12	100	1	-
95	Rough-barked Apple	*Angophora floribunda*	Yes	15	50	1	-
96	Stag	-	Yes	6	60	1	-
97	River Oak	*Casuarina cunninhamiana*	No	13	40	0	-
98	Stag	-	Yes	5	40	1	-
99	Rough-barked Apple	*Angophora floribunda*	Yes	12	40	1	-
100	A Fig	*Ficus sp.*	Yes	18	80	1	-
101	Forest Red Gum	*Eucalyptus tereticornis*	Yes	20	100	1	-
102	Forest Red Gum	*Eucalyptus tereticornis*	Yes	14	60	3	-
103	Spotted Gum	*Corymbia maculata*	Yes	15	30	1	-
106	Eucalyptus	*Eucalyptus sp.*	Yes	25	80	2	-
Lower Creek Road							
1	Spotted Gum	*Corymbia maculata*	Yes	12	60	1	-
3	Broad-leaved Apple	*Angophora subvelutina*	Yes	10	30	1	-

4.2.1.2 Culverts – Microbat Assessment

A total of 193 culverts were assessed for potential microbat habitat (refer to **Appendix E**). Thirty-seven could not be located and surveyed. Based on the expected location these culverts are likely buried and of low habitat value or new proposed culverts that have existing DM identification numbers. It should also be noted this assessment was done outside of the overwintering period for Large Bent-winged Bat and Little Bent-winged Bat. All culverts were assessed using the criteria outlined in **Table 4.2**.

Key findings from the microbat assessment include:

- Ten culverts offer conservation/ habitat value as opportunistic roosting sites for microbats and are listed in **Table 4.3**.
- Only one culvert was occupied at the time of the inspection (culvert DM01007), which supported five Southern Myotis (*Myotis Macropus*). This species is listed as a threatened species under the NSW BC Act.
- Five culverts did not contain microbats, however showed evidence of usage (guano, bat bugs/staining).
- No culverts showed evidence of significant microbat roosting or likely breeding usage.

With the implementation of relevant safeguards, the Activity is expected to have a low risk of injury/mortality to native fauna during culvert works; and habitat values would be retained by maintained culvert lift holes and cell joins in new culverts or installed artificial habitat structures.

Table 4.2 Drainage Structure Conservation/ Habitat Value Categories

Conservation/ Habitat Value Category	Criteria
High	■ Known to provide breeding habitat for threatened species (i.e. Large-footed Myotis); or ■ Known to provide non-breeding roosting habitat for large numbers (ie. >50) of threatened species (e.g. known to support large numbers of Bentwing bats over winter); or ■ Supports one or more of the federally listed Large-eared Pied Bat.
Medium	■ Does not satisfy high conservation/ habitat value category; ■ Provides non-breeding roosting habitat for small numbers (ie. <20) of threatened species; or ■ Medium to large guano accumulations and/ or stains present indicative of the occurrence of moderate numbers of microbats or medium to long-term usage (threatened/ non-threatened status unknown); or ■ Potentially suitable for breeding Large-footed Myotis. For example, access under bridge/ into culvert >500 mm diameter, presence of large cavities (e.g. >20 mm wide and >100 mm deep), directly adjacent to/ over open water, low inundation susceptibility; or ■ Supports protected cavities providing good potential long term roosting habitat; however, no bats or evidence of roosting bats present; and/or ■ In proximity to open surface water, however provides mainly exposed roosting opportunities (e.g. cavities <50 mm deep, or rough concrete), offering limited potential for breeding roosting; and/or ■ Supports a breeding colony of non-threatened microbats.
Low	■ Does not satisfy high or medium conservation/ habitat value categories; and ■ Individual microbats or very small numbers of non-breeding microbats (e.g. <5) present; or ■ Small guano accumulations and/ or stains present indicative of the occurrence of small numbers of microbats or short-term usage; or ■ Provides mainly exposed roosting opportunities (e.g. cavities <50 mm deep, or rough concrete) offering limited potential for use as breeding habitat; or ■ Not in proximity to open water.
Nil	■ No evidence of microbat activity (no guano, stains, or bugs); and/or ■ No roosting habitat present

Table 4.3 Culverts Identified as having Conservation/ Habitat Value

ID Number	Date Surveyed	Feature	No. of Cells	Approximate Culvert Diameter (mm)	Microbat Evidence	Conservation/ Habitat Value Category	Comments	Inspection required?	Photo
DM00984	18/10/2023	Pipe culvert	1	975	Nil	Low	Small joint gaps and rough concrete	Yes	
DM00992	18/10/2023	Pipe culvert	3	900	Guano	Low	Microbat guano observed within the culvert. Lift holes present	Yes	
DM00061	18/10/2023	Pipe culvert	6	1200	Bat bugs obserbed in lift holes	Low	One unknown microbat observed in previous inspection of the culvert	Yes	

ID Number	Date Surveyed	Feature	No. of Cells	Approximate Culvert Diameter (mm)	Microbat Evidence	Conservation/ Habitat Value Category	Comments	Inspection required?	Photo
DM01007	18/10/2023	Pipe culvert	3	1050	Five Southern Myotis (*Myotis macropus*) bats roosting in lift holes	Medium	-	Yes	 
DM01011	19/10/2023	Pipe culvert	2	1050	Guano	Low	Small joint gaps and rough concrete	Yes	
DM00915	19/10/2023	Pipe culvert	1	1200	Nil	Low	Joint gaps and Lift holes present	Yes	

ID Number	Date Surveyed	Feature	No. of Cells	Approximate Culvert Diameter (mm)	Microbat Evidence	Conservation/ Habitat Value Category	Comments	Inspection required?	Photo
DM01023	19/10/2023	Pipe culvert	1	1200	Nil	Low	Joint gaps and Lift holes present	Yes	
C100.907	19/10/2023	Pipe culvert	1	1050	Guano	Low	Joint gaps	Yes	
DM01036	19/10/2023	Pipe culvert	2	1050	Nil	Low	Joint gaps. Microbat evidence found in previous 2021 site visit	Yes	

ID Number	Date Surveyed	Feature	No. of Cells	Approximate Culvert Diameter (mm)	Microbat Evidence	Conservation/ Habitat Value Category	Comments	Inspection required?	Photo
DM00868	18/10/2023	Pipe culvert	1	750	Guano	Low	Joint gaps	Yes	

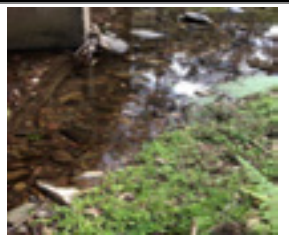
4.2.1.3 Aquatic Habitat

Waterways at the site range from lower order creeks and gullies (1st and 2nd order streams) to higher order rivers (>4). The site is largely in proximity to the Macleay River (within 100 m) which is a >4th order waterway. Select waterways are mapped as DPI Key Fish Habitat (Northern Rivers Region) and a subset of these are mapped as potential habitat for the Purple Spotted Gudgeon (*Mogurnda adspersa*) (refer to **Table** 4**.**4).

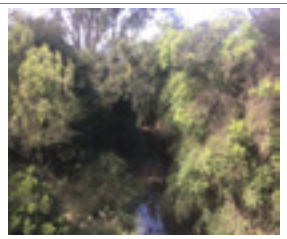
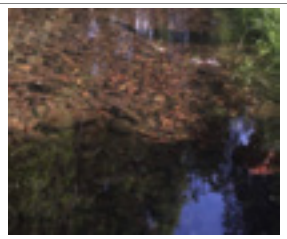
No other species, populations or ecological communities listed under FM Act were recorded at, or in proximity to the site. While works are proposed in the waterways for the purpose of scour protection and culvert works, any potential impacts to the waterways can be managed by way of effective implementation of erosion and sediment controls (refer to **Section 5.2**).

A total of 20 waterways mapped as FM Act Key Fish Habitat occur at the site and are outlined in **Table** 4**.**4.

Table 4.4 Habitat Condition of Mapped Key Fish Habitat at the Site

Road	Chain-age	Waterway	Impact	Strahler stream order	DPI Mapped Threatened Fish Habitat	Upstream	Downstream	Substrate	Adjacent land use
Armidale-Kempsey Road	104600	Little Georges Creek	Nil	5	None				
	102900	Tibbs Gully	Nil	3	None				
	101700	Cherry Tree Gully	Pipe culvert replacement	3	None				
	101200	Fosters Gully	Pipe culvert replacement	3	None				

Road	Chain-age	Waterway	Impact	Strahler stream order	DPI Mapped Threatened Fish Habitat	Upstream	Downstream	Substrate	Adjacent land use
	9940-0	Georges Creek	Bridge scour protection	6	Southern Purple Spotted Gudgeon				
	91300	Middle Creek	Bridge scour protection	4	None				
	89400	Unnamed	Nil	3	None				
	88700	Dyke River	Bridge scour protection	5	Southern Purple Spotted Gudgeon				

Road	Chain-age	Waterway	Impact	Strahler stream order	DPI Mapped Threatened Fish Habitat	Upstream	Downstream	Substrate	Adjacent land use
	88000	Unnamed	Pipe culvert replacement	3	None				
	83700	Little Smiths Creek	Nil	4	None				
	83000	Smiths Creek	Bridge scour protection	5	None				
	80500	Unnamed	Pipe culvert replacement	3	None				
	79200	Unnamed	Pipe culvert replacement	3	None				-

Road	Chain-age	Waterway	Impact	Strahler stream order	DPI Mapped Threatened Fish Habitat	Upstream	Downstream	Substrate	Adjacent land use
	79100	Unnamed	Pipe culvert replacement	4	None			-	
	76400	Unnamed	Nil	3	None	Assessed in previous study (GeoLINK 2021; Ref. No. 4078-1011)			
	75200	Lagoon Creek	Bridge scour protection	5	Southern Purple Spotted Gudgeon				
	73500	Blackbird Flat Creek	Bridge scour protection	4	None				
Lower Creek Road	1900	Unnamed	Pipe culvert replacement	4	None				

Road	Chain-age	Waterway	Impact	Strahler stream order	DPI Mapped Threatened Fish Habitat	Upstream	Downstream	Substrate	Adjacent land use
	3100	Robinsons Gully	Pipe culvert replacement	2	None				
	3600	Branch Creek	Bridge scour protection	4	Southern Purple Spotted Gudgeon				

4.2.2 Connectivity

The landscape at the locality consists of a mosaic of areas of remnant and regrowth native vegetation and cleared areas that are mostly used for stock grazing. In general, native vegetation occurring at the site is connected with adjacent large patches of native vegetation, or along linear riparian vegetation of the Macleay River. The Armidale-Kempsey Road and Lower Creek Road broadly follows the Macleay River in the locality, with the road being closest to the river around hills where the landform is the steepest. The cleared corridor of Armidale-Kempsey Road and Lower Creek Road is predominantly narrow (<10 m), but nonetheless the road corridor results in a minor break in continuity between vegetation within the riparian zone of the Macleay River and the hills and ranges further upslope. Fauna groups would have no difficulty in accessing habitats dissected by the road.

4.2.3 Threatened and Significant Fauna Habitat

The site constitutes a linear area along an existing road corridor. The fauna habitats within the site are associated with larger areas of riparian or forest habitats in the broader locality. Based on the desktop analysis and habitats present on site, the following threatened fauna species have at least a moderate potential to occur at the site (refer to potential occurrence assessment at **Appendix C**):

- Waterways provide foraging and breeding habitat for the following frogs: Davies' Tree Frog, Glandular Frog, Stuttering Frog, and Sphagnum Frog.
- Foraging and nesting habitat for the following birds: Speckled Warbler, Brown Treecreeper, Varied Sittella, Little Lorikeet, Black-chinned Honeyeater (eastern subspecies), Scarlet Robin, and Flame Robin.
- Foraging habitat for the following birds: Regent Honeyeater, Glossy Black-Cockatoo, and Wompoo Fruit Dove.
- Foraging habitat for the following forest owls: Masked Owl, Powerful Owl, Barking Owl and Sooty Owl.
- Broadly suitable habitat with high use Koala food trees available in the study area (NSW Office of Environment and Heritage 2018). However, no evidence of usage at the site (scat searches/ scratches on trunks).
- Foraging habitat for birds of prey: White-bellied Sea Eagle, Square-tailed Kite, and Eastern Osprey. No nests occur on or adjacent to the site.
- Foraging habitat for the Spotted-tailed Quoll (as part of a much larger foraging home range).
- Foraging and/or roosting habitat for the following microbats: Greater Broad-nosed Bat, Golden-tipped Bat, Eastern Coastal Free-tailed Bat, Yellow-bellied Sheathtail Bat, Eastern Cave Bat and Eastern False Pipistrelle.
- Foraging habitat for the Grey-headed Flying-fox.
- Foraging and denning habitat for the Yellow-bellied Glider, Greater Glider, Squirrel Glider and Brush-tailed Phascogale.
- Potential habitat for New Holland Mouse and Hastings River Mouse.
- Foraging and roosting habitat for the Large and Little Bent-winged Bat (non-breeding) and Southern Myotis within culvert structures.
- Potential habitat for Parma Wallaby, Brush-tailed Rock Wallaby, and Long-nosed Potoroo.

The habitats on site are not significant in the context of the surrounding habitat and it is unlikely that any local threatened species populations would be exclusively dependant on the habitat at the site to satisfy their lifecycle needs.

Southern Myotis was the only threatened species recorded during the field survey (refer to **Section 4.2.1.2**. No other threatened fauna species listed under the BC Act or EPBC Act were recorded in the site.

No migratory species listed under the EPBC Act were recorded.

5. Impacts and Mitigation

5.1 Potential Impacts of the Activity

Potential biodiversity impacts of the Activity are discussed below.

5.1.1 Habitat Removal

The Activity would require the removal of native vegetation from four PCTs, these include:

- *PCT 3205 - Northern Escarpment New England Blackbutt-Tallowwood Wet Forest* - removal of up to 4.03 ha across CH 113300-118800 (Armidale-Kempsey Road).
- *PCT 4073 - Lower North Hinterland River Oak Forest* - removal of up to 2.59 ha across CH 75200-99400 (Armidale-Kempsey Road) and CH 3600 (Lower Creek Road).
- *PCT 3251 Northern Gorges Diverse Grassy Forest* - removal of up to 15.24 ha across CH 83800-113500 (Armidale-Kempsey Road) and CH400-4600 (Lower Creek Road).
- *PCT 3240 - Lower North Escarpment Red Gum Grassy Forest* - removal of up to 27.11 ha across CH 73300-98600 (Armidale-Kempsey Road) and CH 2800 (Lower Creek Road).

In relation to specific fauna habitat features, the Activity would remove:

- 46.38 ha of sclerophyll forest (PCTs 3205, 3251, 3240).
- 2.59 ha of riparian woodland (PCT 4073).
- 31 hollow-bearing trees, two trees containing stick nests and one tree containing a fissure.
- 193 culverts (temporary impact only as new culverts would be installed).
- Localised instream works at seven waterways.

Impacts of the Activity on potentially occurring threatened fauna species are provided in the ToS assessments in **Appendix F** and **Appendix G**

5.1.2 Injury/ Mortality of Native Fauna

During the works there is a risk of adverse impacts relating to injury/ mortality to native fauna, particularly in relation to removal of native vegetation and culvert works (refer to **4.2.1.2**). Mitigation measures are recommended, specifically for the purpose of minimising the risk of injury/ mortality during these works.

5.1.3 Erosion and Sedimentation of Waterways

There is a risk of erosion and sedimentation impacts during the construction phase of the project, particularly when working in proximity to riparian zones and drainage features (e.g. culverts). Standard erosion and sediment controls would be implemented during construction, particularly where excavation is required in proximity to waterways. These provisions are provided in the corresponding REF.

5.1.4 Introduction of Weeds and Pathogens

There is a risk of spreading or introducing declared and environmental weeds when disturbing the ground during construction and bringing in propagules on plant, equipment, materials and personnel. This would include the potential introducing or facilitating the spread of weeds listed under the *Biosecurity Act 2015*. Plant (Phytophthora [*Phytophthora cinnamomic*] and Myrtle Rust [caused by the

fungus *Puccinia psidii*]) and fauna pathogens (chytrid fungus [*Batrachochytrium dendrobatidis*]) can also be introduced and spread by contaminated materials. Provisions to reduce this risk are provided in **Section 5.2**.

5.2 Mitigation Measures

The following mitigation measures outlined in **Table 5.1** are recommended to minimise the potential biodiversity impacts of the Activity. These would occur in associated with the management measures detailed in the project's REF.

Table 5.1 Mitigation Measures

Reference Number	Environmental safeguards	Responsibility	Timing
BD-01	Pre-clearing surveys will be undertaken in accordance with *Guide 1: Pre-clearing process* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA, 2011)**.**	Contactor	Pre-construction
BD-02	An Environmental Work Method Statement would be prepared for any instream works. It would include: ■ Assessment of the need for aquatic fauna salvage by a licenced aquatic ecologist. ■ Methods to manage water quality risks. ■ An erosion and sediment control plan.	Contractor	Pre-construction
BD-03	The works limit would be clearly delineated to prevent impacts to native vegetation and fauna habitat outside of the approved works footprint.	Contractor	Pre-construction
BD-04	Vegetation clearing/trimming is to be kept to the minimum extent needed to carry out the works.	Contactor	Detailed design / pre-construction
BD-05	The 10 culverts listed in **Table 4.3** would be subject to ecologist microbat inspections prior to commencing works to: ■ Determine the presence/absence of microbats, and if present, the number of animals, species and breeding status; and appropriate management option. ■ Remove and exclude microbats if present. ■ Prior to construction phase, install exclusion devices to prevent microbat access and roosting opportunities within the culvert (such as one-way valves, curtains and filling gaps and voids). The ecologist would be responsible for managing the animals' welfare and providing advice as appropriate. Key requirements include: ■ If breeding colonies are detected, works at that culvert may be delayed until outside of that species' breeding period (October to mid-April inclusive for the Southern Myotis). ■ Microbats would not be displaced during periods of torpor, cold or windy conditions.	Contactor	Detailed design / pre-construction

Reference Number	Environmental safeguards	Responsibility	Timing
	■ Exclusion may need to be installed at night after flyout if >10 animals are present. ■ Consideration of availability and potential need for alternative roosting habitat.		
BD-06	In new concrete culverts over 0.75 m diameter, the culvert cell joins and internal lift holes would be left open (i.e. not grouted), to retain microbat roost habitat post completion of the works. If not achievable artificial microbat habitat would be installed a minimum of one month prior to microbat exclusion and this would be completed in consultation with an ecologist regarding appropriate design and location.	Contactor	Detailed design / pre-construction
BD-07	Pruning of mature trees is to be in accordance with Part 5 of the Australian Standard 4373-2007 Pruning of amenity trees.	Contactor	Detailed design / pre-construction
BD-08	Declared weeds are to be managed according to requirements under the *Biosecurity Act 2015* and Guide 6 (Weed Management) of the *Roads and Maritime Services Biodiversity Guidelines 2011,* where required.	Contactor	Detailed design / pre-construction
BD-09	Fauna handling must be carried out in accordance with the requirements the *Roads and Maritime Services Biodiversity Guidelines - Guide 9 (Fauna Handling).*	Contactor	Detailed design / pre-construction
BD-10	If unexpected, threatened fauna or flora species are discovered, stop works immediately and follow the *Roads and Maritime Services Unexpected Threatened Species Find Procedure in the Roads and Maritime Services Biodiversity Guidelines 2011 – Guide 1 (Pre-clearing process).*	Contactor	Detailed design / pre-construction
BD-11	All pathogens (e.g. Chytrid, Myrtle Rust and Phytophthora) are to be managed in accordance with the *Roads and Maritime Services Biodiversity Guidelines - Guide 7 (Pathogen Management)* and *DECC Statement of Intent 1: Infection of native plants by Phytophthora cinnamomi (for Phytophthora).*	Contactor	Detailed design / pre-construction

6. Statutory Requirements

The following sections assess the findings of the site assessment with regard to relevant statutory requirements.

6.1 Biodiversity Conservation Act 2016 (BC Act)

This Biodiversity Assessment was prepared to assess for potential significant impacts on threatened species and communities, and their habitat, as is required under section 7.3 of the BC Act.

Based on the potential occurrence assessments for threatened species, five-part ToS were conducted (refer to **Appendix F**) and concluded that the Activity would be unlikely to have a significant impact on any threatened flora or fauna species, or TECs listed under the BC Act. Therefore, a species impact statement is not required (or alternatively a Biodiversity Development Assessment Report).

6.1.1 Requirements for Biodiversity Offsets Under BC Act

Offsetting under the NSW Biodiversity Offsets Scheme of the BC Act is not required for the Activity as the proposed works are an Activity that can be assessed by a REF under Part 5 of the EP&A Act in accordance with division 12 of the TISEPP. Proponents of Part 5 activities can opt-in to the scheme if they wish.

Under the BC Act proponents of Part 5 activities must apply the ToS (under s.7.3 of the BC Act) to determine whether the proposed Activity is likely to significantly affect threatened species or ecological communities, or their habitats. If the Activity is likely to have a significant impact or will be carried out in a declared area of outstanding biodiversity value, the proponent must either apply the Biodiversity Offsets Scheme or prepare a species impact statement.

Tests of significance undertaken for potentially occurring threatened species and communities concluded that the Activity would be unlikely to result in a significant impact on any of the subject threatened species and communities (refer to **Appendix F**). Therefore, the Activity would not require preparation of a species impact statement or offsetting under the NSW Biodiversity Offsets Scheme.

6.2 Fisheries Management Act 1994 (FM Act)

Based on the DPIE Purple Spotted Gudgeon habitat mapping, a Seven-part ToS was prepared (refer to **Appendix H**) and concluded that the Activity would be unlikely to significantly impact this species, and hence a SIS is not required. The Activity would not significantly impact any FM Act listed threatened species, populations or communities.

6.3 Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)

The EPBC Act protects/ regulates matters of national environmental significance, including:

- World heritage properties.
- National heritage places.
- Wetlands of international importance.
- Nationally threatened species and ecological communities.
- Migratory species.
- Commonwealth marine areas.

- The Great Barrier Reef Marine Park.
- Nuclear actions (including uranium mining).
- A water resource, in relation to coal seam gas development and large coal mining development.

Based on the search results and site assessment, no significant impacts to any MNES would be likely to result from the Activity (refer to **Table 6.1** below), therefore referral to the Minister is not required.

Table 6.1 Assessment of MNES

Matter	Impact
Any impact on a World Heritage property?	
Gondwana Rainforests of Australia occurs approximately 4.5 km south of CH 98200. The road drainage, scour protection and slip remediation works within the road reserve would not impact on this World Heritage property.	Nil
Any impact on a National Heritage place?	
Gondwana Rainforests of Australia occurs approximately 4.5 km south of CH 98200. The road drainage, scour protection and slip remediation works within the road reserve would not impact on this National Heritage property.	Nil
Any impact on a Wetland of International Importance?	
The MNES search results did not identify any wetlands of international importance (Ramsar sites) occur within 10 kilometres of the site.	Nil
Any impact on nationally threatened species and ecological communities?	
Habitat for five threatened ecological communities and 67 threatened species is identified within 10 km of the site. No threatened flora species or TECs occur at the site. 14 EPBC Act listed threatened fauna species were determined to potentially occur at the site; these include: Koala, Regent Honeyeater, Spotted-tailed Quoll, Hastings River Mouse, Southern Greater Glider, Stuttering Frog, Sphagnum Frog, South-eastern Glossy Black-Cockatoo, Brown Treecreeper, Grey-headed Flying-fox, Long-nosed Potoroo, New Holland Mouse, Parma Wallaby, and Yellow-bellied Glider. EPBC Matters of National Environmental Significance – significance impact assessment indicated that the Activity is unlikely to result in a significant impact on any of these EPBC Act listed threatened fauna species (refer to **Appendix G**), and therefore referral to the Minister is not required.	Minor
Any impact on Migratory species?	
Habitat for 15 migratory species is identified within 10 km of the site. No migratory fauna species were recorded in the site survey. However, the site may be used for opportunistic foraging by a number of these species (e.g. White-throated Needletail, Spectacled Monarch, and Rufous Fantail). No migratory species are likely to be significantly affected by the Activity given that no areas of important habitat or an ecologically significant proportion of any migratory species would be impacted.	Minor
Any impact on a Commonwealth marine area?	
No Commonwealth marine areas occur within 10 km of the site.	Nil
Any impact on the Great Barrier Reef Marine Park?	
The Activity will not impact on the Great Barrier Reef Marine Park (Queensland).	Nil
Does the project involve a nuclear action?	
No nuclear actions are proposed.	Nil
Does the project involve impacts to a water resource, in relation to coal seam gas development and large coal mining development?	
The Activity is not a coal seam gas or mining development.	Nil

7. Conclusion

Results of this Biodiversity Assessment indicate that the Activity is unlikely to significantly affect threatened species or ecological communities or their habitats, within the meaning of the BC Act or FM Act. The Activity is also unlikely to affect Commonwealth land or have an impact on any matters of national environmental significance as listed under the EPBC Act and therefore referral to the Australian Government Environment Minister is not required.

The Activity may result in some environmental impacts. However, these would not result in a significant impact on any threatened species or communities and these impacts can be effectively managed through the implementation of the mitigation measures in this Biodiversity Assessment and associated REF that would be prepared for the Activity.

References

Department of Climate Change, Energy, the Environment and Water 2023, *Interim Biogeographic Regionalisation for Australia (IBRA), Version 7 (Subregions)*. Viewed November 2023, <https://datasets.seed.nsw.gov.au/dataset/b1284c2c-f3bd-4b50-ab07-e1b593b8ee67>

Department of Planning, Industry and Environment 2020, *Saving our Species. Hygiene guidelines. Protocols to protect priority biodiversity areas in NSW from Phytophthora cinnamomi, myrtle rust, amphibian chytrid fungus and invasive plants.* Department of Planning, Industry and Environment, Parramatta.

Department of the Environment 2015, *Arrive Clean, Leave Clean. Guidelines to help prevent the spread of invasive plant diseases and weeds threatening our native plants, animals and ecosystems*. Commonwealth of Australia Department of the Environment, Canberra.

GeoLINK 2019, *3433-1015 ARC Kempsey Road Project 7 REF* (November 2019)

GeoLINK 2019, *3433-1016 ARC Kempsey Road Project 8 REF* (November 2019)

GeoLINK 2020, 3667-1033 *ARC Kempsey Road Stockpile Sites REF* (December 2020)

GeoLINK 2021, *3433-1030 ARC Kempsey Road Project 8 REF (Addendum)* (September 2021).

GeoLINK 2021, 4078-1011 *6 Curves and Corn Patch Culvert REF* (September 2021).

Copyright and Usage

Appendix A

Database Search Results

Data from the BioNet Atlas website, which holds records from a number of custodians. The data are only indicative and cannot be considered a comprehensive inventory, and may contain errors and omissions. Species listed under the Sensitive Species Data Policy may have their locations denatured (^ rounded to 0.1°C; ^^ rounded to 0.01°C. Copyright the State of NSW through the Department of Planning, Industry and Environment. Search criteria : Public Report of all Valid Records of Threatened (listed on BC Act 2016) or Commonwealth listed Plants in selected area [North: -30.52 West: 152.08 East: 152.46 South: -30.87] returned a total of 126 records of 11 species.
Report generated on 12/09/2023 1:56 PM

Kingdom	Class	Family	Species Code	Scientific Name	Exotic	Common Name	NSW status	Comm. status	Records	Info
Plantae	Flora	Apocynaceae	1226	*Cynanchum elegans*		White-flowered Wax Plant	E1	E	1	
Plantae	Flora	Apocynaceae	1233	*Marsdenia longiloba*		Slender Marsdenia	E1	V	4	
Plantae	Flora	Apocynaceae	1245	*Tylophora woollsii*		Cryptic Forest Twiner	E1	E	2	
Plantae	Flora	Haloragaceae	9172	*Haloragis exalata subsp. velutina*		Tall Velvet Sea-berry	V	V	6	
Plantae	Flora	Myrtaceae	9126	*Callistemon pungens*				V	2	
Plantae	Flora	Myrtaceae	4283	*Rhodamnia rubescens*		Scrub Turpentine	E4A	CE	18	
Plantae	Flora	Orobanchaceae	5954	*Euphrasia arguta*			E4A	CE	1	
Plantae	Flora	Proteaceae	9480	*Grevillea guthrieana*		Guthrie's Grevillea	E1	E	30	
Plantae	Flora	Rubiaceae	6744	*Asperula asthenes*		Trailing Woodruff	V	V	60	
Plantae	Flora	Sapotaceae	11957	*Niemeyera whitei*		Rusty Plum, Plum Boxwood	V		1	
Plantae	Flora	Winteraceae	8194	*Tasmannia glaucifolia*		Fragrant Pepperbush	V	V	1	

Data from the BioNet Atlas website, which holds records from a number of custodians. The data are only indicative and cannot be considered a comprehensive inventory, and may contain errors and omissions. Species listed under the Sensitive Species Data Policy may have their locations denatured (^ rounded to 0.1°C; ^^ rounded to 0.01°C. Copyright the State of NSW through the Department of Planning, Industry and Environment. Search criteria : Public Report of all Valid Records of Threatened (listed on BC Act 2016) or Commonwealth listed Animals in selected area [North: -30.52 West: 152.08 East: 152.46 South: -30.87] returned a total of 2,387 records of 47 species.
Report generated on 12/09/2023 1:49 PM

Kingdom	Class	Family	Species Code	Scientific Name	Exotic	Common Name	NSW status	Comm. status	Records	Info
Animalia	Amphibia	Myobatrachidae	3073	^*Mixophyes balbus*		Stuttering Frog	E1,P,2	V	108	
Animalia	Amphibia	Limnodynastidae	3109	*Philoria sphagnicolus*		Sphagnum Frog	V,P	V	1	
Animalia	Amphibia	Hylidae	3303	*Litoria daviesae*		Davies' Tree Frog	V,P		1	
Animalia	Amphibia	Hylidae	3186	*Litoria subglandulosa*		Glandular Frog	V,P		27	
Animalia	Aves	Columbidae	0025	*Ptilinopus magnificus*		Wompoo Fruit-Dove	V,P		7	
Animalia	Aves	Apodidae	0334	*Hirundapus caudacutus*		White-throated Needletail	P	V,C,J,K	3	
Animalia	Aves	Ciconiidae	0183	*Ephippiorhynchus asiaticus*		Black-necked Stork	E1,P		1	
Animalia	Aves	Accipitridae	0226	*Haliaeetus leucogaster*		White-bellied Sea-Eagle	V,P		8	
Animalia	Aves	Accipitridae	0230	^^*Lophoictinia isura*		Square-tailed Kite	V,P,3		3	
Animalia	Aves	Accipitridae	8739	^^*Pandion cristatus*		Eastern Osprey	V,P,3		1	
Animalia	Aves	Cacatuidae	8862	^*Calyptorhynchus lathami lathami*		South-eastern Glossy Black-Cockatoo	V,P,2	V	358	
Animalia	Aves	Psittacidae	0260	*Glossopsitta pusilla*		Little Lorikeet	V,P		4	
Animalia	Aves	Strigidae	0246	^^*Ninox connivens*		Barking Owl	V,P,3		2	
Animalia	Aves	Strigidae	0248	^^*Ninox strenua*		Powerful Owl	V,P,3		67	
Animalia	Aves	Tytonidae	0250	^^*Tyto novaehollandiae*		Masked Owl	V,P,3		37	
Animalia	Aves	Tytonidae	9924	^^*Tyto tenebricosa*		Sooty Owl	V,P,3		17	
Animalia	Aves	Atrichornithidae	0355	*Atrichornis rufescens*		Rufous Scrub-bird	V,P	E	25	
Animalia	Aves	Climacteridae	8127	*Climacteris picumnus victoriae*		Brown Treecreeper (eastern subspecies)	V,P		6	
Animalia	Aves	Acanthizidae	0504	*Chthonicola sagittata*		Speckled Warbler	V,P		2	

Animalia	Aves	Meliphagidae	8303	*Melithreptus gularis gularis*	Black-chinned Honeyeater (eastern subspecies)	V,P		1
Animalia	Aves	Neosittidae	0549	*Daphoenositta chrysoptera*	Varied Sittella	V,P		7
Animalia	Aves	Pachycephalidae	0405	*Pachycephala olivacea*	Olive Whistler	V,P		7
Animalia	Aves	Petroicidae	0380	*Petroica boodang*	Scarlet Robin	V,P		28
Animalia	Aves	Petroicidae	0382	*Petroica phoenicea*	Flame Robin	V,P		12
Animalia	Mammalia	Dasyuridae	1008	*Dasyurus maculatus*	Spotted-tailed Quoll	V,P	E	346
Animalia	Mammalia	Dasyuridae	1017	*Phascogale tapoatafa*	Brush-tailed Phascogale	V,P		2
Animalia	Mammalia	Phascolarctidae	1162	*Phascolarctos cinereus*	Koala	E1,P	E	24
Animalia	Mammalia	Burramyidae	1150	*Cercartetus nanus*	Eastern Pygmy-possum	V,P		4
Animalia	Mammalia	Petauridae	1136	*Petaurus australis*	Yellow-bellied Glider	V,P	V	6
Animalia	Mammalia	Petauridae	1137	*Petaurus norfolcensis*	Squirrel Glider	V,P		1
Animalia	Mammalia	Pseudocheiridae	1133	*Petauroides volans*	Southern Greater Glider	E1,P	E	433
Animalia	Mammalia	Potoroidae	1175	*Potorous tridactylus*	Long-nosed Potoroo	V,P	V	38
Animalia	Mammalia	Macropodidae	1245	*Notamacropus parma*	Parma Wallaby	V,P	V	208
Animalia	Mammalia	Macropodidae	1215	*Petrogale penicillata*	Brush-tailed Rock-wallaby	E1,P	V	14
Animalia	Mammalia	Macropodidae	1234	*Thylogale stigmatica*	Red-legged Pademelon	V,P		231
Animalia	Mammalia	Pteropodidae	1280	*Pteropus poliocephalus*	Grey-headed Flying-fox	V,P	V	3
Animalia	Mammalia	Emballonuridae	1321	*Saccolaimus flaviventris*	Yellow-bellied Sheathtail-bat	V,P		1
Animalia	Mammalia	Molossidae	1329	*Micronomus norfolkensis*	Eastern Coastal Free-tailed Bat	V,P		1
Animalia	Mammalia	Vespertilionidae	1372	*Falsistrellus tasmaniensis*	Eastern False Pipistrelle	V,P		63
Animalia	Mammalia	Vespertilionidae	1357	*Myotis macropus*	Southern Myotis	V,P		3
Animalia	Mammalia	Vespertilionidae	1369	*Phoniscus papuensis*	Golden-tipped Bat	V,P		10
Animalia	Mammalia	Vespertilionidae	1361	*Scoteanax rueppellii*	Greater Broad-nosed Bat	V,P		4
Animalia	Mammalia	Vespertilionidae	1025	*Vespadelus troughtoni*	Eastern Cave Bat	V,P		1

Animalia	Mammalia	Miniopteridae	1346	*Miniopterus australis*	Little Bent-winged Bat	V,P		8	
Animalia	Mammalia	Miniopteridae	3330	*Miniopterus orianae oceanensis*	Large Bent-winged Bat	V,P		12	
Animalia	Mammalia	Muridae	1455	*Pseudomys novaehollandiae*	New Holland Mouse	P	V	18	
Animalia	Mammalia	Muridae	1464	*Pseudomys oralis*	Hastings River Mouse	E1,P	E	223	

Data from the BioNet Atlas website, which holds records from a number of custodians. The data are only indicative and cannot be considered a comprehensive inventory, and may contain errors and omissions. Species listed under the Sensitive Species Data Policy may have their locations denatured (^ rounded to 0.1°C; ^^ rounded to 0.01°C.
Search criteria : Public Report of all Valid Records of Threatened (listed on BC Act 2016) or Commonwealth listed Communities in selected area [North: -30.52 West: 152.08 East: 152.46 South: -30.87] returned 0 records for 19 entities.
Report generated on 12/09/2023 2:01 PM

Kingdom	Class	Family	Species Code	Scientific Name	Exotic	Common Name	NSW status	Comm. status	Records	Info
Community				*Carex Sedgeland of the New England Tableland, Nandewar, Brigalow Belt South and NSW North Coast Bioregions*		Carex Sedgeland of the New England Tableland, Nandewar, Brigalow Belt South and NSW North Coast Bioregions	E3		K	
Community				*Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions*		Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E3		K	
Community				*Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions*		Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E3		K	
Community				*Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions*		Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E3		K	

Community	*Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions*	Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions	E3		K	
Community	*Lowland Rainforest of Subtropical Australia*	Lowland Rainforest of Subtropical Australia		CE	K	
Community	*Lowland Rainforest on Floodplain in the New South Wales North Coast Bioregion*	Lowland Rainforest on Floodplain in the New South Wales North Coast Bioregion	E3		K	
Community	*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 of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands and Australian Alps bioregions	E3		K	
Community	*New England Peppermint (Eucalyptus nova-anglica) Grassy Woodlands*	New England Peppermint (Eucalyptus nova-anglica) Grassy Woodlands		CE	K	
Community	*New England Peppermint (Eucalyptus nova-anglica) Woodland on Basalts and Sediments in the New England Tableland Bioregion*	New England Peppermint (Eucalyptus nova-anglica) Woodland on Basalts and Sediments in the New England Tableland Bioregion	E4B		K	

Community	*Ribbon Gum—Mountain Gum—Snow Gum Grassy Forest/Woodland of the New England Tableland Bioregion*	Ribbon Gum—Mountain Gum—Snow Gum Grassy Forest/Woodland of the New England Tableland Bioregion	E3	P	
Community	*Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion*	Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion	E3	K	
Community	*Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions*	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E3	K	
Community	*Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions*	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E3	K	
Community	*Themeda grassland on seacliffs and coastal headlands in the NSW North Coast, Sydney Basin and South East Corner Bioregions*	Themeda grassland on seacliffs and coastal headlands in the NSW North Coast, Sydney Basin and South East Corner Bioregions	E3	K	
Community	*Upland Wetlands of the Drainage Divide of the New England Tableland Bioregion*	Upland Wetlands of the Drainage Divide of the New England Tableland Bioregion	E3	P	

Community	*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*	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	E4B		K	
Community	*White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland*	White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland		CE	K	
Community	*White Gum Moist Forest in the NSW North Coast Bioregion*	White Gum Moist Forest in the NSW North Coast Bioregion	E3		K	

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 12-Sep-2023

Summary

Matters of National Environment Significance

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

World Heritage Properties:	1
National Heritage Places:	1
Wetlands of International Importance (Ramsar	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	5
Listed Threatened Species:	67
Listed Migratory Species:	15

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Lands:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	21
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

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

State and Territory Reserves:	8
Regional Forest Agreements:	1
Nationally Important Wetlands:	None
EPBC Act Referrals:	5
Key Ecological Features (Marine):	None
Biologically Important Areas:	None
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

World Heritage Properties [Resource Information]

Name	State	Legal Status	Buffer Status
Gondwana Rainforests of Australia	QLD	Declared property	In buffer area only

National Heritage Places [Resource Information]

Name	State	Legal Status	Buffer Status
Natural			
Gondwana Rainforests of Australia	NSW	Listed place	In buffer area only

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.
Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text	Buffer Status
Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland	Endangered	Community may occur within area	In feature area
Lowland Rainforest of Subtropical Australia	Critically Endangered	Community likely to occur within area	In feature area
New England Peppermint (Eucalyptus nova-anglica) Grassy Woodlands	Critically Endangered	Community may occur within area	In feature area
Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions	Endangered	Community may occur within area	In feature area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community likely to occur within area	In feature area

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text	Buffer Status
null			
Mordacia praecox			
Non-parasitic Lamprey, Precocious Lamprey [81530]	Endangered	Species or species habitat likely to occur within area	In feature area
BIRD			

Scientific Name	Threatened Category	Presence Text	Buffer Status
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Foraging, feeding or related behaviour likely to occur within area	In feature area
Aphelocephala leucopsis Southern Whiteface [529]	Vulnerable	Species or species habitat may occur within area	In feature area
Atrichornis rufescens Rufous Scrub-bird [655]	Endangered	Species or species habitat known to occur within area	In feature area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat may occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area	In feature area
Calyptorhynchus lathami lathami South-eastern Glossy Black-Cockatoo [67036]	Vulnerable	Species or species habitat known to occur within area	In feature area
Climacteris picumnus victoriae Brown Treecreeper (south-eastern) [67062]	Vulnerable	Species or species habitat known to occur within area	In feature area
Cyclopsitta diophthalma coxeni Coxen's Fig-Parrot [59714]	Critically Endangered	Species or species habitat may occur within area	In feature area
Erythrotriorchis radiatus Red Goshawk [942]	Endangered	Species or species habitat may occur within area	In feature area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area	In feature area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat may occur within area	In feature area
Melanodryas cucullata cucullata South-eastern Hooded Robin, Hooded Robin (south-eastern) [67093]	Endangered	Species or species habitat may occur within area	In feature area
Neophema chrysostoma Blue-winged Parrot [726]	Vulnerable	Species or species habitat may occur within area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In feature area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area	In feature area
Stagonopleura guttata Diamond Firetail [59398]	Vulnerable	Species or species habitat known to occur within area	In feature area
Turnix melanogaster Black-breasted Button-quail [923]	Vulnerable	Species or species habitat may occur within area	In buffer area only
FROG			
Litoria daviesae Davies' Tree Frog [78964]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Litoria subglandulosa Glandular Frog [1807]	Vulnerable	Species or species habitat known to occur within area	In feature area
Mixophyes balbus Stuttering Frog, Southern Barred Frog (in Victoria) [1942]	Vulnerable	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Mixophyes iteratus			
Giant Barred Frog, Southern Barred Frog [1944]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Philoria sphagnicola			
Sphagnum Frog [59709]	Vulnerable	Species or species habitat likely to occur within area	In feature area
INSECT			
Argynnis hyperbius inconstans			
Australian Fritillary [88056]	Critically Endangered	Species or species habitat may occur within area	In buffer area only
MAMMAL			
Chalinolobus dwyeri			
Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Dasyurus maculatus maculatus (SE mainland population)			
Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat known to occur within area	In feature area
Notamacropus parma			
Parma Wallaby [89289]	Vulnerable	Species or species habitat known to occur within area	In feature area
Petauroides volans			
Greater Glider (southern and central) [254]	Endangered	Species or species habitat known to occur within area	In feature area
Petaurus australis australis			
Yellow-bellied Glider (south-eastern) [87600]	Vulnerable	Species or species habitat known to occur within area	In feature area
Petrogale penicillata			
Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat known to occur within area	In feature area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)			
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Endangered	Species or species habitat known to occur within area	In feature area
Potorous tridactylus tridactylus			
Long-nosed Potoroo (northern) [66645]	Vulnerable	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Pseudomys novaehollandiae New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat known to occur within area	In feature area
Pseudomys oralis Hastings River Mouse, Koontoo [98]	Endangered	Species or species habitat known to occur within area	In feature area
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
PLANT			
Arthraxon hispidus Hairy-joint Grass [9338]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Asperula asthenes Trailing Woodruff [14004]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Bertya sp. Clouds Creek (M.Fatemi 4) [84675]	Endangered	Species or species habitat may occur within area	In feature area
Callistemon pungens [55581]	Vulnerable	Species or species habitat known to occur within area	In feature area
Chiloglottis anaticeps Duck's-head Wasp-orchid [55027]	Endangered	Species or species habitat may occur within area	In buffer area only
Cryptostylis hunteriana Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Cynanchum elegans White-flowered Wax Plant [12533]	Endangered	Species or species habitat known to occur within area	In feature area
Dichanthium setosum bluegrass [14159]	Vulnerable	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Diuris eborensis [88275]	Endangered	Species or species habitat likely to occur within area	In feature area
Diuris pedunculata Small Snake Orchid, Two-leaved Golden Moths, Golden Moths, Cowslip Orchid, Snake Orchid [18325]	Endangered	Species or species habitat likely to occur within area	In buffer area only
Eucalyptus nicholii Narrow-leaved Peppermint, Narrow-leaved Black Peppermint [20992]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Euphrasia arguta [4325]	Critically Endangered	Species or species habitat may occur within area	In feature area
Gingidia rupicola Mountain Angelica, Broad-leafed Carrot [86880]	Endangered	Species or species habitat may occur within area	In buffer area only
Grevillea guthrieana [64521]	Endangered	Species or species habitat known to occur within area	In feature area
Haloragis exalata subsp. velutina Tall Velvet Sea-berry [16839]	Vulnerable	Species or species habitat known to occur within area	In feature area
Leichhardtia longiloba listed as Marsdenia longiloba Clear Milkvine [91911]	Vulnerable	Species or species habitat may occur within area	In feature area
Macadamia integrifolia Macadamia Nut, Queensland Nut Tree, Smooth-shelled Macadamia, Bush Nut, Nut Oak [7326]	Vulnerable	Species or species habitat may occur within area	In feature area
Neoastelia spectabilis [6404]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Parsonsia dorrigoensis Milky Silkpod [64684]	Endangered	Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Persicaria elatior Knotweed, Tall Knotweed [5831]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Picris evae Hawkweed [10839]	Vulnerable	Species or species habitat may occur within area	In feature area
Plectranthus nitidus Nightcap Plectranthus, Silver Plectranthus [55742]	Endangered	Species or species habitat may occur within area	In feature area
Rhodamnia rubescens Scrub Turpentine, Brown Malletwood [15763]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Rhodomyrtus psidioides Native Guava [19162]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
Sarcochilus fitzgeraldii Ravine Orchid [19131]	Vulnerable	Species or species habitat may occur within area	In feature area
Styphelia perileuca [56017]	Endangered	Species or species habitat may occur within area	In buffer area only
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Vincetoxicum woollsii listed as Tylophora woollsii [40080]	Endangered	Species or species habitat likely to occur within area	In feature area
REPTILE			
Coeranoscincus reticulatus Three-toed Snake-tooth Skink [59628]	Vulnerable	Species or species habitat may occur within area	In feature area
Harrisoniascincus zia Rainforest Cool-skink [84785]	Vulnerable	Species or species habitat likely to occur within area	In feature area

Listed Migratory Species [Resource Information]

Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area
Migratory Terrestrial Species			
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area	In feature area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area	In feature area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area	In feature area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area	In feature area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area	In feature area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area	In feature area
Symposiachrus trivirgatus as Monarcha trivirgatus Spectacled Monarch [83946]		Species or species habitat known to occur within area	In feature area
Migratory Wetlands Species			
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area	In feature area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat likely to occur within area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In feature area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area	In feature area

Other Matters Protected by the EPBC Act

Commonwealth Lands [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Commonwealth Land Name	State	Buffer Status
Communications, Information Technology and the Arts - Telstra Corporation Limited		
Commonwealth Land - Australian Telecommunications Corporation [11663]	NSW	In buffer area only

Listed Marine Species [Resource Information]

Scientific Name	Threatened Category	Presence Text	Buffer Status
Bird			
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area	In feature area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area overfly marine area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area	In feature area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat likely to occur within area overfly marine area	In feature area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area	In feature area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In feature area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat may occur within area overfly marine area	In feature area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In feature area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area overfly marine area	In feature area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area overfly marine area	In feature area
Neophema chrysostoma Blue-winged Parrot [726]	Vulnerable	Species or species habitat may occur within area overfly marine area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In feature area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area	In feature area
Pterodroma cervicalis White-necked Petrel [59642]		Species or species habitat may occur within area	In feature area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area overfly marine area	In feature area
Rostratula australis as Rostratula benghalensis (sensu lato) Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area overfly marine area	In feature area
Symposiachrus trivirgatus as Monarcha trivirgatus Spectacled Monarch [83946]		Species or species habitat known to occur within area overfly marine area	In feature area

Extra Information

State and Territory Reserves			[Resource Information]
Protected Area Name	Reserve Type	State	Buffer Status
Carrai	State Conservation Area	NSW	In buffer area only
Carrai	National Park	NSW	In buffer area only
Cunnawarra	National Park	NSW	In feature area

Protected Area Name	Reserve Type	State	Buffer Status
Georges Creek	Nature Reserve	NSW	In feature area
Jobs Mountain	Nature Reserve	NSW	In buffer area only
New England	National Park	NSW	In buffer area only
Oxley Wild Rivers	National Park	NSW	In buffer area only
Pee Dee	Nature Reserve	NSW	In buffer area only

Regional Forest Agreements [Resource Information]

Note that all areas with completed RFAs have been included. Please see the associated resource information for specific caveats and use limitations associated with RFA boundary information.

RFA Name	State	Buffer Status
North East NSW RFA	New South Wales	In feature area

EPBC Act Referrals [Resource Information]

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Controlled action				
Oven Mountain Pumped Hydro Energy Storage Project	2020/8850	Controlled Action	Assessment Approach	In feature area
Not controlled action				
Aerial baiting field trials	2005/1962	Not Controlled Action	Completed	In feature area
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed	In feature area
Not controlled action (particular manner)				
Aerial baiting for wild dog control	2006/2713	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
Wild Dog Baiting	2006/2768	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

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

Threatened, migratory and marine species

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

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

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

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

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

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

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

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

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

Please feel free to provide feedback via the Contact us page.

Department of Climate Change, Energy, the Environment and Water
GPO Box 3090
Canberra ACT 2601 Australia
+61 2 6274 1111

Appendix B

Flora Inventory

Table B1 Flora inventory

Family	Scientific Name	Exotic	Common Name
Anacardiaceae	*Euroschinus falcatus var. falcatus*		Ribbonwood
Anacardiaceae	*Rhodosphaera rhodanthema*		Tulip Satinwood
Asphodelaceae	*Dianella caerulea*		Blue Flax-lily
Asteraceae	*Ambrosia artemisiifolia*	*	Annual Ragweed
Asteraceae	*Bidens pilosa*	*	Farmer's Friend
Asteraceae	*Conyza bonariensis*	*	Flaxleaf Fleabane
Asteraceae	*Hypochaeris radicata*	*	Catsear
Asteraceae	*Senecio madagascariensis*	*	Fireweed
Asteraceae	*Sonchus oleraceus*	*	Common Sowthistle
Asteraceae	*Vittadinia hispidula*		
Asteraceae	*Xanthium occidentale*	*	Noogoora burr
Basellaceae	*Anredera cordifolia*	*	Madeira Vine
Bignoniaceae	*Dolichandra unguis-cati*	*	Cat's Claw Creeper
Bignoniaceae	*Jacaranda mimosifolia*	*	Jacaranda
Bignoniaceae	*Pandorea pandorana*		Pandorea pandorana
Campanulaceae	*Lobelia purpurascens*		Whiteroot
Campanulaceae	*Wahlenbergia spp.*		Bluebell
Cannabaceae	*Aphananthe philippinensis*		Rough-leaved Elm
Casuarinaceae	*Allocasuarina torulosa*		Forest Oak
Casuarinaceae	*Casuarina cunninghamiana subsp. cunninghamiana*		River Oak
Cunoniaceae	*Callicoma serratifolia*		Black Wattle
Dennstaedtiaceae	*Pteridium esculentum*		Bracken
Dilleniaceae	*Hibbertia scandens*		Climbing Guinea Flower
Dicksoniaceae	*Dicksonia antarctica*		Soft tree-fern
Ericaceae	*Trochocarpa laurina*		Tree Heath
Euphorbiaceae	*Mallotus philippensis*		Red Kamala
Fabaceae (Faboideae)	*Daviesia ulicifolia*		Gorse Bitter Pea
Fabaceae (Faboideae)	*Hardenbergia violacea*		False Sarsaparilla
Fabaceae (Faboideae)	*Indigofera australis*		Australian Indigo
Fabaceae (Faboideae)	*Kennedia rubicunda*		Dusky Coral Pea
Fabaceae (Faboideae)	*Podolobium ilicifolium*		Prickly Shaggy Pea
Fabaceae (Faboideae)	*Pultenaea spinosa*		
Fabaceae (Mimosoideae)	*Acacia binervata*		Two-veined Hickory
Fabaceae (Mimosoideae)	*Acacia falcata*		
Fabaceae (Mimosoideae)	*Acacia implexa*		Hickory Wattle

Family	Scientific Name	Exotic	Common Name
Fabaceae (Mimosoideae)	*Acacia longissima*		Long-leaf Wattle
Geraniaceae	*Geranium solanderi*		Native Geranium
Gleicheniaceae	*Sticherus flabellatus var. flabellatus*		Umbrella Fern
Goodeniaceae	*Goodenia hederacea subsp. hederacea*		
Goodeniaceae	*Goodenia ovata*		Hop Goodenia
Haloragaceae	*Gonocarpus teucrioides*		Germander Raspwort
Lamiaceae	*Plectranthus parviflorus*		
Lauraceae	*Cinnamomum camphora*	*	Camphor Laurel
Lomandraceae	*Lomandra longifolia*		Spiny-headed Mat-rush
Lomandraceae	*Lomandra multiflora subsp. multiflora*		Many-flowered Mat-rush
Luzuriagaceae	*Eustrephus latifolius*		Wombat Berry
Malvaceae	*Hibiscus heterophyllus subsp. heterophyllus*		Native Rosella
Malvaceae	*Sida rhombifolia*	*	Sida
Meliaceae	*Melia azedarach*		White Cedar
Moraceae	*Ficus coronata*		Creek Sandpaper Fig
Moraceae	*Ficus rubiginosa*		Port Jackson Fig
Moraceae	*Maclura cochinchinensis*		Cockspur Thorn
Moraceae	*Morus alba**		White Mulberry
Myrtaceae	*Angophora floribunda*		Rough-barked Apple
Myrtaceae	*Angophora subvelutina*		Broad-leaved Apple
Myrtaceae	*Callistemon viminalis*		Weeping Bottlebrush
Myrtaceae	*Corymbia intermedia*		Pink Bloodwood
Myrtaceae	*Corymbia maculata*		Spotted Gum
Myrtaceae	*Eucalyptus caliginosa*		Broad-leaved Stringybark
Myrtaceae	*Eucalyptus campanulata*		New England Blackbutt
Myrtaceae	*Eucalyptus microcorys*		Tallowwood
Myrtaceae	*Eucalyptus moluccana*		Grey Box
Myrtaceae	*Eucalyptus saligna*		Sydney Blue Gum
Myrtaceae	*Eucalyptus tereticornis*		Forest Red Gum
Myrtaceae	*Lophostemon confertus*		Brush Box
Myrtaceae	*Melaleuca bracteata*		Black Tea-tree
Myrtaceae	*Syncarpia glomulifera*		Turpentine
Oleaceae	*Ligustrum sinense*	*	Small-leaved Privet
Passifloraceae	*Passiflora subpeltata*	*	White Passionflower
Phormiaceae	*Dianella caerulea*		Blue Flax-lily

Family	Scientific Name	Exotic	Common Name
Phyllanthaceae	*Glochidion ferdinandi*		Cheese Tree
Pittosporaceae	*Pittosporum undulatum*		Sweet Pittosporum
Poaceae	*Cynodon dactylon*		Common Couch
Poaceae	*Entolasia stricta*		Wiry Panic
Poaceae	*Imperata cylindrica*		Blady Grass
Poaceae	*Poa sieberiana*		Snowgrass
Poaceae	*Sporobolus spp.*		Rat's Tail Couch
Poaceae	*Themeda triandra*		
Primulaceae	*Lysimachia arvensis*	*	Scarlet Pimpernel
Proteaceae	*Banksia integrifolia*		Coast Banksia
Proteaceae	*Grevillea robusta*		Silky Oak
Proteaceae	*Persoonia media*		
Rhamnaceae	*Alphitonia excelsa*		Red Ash
Rosaceae	*Rubus parvifolius*		Native Raspberry
Sapindaceae	*Alectryon subcinereus*		Native Quince
Solanaceae	*Solanum mauritianum*	*	Wild Tobacco Bush
Solanaceae	*Solanum nigrum*	*	Blackberry Nightshade
Solanaceae	*Solanum prinophyllum*		Forest Nightshade
Stylidiaceae	*Stylidium graminifolium*		Grass Triggerplant
Ulmaceae	*Aphananthe philippinensis*		Rough-leaved Elm
Urticaceae	*Dendrocnide excelsa*		Giant Stinging Tree
Verbenaceae	*Lantana camara*	*	Lantana
Verbenaceae	*Verbena bonariensis*	*	Purpletop
Vitaceae	*Cissus antarctica*		Water Vine
Vitaceae	*Cissus hypoglauca*		Giant Water Vine
Zamiaceae	*Macrozamia communis*		Burrawang

Appendix C

Threatened Species Potential Occurrence Assessment

Threatened Species Potential Occurrence Assessment - Overview

A potential of occurrence assessment was completed to assess the likelihood of occurrence of threatened species or populations at the subject site. All threatened biodiversity identified in background research were considered. The assessment is based on the habitat profile for the species and other habitat information in the Threatened Species Profile Database (Environment Energy and Science Group). The assessment also takes into consideration the dates and locations of nearby records and information about species populations in the locality.

Table C1 Threatened Flora Likelihood of Occurrence Criteria

Likelihood	Criteria
Known	The species was observed in the subject site either during the current survey or during another survey less than one year prior.
High	A species has a high likelihood of occurrence if: ■ the subject site contains or forms part of a large area of high-quality suitable habitat that has not been subject to recent disturbance (e.g. fire), the species is known to form a persistent soil seedbank and the species has been recorded recently (within 10 years) in the locality ■ the species is a cryptic flowering species that has been recorded recently (within 10 years) in the locality and has a large area of high-quality potential habitat within the construction footprint that was not seasonally targeted by surveys.
Moderate	A species has a moderate likelihood of occurrence if: the species: ■ has a large area of high-quality suitable habitat in the subject site that has not been subject to recent disturbance (e.g. fire) ■ the species is known to form a persistent soil seedbank, but ■ the species has not been recorded recently (within 10 years) in the locality the species: ■ has a small area of high-quality suitable habitat or a large area of marginal habitat in the subject site That has not been subject to recent disturbance (e.g. fire) ■ the species is known to form a persistent soil seedbank ■ the species has been recorded recently (within 10 years) in the locality ■ the species is a cryptic flowering species, with a small area of high-quality potential habitat or a large area of marginal habitat within the proposal footprint, that was not seasonally targeted by surveys.
Low	A species has a low likelihood of occurrence if: ■ it is not a cryptic species, nor a species known to have a persistent soil seedbank species and was not detected despite targeted searches ■ the species is a cryptic flowering species, with a small area of high-quality potential habitat or a large area of marginal habitat within the proposal footprint, that was not seasonally targeted by surveys as the species has not been recorded within 50 years in the locality.
None	Suitable habitat is absent from the subject site.

Table C2 Habitat Assessment – Threatened Flora

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Requirement	Likelihood of occurrence
Arthraxon hispidus	Hairy Jointgrass	V	V	Moist shady places in or on the edges of rainforest and wet eucalypt forest, often near creeks or swamps.	Low – field surveys did not record the species in the site. No BioNet records within the locality. Test of significance not required.
Asperula asthenes	Trailing Woodruff	V	V	Damp sites, often along river banks. Occurs only in NSW, in scattered locations from Bulahdelah north to near Kempsey, with several records from the Port Stephens/Wallis Lakes area.	**Moderate** - field surveys did not record the species in the study area. There is suitable habitat at the study site and this species is known to be cryptic. **Test of significance completed**.
Callistemon pungens		-	V	In or near rocky watercourses, usually in sandy creek beds on granite or sometimes on basalt.	Low – field surveys did not record the species in the site. Test of significance not required.
Chiloglottis anaticeps	Bird Orchid	E	-	Often grows near streams or on the edges of low, flat rock outcrops, in eucalypt forest in areas with very little ground cover, in gravely loam soils. Confined to the New England Tablelands of NSW in Werrikimbe National Park and near Ebor.	None - no suitable habitat occurs. No BioNet records within the locality. Test of significance not required.
Cryptostylis hunteriana	Leafless Tongue-orchid	V	V	Does not have well defined habitat and is known from a range of communities, including swamp-heath and woodland.	None - no suitable habitat occurs. No BioNet records within the locality. Test of significance not required.
Cynanchum elegans	White-flowered Wax Plant	E	E	Dry, littoral or subtropical rainforest, and occasionally in scrub or woodland.	**Moderate** - Field surveys did not record the species in the study area. There is suitable habitat at the study site and this species is known to be cryptic. **Test of significance completed**.
Dichanthium setosum	Bluegrass	V	V	In NSW, occurs on the New England Tablelands, North West Slopes and Plains and the Central Western Slopes of NSW, in moderately disturbed areas such as cleared woodland, grassy roadside remnants and highly disturbed pasture.	Low – not recorded. No BioNet records within the locality. Test of significance not required.

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Requirement	Likelihood of occurrence
Diuris eborensis	-	E	E	Found mainly in damp grassland and woodland sites or in areas of sedge and swampy sites. Main locations are higher altitude sites in the eastern New England Plateau, with known locations in the Ebor, Yarrowitch and Backwater areas. Typically in brown clay loam soil over an igneous substrate	None - no suitable habitat occurs. No BioNet records within the locality. Test of significance not required.
Diuris pedunculata	Small Snake Orchid	E	E	Grassy sclerophyll forests, dry sclerophyll woodlands, grassy sclerophyll woodlands, grasslands, riparian areas, and swampy forests.	None - no suitable habitat occurs. No BioNet records within the locality. Test of significance not required.
Eucalyptus nicholii	Narrow-leaved Peppermint	V	V	Grassy or sclerophyllous woodland on shallow relatively infertile soils on shales and slates.	Low – field surveys did not record the species in the site. No BioNet records within the locality. Test of significance not required.
Euphrasia arguta	-	CE	CE	Known from three sites in/near Nundle State Forest in eucalypt forest with a mixed grass and shrub understorey. Habitat includes open forest country around Bathurst in subhumid places, grassy country near Bathurst and in meadows near rivers.	Low – field surveys did not record the species in the site. Test of significance not required.
Gingidia rupicola	Mountain Angelica	E	E	Known from only one location within the New England National Park on the Northern Tablelands, in Snow Gum (*Eucalyptus pauciflora*) Woodland and at the edge of Antarctic Beech *(Nothofagus moorei)* forest.	Low – field surveys did not record the species in the site. No BioNet records within the locality. Test of significance not required.
Grevillea guthrieana	Guthrie's Grevillea	E	E	Known from the north coast of NSW, at Booral near Bulahdelah and on the Carrai Plateau, south-west of Kempsey. Grows along creeks and cliff lines in eucalypt forest, on granitic or sedimentary soil.	Low – field surveys did not record the species in the site. Test of significance not required.

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Requirement	Likelihood of occurrence
Haloragis exalata subsp. velutina	Tall Velvet Sea-berry	V	V	Damp places near watercourses, also in woodland and steep rocky slopes of gorges.	Low – field surveys did not record the species in the site. Test of significance not required.
Macadamia integrifolia	Macadamia Nut	-	V	While specimens have been collected from the North Coast of NSW (e.g. Lismore, Gross 1995), this species is not known to occur naturally in NSW (Harden 1991). The Macadamia Nut grows in remnant rainforest.	Low – field surveys did not record the species in the site. No BioNet records within the locality. Test of significance not required.
Marsdenia longiloba	Slender Milkvine	E	V	Subtropical and warm temperate rainforest, lowland moist eucalypt forest adjoining rainforest and, sometimes, in areas with rock outcrops.	**Moderate** - field surveys did not record the species in the study area. There is suitable habitat at the study site and this species is known to be cryptic. **Test of significance completed**.
Neoastelia spectabilis	Silver Sword Lily	V	V	Grows in rock crevices near waterfalls and in seepage lines on rocky slopes in Antarctic Beech rainforest, between 900 - 1150 m altitude	Low – field surveys did not record the species in the site. No BioNet records within the locality. Test of significance not required.
Niemeyera whitei	Rusty Plum	V	-	Rainforest and adjoining moist eucalypt forest.	Low – field surveys did not record the species in the site. Test of significance not required.
Parsonsia dorrigoensis	Milky Silkpod	V	E	Subtropical and warm temperate rainforest, on rainforest margins, and in moist eucalypt forest up to 800 m, on brown clay soils.	Low – field surveys did not record the species in the site. No BioNet records within the locality. Test of significance not required.
Persicaria elatior	Tall Knot-weed	V	V	Damp or swampy situations and sometimes with *Melaleuca linarifiolia*.	Low - Field surveys did not record the species in the site. No BioNet records within the locality.

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Requirement	Likelihood of occurrence
Picris evae	Hawkweed	V	V	All recent collections appear to come from modified habitats such as weedy roadside vegetation and paddocks. Its main habitat is open Eucalypt forest including a canopy of *Eucalyptus melliodora, E. crebra, E. populnea, E. albens, Angophora subvelutina, Allocasuarina torulosa* , and/or *Casuarina cunninghamiana* with a *Dichanthium* grassy understory. Soils are black, dark grey or red-brown (specified as shallow, stony soil over basalt for one collection) and reddish clay-loam or medium clay soils.	Low – field surveys did not record the species in the site. No BioNet records within the locality. Test of significance not required.
Plectranthus nitidus	Nightcap Plectranthus	E	E	Rocky cliff faces and boulders, creek banks in shelter of adjacent rainforest.	**Moderate** - Field surveys did not record the species in the study area. There is suitable habitat at the study site and this species is known to be cryptic. **Test of significance completed**.
Rhodamnia rubescens	Scrub Turpentine	CE	CE	Subtropical rainforests, warm temperate rainforests, littoral rainforests, and wet sclerophyll forests. It may also occur as a pioneer in adjacent areas of dry sclerophyll and grassy woodland associations.	**Moderate** - Field surveys did not record the species in the study area. There is suitable habitat at the study site. **Test of significance completed**.
Rhodomyrtus psidioides	Native Guava	CE	-	Rainforest and its margins with sclerophyll vegetation, often near creeks and drainage lines. Pioneer species in disturbed environments such as regrowth and rainforest margins.	Low – field surveys did not record the species in the site. No BioNet records within the locality. Test of significance not required.
Sarcochilus fitzgeraldii	Ravine Orchid	V	V	Plants favour Hoop Pine as a host.	Low – field surveys did not record the species in the site. No BioNet records within the locality. Test of significance not required.
Styphelia perileuca	Montain Green Five-corners	V	V	Dry forest on ridges and gentle slopes, on sandy shallow soils over granite and trachyte, and shrublands surrounding swamps.	Low – field surveys did not record the species in the site. No BioNet records within the locality. Test of significance not required.

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Requirement	Likelihood of occurrence
Tasmannia glaucifolia	Fragrant Pepperbush	V	V	Mostly grows along small creeks or drainage lines, near or along edge of Nothofagus moorei rainforest, between 1200 and 1550 m alt.; recorded from Barrington Tops, Ben Hall's Gap and Point Lookout areas.	Low – field surveys did not record the species in the site. Test of significance not required.
Thesium australe	Austral Toadflax	V	V	Grassland or grassy eucalypt woodland where Themeda australis is predominant, on grassy headlands.	Low - lack of suitable habitat occurs. No BioNet records within the locality. Test of significance not required.
Tylophora woollsii		E	E	Moist eucalypt forest, moist sites in dry eucalypt forest and rainforest margins.	**Moderate** - field surveys did not record the species in the study area. There is suitable habitat at the study site and this species is known to be cryptic. **Test of significance completed**.
V = Vulnerable; E = Endangered; CE = Critically Endangered					

Table C3 Fauna Likelihood of Occurrence Criteria

Likelihood	Criteria
Recorded	The species was observed in the study area during the current survey
High	It is highly likely that a species inhabits the study area and is dependent on identified suitable habitat (i.e. for breeding or important life cycle periods such as winter flowering resources), has been recorded recently in the locality (10 km) and is known or likely to maintain resident populations in the study area. Also includes species known or likely to visit the study area during regular seasonal movements or migration.
Moderate	Potential habitat is present in the study area. Species unlikely to maintain sedentary populations; however, may seasonally use resources within the study area opportunistically or during migration. The species is unlikely to be dependent (i.e. for breeding or important life cycle periods such as winter flowering resources) on habitat within the study area, or habitat is in a modified or degraded state.
Low	It is unlikely that the species inhabits the study area and has not been recorded recently (<10yrs) in the locality (10 km). It may be an occasional visitor, but habitat similar to the study area is widely distributed in the local area, meaning that the species is not dependent (i.e. for breeding or important life cycle periods such as winter flowering resources) on available habitat.
None	Suitable habitat is absent from the study area. Based on a field assessment of the habitat constraints or microhabitats on the study area, the habitat is identified as being substantially degraded such that the species is unlikely to utilise the study area (or specific vegetation zones), or an expert report that is prepared that states the species is unlikely to be present on the study area or specific vegetation zones.

Table C4 Habitat Assessment – Threatened Fauna

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Requirement	Potential Occurrence/ Subject Species
Amphibians					
Litoria daviesae	Davies' Tree Frog	V	-	Davies' Tree Frog occurs in permanent, slow-flowing small streams above 400 m elevation, mostly in the headwaters of eastern-flowing streams (although it does occur in the headwaters of the western-flowing Peel River).	**Moderate** - potential foraging and breeding habitat. Recorded within locality. **Test of significance completed**.
Litoria subglandulosa	Glandular Frog	V	-	Streams in rainforest, moist and dry eucalypt forest or subalpine swamps.	**Moderate** - potential foraging and breeding habitat. Recorded within locality. **Test of significance completed**.
Mixophyes balbus	Stuttering Frog	E	V	Cool rainforest, moist eucalypt forest and occasionally along creeks in dry eucalypt forest. Typically at elevations between 200 and 1420m above sea level in their northern range.	**Moderate** - potential foraging and breeding habitat. Recorded within locality. **Test of significance completed**.
Mixophyes iteratus	Giant Barred Frog	E	E	Deep, damp leaf litter in rainforests, moist eucalypt forest and near dry eucalypt forest.	Low - No dense leaf litter available to provide habitat. No BioNet records within the locality. Test of significance not required.
Philoria sphagnicolus	Sphagnum Frog	V	V	Rainforests including Antarctic Beech forest, moist eucalypt forest and sphagnum moss beds.	**Moderate** - potential foraging and breeding habitat. Recorded within locality. **Test of significance completed**.
Birds					
Anthochaera phrygia	Regent Honeyeater	CE	CE	Dry open forest and woodland with an abundance of nectar-producing eucalypts, particularly box-ironbark woodland, swamp mahogany forests, and riverine sheoak woodlands.	**Moderate** - potential foraging habitat. No BioNet records within the locality. **Test of significance completed**

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Requirement	Potential Occurrence/ Subject Species
Aphelocephala leucopsis	Southern Whiteface	-	V	Open woodlands and shrublands where there is an understorey of grasses or shrubs, or both. These areas are usually in habitats dominated by acacias or eucalypts on ranges, foothills and lowlands, and plains. Individuals may move into wetter areas outside of their normal range during drought years	Low - outside of known range for the species. No BioNet records within the locality. Test of significance not required.
Atrichornis rufescens	Rufous Scrub-bird	V	E	Subtropical, warm temperate, cool temperate rainforest and moist eucalypt forest with rainforest mid-storey. Moist, densely vegetated lower levels with deep leaf litter.	Low - preferred habitat is absent from the site and the species would not be dependent on the available habitat within the site. Test of significance not required.
Botaurus poiciloptilus	Australasian Bittern	E	E	Permanent freshwater wetlands with tall dense vegetation, particularly bullrushes and spikerushes.	None - No suitable habitat occurs. No BioNet records within the locality. Test of significance not required.
Calidris ferruginea	Curlew Sandpiper	E	CE	The Curlew Sandpiper is distributed around most of the Australian coastline. It occurs along the entire coast of NSW, particularly in the Hunter Estuary, and sometimes in freshwater wetlands in the Murray-Darling Basin.	None - No suitable habitat occurs. No BioNet records within the locality. Test of significance not required.
Calyptorhynchus lathami lathami	South Eastern Glossy Black-Cockatoo	V	V	Sheoaks in coastal forests and woodlands, timbered watercourses, and moist and dry eucalypt forests of the coast and the Great Divide up to 1,000 m. Hollow nesters. In central NSW, a very high preference for *E.crebra* among other *Eucalyptus*, living or dead trees, >8m above ground, in branches >30cm diam, steeply angled.	**Moderate** - potential foraging habitat. Recorded within locality. **Test of significance completed**.

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Requirement	Potential Occurrence/ Subject Species
Chthonicola sagittata	Speckled Warbler	V	-	Eucalyptus dominated communities with sparse shrubs and grassy understorey.	**Moderate** - potential foraging and breeding habitat. Recorded within locality. **Test of significance completed**.
Climacteris picumnus victoriae	Brown Treecreeper	V	V	Eucalypt forests and woodlands of inland plains and slopes of the Great Dividing Range, and less commonly on coastal plains and ranges.	**Moderate** - potential foraging and breeding habitat. Recorded within locality. **Test of significance completed**.
Cyclopsitta diophthalma coxeni	Coxen's Fig-parrot	CE	CE	Drier rainforests and adjacent wet eucalypt forest, wetter lowland also wetter lowland rainforests.	Low - Outside of known and predicted ranges for the species. No BioNet records within the locality. Test of significance not required.
Daphoenositta chrysoptera	Varied Sittella	V	-	Inhabits eucalypt forests and woodlands, especially rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland.	**Moderate** - potential foraging and breeding habitat. Recorded within locality. **Test of significance completed**.
Ephippiorhynchus asiaticus	Black-necked Stork	E	-	Swamps, mangroves, mudflats, dry floodplains.	None - No suitable habitat occurs. Test of significance not required.
Erythrotriorchis radiatus	Red Goshawk	CE	E	Open woodland and forest, preferring a mosaic of vegetation types, a large population of birds as a source of food, and permanent water. Typically found in riparian habitats along or near watercourses or wetlands. In NSW, preferred habitats include mixed subtropical rainforest, Melaleuca swamp forest and riparian Eucalyptus forest of coastal rivers. Population in NSW is naturally small (probably only one pair), and lies at extreme of the natural range of the species in Australia.	Low - Outside of known and predicted ranges for the species. No BioNet records within the locality. Test of significance not required.

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Requirement	Potential Occurrence/ Subject Species
Falco hypoleucos	Grey Falcon	V	V	The Grey Falcon is sparsely distributed in NSW, chiefly throughout the Murray-Darling Basin, with the occasional vagrant east of the Great Dividing Range. Frequents timbered lowland plains, particularly Acacia shrublands with watercourses, but also hunts in tussock grassland and open woodland, feeding almost entirely on small birds and rarely small mammals. Nests in tall trees such as E.camaldulensis and E.coolabah, reusing other raptors nests.	Low - Outside of known and predicted ranges for the species. No BioNet records within the locality. Test of significance not required.
Glossopsitta pusilla	Little Lorikeet	V	-	Forages in open Eucalyptus forest and woodland; also feeds on Angophora, Melaleuca and other tree species. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity.	**Moderate** - potential foraging and breeding habitat. Recorded within locality. **Test of significance completed**.
Grantiella picta	Painted Honeyeater	V	V	Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests. Specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias. Prefers mistletoes of the genus Amyema.	Low - Outside of known and predicted ranges for the species. No BioNet records within the locality. Test of significance not required.
Haliaeetus leucogaster	White-bellied Sea-eagle	V	-	Coastal habitats and around terrestrial wetlands characterised by the presence of large areas of open water (larger rivers, swamps, lakes, ocean). Habitats may include freshwater swamps, lakes, reservoirs, billabongs, saltmarsh and sewage ponds in addition to bays and inlets, beaches, reefs, lagoons, estuaries and mangroves.	**Moderate** - potential foraging habitat. Recorded within locality. No nests observed. **Test of significance completed**.

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Requirement	Potential Occurrence/ Subject Species
Hirundapus caudacutus	White-throated Needletail	-	V	Most often seen in eastern Australia before storms, low pressure troughs and approaching cold fronts and occasionally bushfire due to the high insect swarms that can occur in these conditions.	Low - preferred habitat is absent from the site and the species would not be dependent on the available habitat within the site. No BioNet records within the locality. Test of significance not required.
Lathamus discolor	Swift Parrot	E	CE	On mainland Australia foraging occurs where eucalypts are flowering profusely or where abundant lerp infestations occur. Favoured feed trees include winter flowering species such as Swamp Mahogany (*Eucalyptus robusta*), Spotted Gum (*Corymbia maculata*), Red Bloodwood (*C. gummifera*), Forest Red Gum (*E. tereticornis*), Mugga Ironbark (*E. sideroxylon*), and White Box (*E. albens*). Commonly used lerp infested trees include Inland Grey Box (*E. microcarpa*), Grey Box (*E. moluccana*), Blackbutt (*E. pilularis*) and Yellow Box (*E. melliodora*).	Low - preferred habitat is absent from the site and the species would not be dependent on the available habitat within the site. No BioNet records within the locality. Test of significance not required.
Lophoictinia isura	Square-tailed Kite	V	-	Dry woodland and open forest, particularly along major rivers and belts of trees in urban or semi-urban areas. Home ranges can extend over at least 100 km2.	**Moderate** - potential foraging habitat. Recorded within locality. No nests observed. **Test of significance completed**.
Melanodryas cucullata cucullata	South-eastern Hooded Robin	V	E	Prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas.	Low - preferred habitat is absent from the site and the species would not be dependent on the available habitat within the site. No BioNet records within the locality. Test of significance not required.
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	V	-	Drier open forests or woodlands dominated by box and ironbark eucalypts, and open forests of smooth-barked gums, stringybarks, ironbarks and tea-trees.	**Moderate** - potential foraging and breeding habitat. Recorded within locality. **Test of significance completed**.

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Requirement	Potential Occurrence/ Subject Species
Neophema chrysostoma	Blue-winged Parrot	V	V	Blue-winged parrots breed in Tasmania, coastal south-eastern South Australia and southern Victoria. During the breeding season (spring and summer), birds occupy eucalypt forests and woodlands. Outside of the breeding range, habitat critincal to the survival of this species includes foraging and staging habitats found from coastal, sub-coastal and inland areas, right through to semi-arid zones including: grasslands, grassy woodlands and semi-arid chenopod shrubland with native and introduced grasses, herbs and shrubs; and wetlands both near the coast and in semi-arid zones used for foraging and staging.	Low - preferred habitat is absent from the site and the species would not be dependent on the available habitat within the site. No BioNet records within the locality. Test of significance not required.
Ninox connivens	Barking Owl	V	-	Eucalypt woodland, open forest, swamp woodlands and timber along watercourses.	**Moderate** - potential foraging habitat. Recorded within locality. **Test of significance completed**.
Ninox strenua	Powerful Owl	V	-	Woodland and open forest to tall moist forest and rainforest. Requires large tracts of forest or woodland habitat but may also occur in fragmented landscapes.	**Moderate** - potential foraging habitat. Recorded within locality. **Test of significance completed**.
Numenius madagascariensis	Eastern Curlew	-	CE	In NSW the species occurs across the entire coast but is mainly found in estuaries such as the Hunter River, Port Stephens, Clarence River, and Richmond River.	None - No suitable habitat occurs. No BioNet records within the locality. Test of significance not required.

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Requirement	Potential Occurrence/ Subject Species
Pachycephala olivacea	Olive Whistler	V	-	Wet high-altitude forests above 500 m	Low - preferred habitat is absent from the site and the species would not be dependent on the available habitat within the site. Test of significance not required.
Pandion cristatus	Eastern Osprey	V	-	Littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia and offshore islands. Typically occur in coastal areas but occasionally travel inland along major rivers. Wetland habitats include inshore waters, reefs, bays, coastal cliffs, beaches, estuaries, mangrove swamps, broad rivers, reservoirs and large lakes and waterholes.	**Moderate** - potential foraging and breeding habitat. Recorded within locality. **Test of significance completed**.
Petroica boodang	Scarlet Robin	V	-	Dry eucalypt forests and woodlands with an open and grassy understorey with few scattered shrubs. Both mature and regrowth vegetation are utilised; habitat usually contains abundant logs and fallen timber.	**Moderate** - potential foraging and nesting habitat. Recorded within locality. **Test of significance completed**.
Petroica phoenicea	Flame Robin	V	-	Breeds in upland tall moist eucalypt forests and woodlands, often on ridges and slopes; prefers clearings or areas with open understoreys. Breeding habitat is dominated by native grasses and the shrub layer may be either sparse or dense. In winter, birds migrate to drier more open habitats in the lowlands (i.e. valleys below the ranges, and to the western slopes and plains).	**Moderate** - potential foraging and nesting habitat. Recorded within locality. **Test of significance completed**.

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Requirement	Potential Occurrence/ Subject Species
Ptilinopus magnificus	Wompoo Fruit-dove	V	-	Rainforests, low-elevation moist eucalypt forest, and Brush Box forests.	**Moderate** - potential foraging. Recorded within locality. **Test of significance complete**d.
Rostratula australis	Australian Painted Snipe	E	E	Well-vegetated shallows and margins of wetlands, dams, sewage ponds, wet pastures, marshy areas, irrigation systems, lignum, tea-tree scrub, and open timber.	None - No suitable habitat occurs. No BioNet records within the locality. Test of significance not required.
Stagonopleura guttata	Diamond Firetail	V	V	Found in grassy eucalypt woodlands, including Box-Gum Woodlands and Snow Gum (*Eucalyptus pauciflora*) Woodlands. Often also found in riparian areas (rivers and creeks), and sometimes in lightly wooded farmland.	Low - preferred habitat is absent from the site and the species would not be dependent on the available habitat within the site. No BioNet records within the locality. Test of significance not required.
Turnix melanogaster	Black-breasted Button-quail	CE	V	Drier rainforests and vine scrubs, often in association with Hoop Pine and a deep moist leaf litter layer. During drought it may move to adjacent wetter rainforests.	None - No suitable habitat occurs. No BioNet records within the locality. Test of significance not required.
Tyto novaehollandiae	Masked Owl	V	-	Dry eucalypt forest and woodlands.	**Moderate** - potential foraging. Recorded within locality. **Test of significance complete**d.
Tyto tenebricosa	Sooty Owl	V	-	Dry, subtropical and warm temperate rainforests and wet eucalypt forests. Nest in large tree hollows.	**Moderate** - potential foraging. Recorded within locality. **Test of significance complete**d.
Fish					
Mogurnda adspersa	Southern Purple Spotted Gudgeon	E (under FM Act)	-	The Southern Purple Spotted Gudgeon occurs in the Murray-Darling basin as well as parts of coastal northern NSW.	**Moderate** – Potential habitat occurs at the site. **Test of significance complete**d.
Mordacia praecox	Non-parasitic Lamprey	-	E	The species has poorly defined habitat preferences beyond a requirement for freshwater habitats with soft substrates	None - No suitable habitat occurs. No BioNet records within the locality. Test of significance not required.

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Requirement	Potential Occurrence/ Subject Species
				as larvae and, possibly, gravel substrates for spawning.	
Insects					
Argynnis hyperbius	Australian Fritillary	E	CE	Open swampy coastal habitat where the caterpillar's food plant, Arrowhead Violet (*Viola betonicifolia*) occurs.	None - No suitable habitat occurs. No BioNet records within the locality. Test of significance not required.
Mammals					
Cercartetus nanus	Eastern Pygmy Possum	V	-	Range from rainforest to heath. North Coast mainly in rainforest, wet eucalypt forest and tee-tree-banksia scrub.	Low - preferred habitat is absent from the site and the species would not be dependent on the available habitat within the site. Test of significance not required.
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	Near cave entrances and crevices in cliffs.	Low – outside of known range of the species and the species would not be dependent on the available habitat within the site. No BioNet records within the locality. Test of significance not required.
Dasyurus maculatus	Spotted-tailed Quoll	V	E	Dry and moist eucalypt forests and rainforests, fallen hollow logs, large rocky outcrops.	**Moderate** - potential foraging. Recorded within locality. **Test of significance complete**d.
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V	-	Moist and dry eucalypt forest and rainforest, particularly at high elevations.	**Moderate** - potential foraging and roosting habitat. Recorded within locality. **Test of significance completed**.
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	V	-	Occurs in dry sclerophyll forest and woodland east of the Great Dividing Range. Roosts in tree hollows.	**Moderate** - potential foraging and roosting habitat. Recorded within locality. **Test of significance completed**.
Miniopterus australis	Little Bent-winged Bat	V	-	Moist eucalypt forest, rainforest and dense coastal scrub.	**Moderate** - potential foraging and roosting habitat. Recorded within locality. **Test of significance completed**.
Miniopterus orianae oceanensis	Large Bent-winged Bat	V	-	Forest or woodland, roost in caves, old mines and stormwater channels.	**Moderate** - potential foraging and roosting habitat. Recorded within locality. **Test of significance completed**.

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Requirement	Potential Occurrence/ Subject Species
Myotis macropus	Southern Myotis	V	-	Bodies of water, rainforest streams, large lakes, reservoirs.	**Recorded. Test of significance completed.**
Notamacropus parma	Parma Wallaby	V	V	Moist eucalypt forest with thick shrubby understorey, often with nearby grassy areas and rainforest margins.	**Moderate** - potential habitat. Recorded within locality. **Test of significance completed**.
Petauroides volans	Southern Greater Glider	E	E	Ranges and coastal plains of eastern Australia, where it inhabits a variety of eucalypt forests and woodlands. Feeds on Eucalyptus leaves, with some buds and flowers, favoured species vary regionally. Prefers large hollows in large old trees.	**Moderate** - potential foraging and denning habitat. Recorded within locality. **Test of significance completed**.
Petaurus australis australis	Yellow-bellied Glider (south-eastern)	V	V	Tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils. Dens in tree hollows of large trees, often in family groups. Forest type preferences vary with latitude and elevation; mixed coastal forests to dry escarpment forests in the north; moist coastal gullies and creek flats to tall montane forests in the south.	**Moderate** - potential foraging and denning habitat. Recorded within locality. **Test of significance completed**.
Petaurus norfolcensis	Squirrel Glider	V	-	Blackbutt, bloodwood and ironbark eucalypt forest with heath understorey in coastal areas, and box-ironbark woodlands and River Red Gum forest inland.	**Moderate** - potential foraging and denning habitat. Recorded within locality. **Test of significance completed**.

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Requirement	Potential Occurrence/ Subject Species
Petrogale penicillata	Brush-tailed Rock Wallaby	E	V	North-facing cliffs and dry eucalypt forest and woodland, inhabiting rock crevices, caves, overhangs during the day, and foraging in grassy areas nearby at night.	**Moderate** - potential foraging habitat. Recorded within locality. **Test of significance completed**.
Phascogale tapoatafa	Brush-tailed Phascogale	V	-	Drier forests and woodlands with hollow-bearing trees and sparse ground cover.	**Moderate** - potential foraging and denning habitat. Recorded within locality. **Test of significance completed**.
Phascolarctos cinereus	Koala	E	E	Appropriate food trees in forests and woodlands, and treed urban areas. Ideally rainfall 700-1500mm, but can be found in more extreme environments. Home ranges for individuals vary widely from 3-500ha. Utilise more than 400 species of tree, with localised preferences.	**Moderate** - potential habitat present. Recorded within locality. **Test of significance completed**.
Phoniscus papuensis	Golden-tipped Bat	V	-	Rainforest and adjacent sclerophyll forest. Roosts in abandoned hanging Yellow-throated Scrubwren and Brown Gerygone nests.	**Moderate** - potential foraging habitat. Recorded within locality. **Test of significance completed**.
Potorous tridactylus	Long-nosed Potoroo	V	V	Cool temperate rainforest, moist and dry forests, and wet heathland, inhabiting dense layers of grass, ferns, vines and shrubs.	**Moderate** - potential habitat present. Recorded within locality. **Test of significance completed**.
Pseudomys novaehollandiae	New Holland Mouse	-	V	Occurs in open heathlands, open woodlands with a heathland understorey, and vegetated sand dunes.	**Moderate** - potential habitat present. Recorded within locality. **Test of significance completed**.

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Requirement	Potential Occurrence/ Subject Species
Pseudomys oralis	Hastings River Mouse	E	E	Dry open forests with dense, low groundcover with diverse mix of ferns, grass, sedges and herbs.	**Moderate** - potential habitat present. Recorded within locality. **Test of significance completed**.
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	Subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops.	**Moderate** - potential foraging habitat. Recorded within locality. No known roosts at or adjacent to site. **Test of significance completed**.
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V	-	Forages in a variety of habitats, roosts in tree hollows and buildings.	**Moderate** - potential foraging and roosting habitat. Recorded within locality. T**est of significance completed**.
Scoteanax rueppellii	Greater Broad-nosed Bat	V	-	Woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest.	**Moderate** - potential foraging and roosting habitat. Recorded within locality. T**est of significance completed**.
Thylogale stigmatica	Red-legged Pademelon	V	-	Rainforest, vine scrub, moist eucalypt forest with dense understorey and ground cover.	Low - preferred habitat is absent from the site and the species would not be dependent on the available habitat within the site. Test of significance not required.
Vespadelus troughtoni	Eastern Cave Bat	V	-	Cave roosting species found in dry open forest and woodland near cliffs and rocky overhangs.	**Moderate** - potential foraging habitat. Recorded within locality. T**est of significance completed**.
Reptiles					
Coeranoscincus reticulatus	Three-toed Snake-tooth Skink	V	E	Rainforest and occasionally moist eucalypt forest, on loamy or sandy soils.	Low - preferred habitat is absent from the site and the species would not be dependent on the available habitat within the site. No BioNet records within the locality. Test of significance not required.

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Requirement	Potential Occurrence/ Subject Species
Harrisoniascincus zia	Rainforest Cool-skink	-	V	The rainforest cool-skink occurs in cool, high elevation rainforest.	Low - preferred habitat is absent from the site and the species would not be dependent on the available habitat within the site. No BioNet records within the locality. Test of significance not required.

V = Vulnerable; E = Endangered; CE = Critically Endangered

Appendix D

Habitat Trees

Table D1 Habitat Tree Inventory

Tree ID	Common Name	Scientific Name	Hollow-bearing Tree	Tree Height (m)	DBH (cm)	Total Hollows	Limb Hollow*			Trunk Hollow*			Total Fissures	Total Basal Hollows	Nests	Comments
							Small	Medium	Large	Small	Medium	Large				
Kempsey Road																
1	Stag	-	Yes	25	100	1	0	0	0	0	1	0	0	0	0	-
2	Stag	-	Yes	25	120	1	0	0	0	0	0	0	0	1	0	-
3	New England Blackbutt	*Eucalyptus campanulata*	Yes	25	60	2	0	2	0	0	0	0	0	0	0	-
4	New England Blackbutt	*Eucalyptus campanulata*	Yes	25	100	1	0	1	0	0	0	0	0	0	0	-
5	New England Blackbutt	*Eucalyptus campanulata*	Yes	25	120	1	0	0	0	0	1	0	0	0	0	-
6	Broad-leaved Apple	*Angophora subvelutina*	Yes	20	80	1	0	0	0	0	1	0	0	0	0	-
7	Broad-leaved Apple	*Angophora subvelutina*	Yes	20	80	1	0	1	0	0	0	0	0	0	0	-
8	Broad-leaved Apple	*Angophora subvelutina*	Yes	25	80	1	0	1	0	0	0	0	0	0	0	-
9	Broad-leaved Apple	*Angophora subvelutina*	Yes	25	70	1	0	1	0	0	0	0	0	0	0	-
10	Broad-leaved Apple	*Angophora subvelutina*	Yes	25	60	1	1	0	0	0	0	0	0	0	0	-
11	Spotted Gum	*Corymbia maculata*	Yes	20	20	1	1	0	0	0	0	0	0	0	0	-
12	New England Blackbutt	*Eucalyptus campanulata*	Yes	30	60	1	1	0	0	0	0	0	0	0	0	-
13	Spotted Gum	*Corymbia maculata*	Yes	25	30	1	0	1	0	0	0	0	0	0	0	-
14	Spotted Gum	*Corymbia maculata*	Yes	25	35	1	0	0	1	0	0	0	0	0	0	-
15	Spotted Gum	*Corymbia maculata*	Yes	20	70	1	0	1	0	0	0	0	0	0	0	-
16	Spotted Gum	*Corymbia maculata*	Yes	30	35	1	1	0	0	0	0	0	0	0	0	-
17	Forest Oak	*Allocasuarina tortulosa*	No	10	15	0	0	0	0	0	0	0	0	0	1	Hanging ball nest

Tree ID	Common Name	Scientific Name	Hollow-bearing Tree	Tree Height (m)	DBH (cm)	Total Hollows	Limb Hollow*			Trunk Hollow*			Total Fissures	Total Basal Hollows	Nests	Comments
							Small	Medium	Large	Small	Medium	Large				
18	New England Blackbutt	*Eucalyptus campanulata*	Yes	25	25	1	0	1	0	0	0	0	0	0	0	-
19	Spotted Gum	*Corymbia maculata*	Yes	20	80	1	0	1	0	0	0	0	0	0	0	-
20	Stag	-	Yes	20	40	3	2	1	0	0	0	0	0	0	0	-
21	Spotted Gum	*Corymbia maculata*	Yes	20	80	1	1	0	0	0	0	0	0	0	0	-
22	Stag	-	Yes	20	80	2	2	0	0	0	0	0	0	0	0	-
23	Stag	-	Yes	10	40	1	0	0	0	0	0	1	0	0	0	-
24	New England Blackbutt	*Eucalyptus campanulata*	Yes	20	80	1	0	1	0	0	0	0	0	0	0	-
25	Forest Red Gum	*Eucalyptus tereticornis*	Yes	25	60	1	0	0	0	0	1	0	0	0	0	-
26	Spotted Gum	*Corymbia maculata*	Yes	16	50	1	1	0	0	0	0	0	0	0	0	-
27	Forest Red Gum	*Eucalyptus tereticornis*	Yes	16	40	1	0	1	0	0	0	0	0	0	0	-
28	Forest Red Gum	*Eucalyptus tereticornis*	Yes	14	30	2	1	1	0	0	0	0	0	0	0	-
29	Rough-barked Apple	*Angophora floribunda*	No	15	50	0	0	0	0	0	0	0	0	0	1	1 mud nest
30	Stag	-	Yes	15	60	2	2	0	0	0	0	0	0	0	0	-
31	Stag	-	Yes	10	30	1	1	0	0	0	0	0	0	0	0	-
32	Forest Red Gum	*Eucalyptus tereticornis*	Yes	22	50	2	0	2	0	0	0	0	0	0	0	-
33	Forest Red Gum	*Eucalyptus tereticornis*	No	14	50	0	0	0	0	0	0	0	0	0	1	White winged cough nest
34	Spotted Gum	*Corymbia maculata*	Yes	20	100	1	1	0	0	0	0	0	0	0	0	-
35	Pink Bloodwood	*Corymbia intermedia*	Yes	15	60	1	0	0	0	1	0	0	0	0	0	-
36	Pink Bloodwood	*Corymbia intermedia*	Yes	25	120	1	0	0	0	0	0	0	0	1	0	-

Tree ID	Common Name	Scientific Name	Hollow-bearing Tree	Tree Height (m)	DBH (cm)	Total Hollows	Limb Hollow*			Trunk Hollow*			Total Fissures	Total Basal Hollows	Nests	Comments
							Small	Medium	Large	Small	Medium	Large				
37	Forest Red Gum	*Eucalyptus tereticornis*	Yes	25	120	1	0	0	0	0	0	0	0	1	0	-
38	Spotted Gum	*Corymbia maculata*	Yes	20	100	2	2	0	0	0	0	0	0	0	0	Beehive in hollow
39	Stag	-	Yes	80	75	4	3	0	0	0	1	0	0	0	0	-
40	Stag	-	Yes	20	75	3	3	0	0	0	0	0	0	0	0	-
41	Grey Box	*Eucalyptus moluccana*	Yes	15	150	1	1	0	0	0	0	0	0	0	0	-
42	Stag	-	Yes	5	80	1	0	0	0	0	1	0	0	0	0	-
43	Forest Red Gum	*Eucalyptus tereticornis*	Yes	18	140	1	0	0	1	0	0	0	0	0	1	1 medium stick nest
44	Forest Red Gum	*Eucalyptus tereticornis*	Yes	18	220	2	0	2	0	0	0	0	0	0	0	-
45	Forest Red Gum	*Eucalyptus tereticornis*	Yes	18	80	2	2	0	0	0	0	0	0	0	0	-
46	Forest Red Gum	*Eucalyptus tereticornis*	Yes	25	100	2	0	2	0	0	0	0	0	0	0	-
47	Forest Red Gum	*Eucalyptus tereticornis*	Yes	18	70	1	1	0	0	0	0	0	0	0	0	-
48	Forest Red Gum	*Eucalyptus tereticornis*	Yes	18	70	1	1	0	0	0	0	0	0	0	0	-
49	Forest Red Gum	*Eucalyptus tereticornis*	Yes	10	50	3	1	2	0	0	0	0	0	0	0	-
50	Stag	-	Yes	12	20	3	3	0	0	0	0	0	0	0	0	-
51	Forest Red Gum	*Eucalyptus tereticornis*	Yes	10	30	1	0	1	0	0	0	0	0	0	0	-
52	Stag	-	Yes	8	40	1	0	0	0	0	0	1	0	0	0	-
53	Forest Red Gum	*Eucalyptus tereticornis*	Yes	6	60	1	0	0	0	0	1	0	0	0	0	-
54	Stag	-	Yes	8	40	2	1	0	0	0	1	0	0	0	0	-
55	Stag	-	Yes	8	40	1	0	1	0	0	0	0	0	0	0	-
56	Forest Red Gum	*Eucalyptus tereticornis*	Yes	16	50	1	1	0	0	0	0	0	0	0	0	-

Tree ID	Common Name	Scientific Name	Hollow-bearing Tree	Tree Height (m)	DBH (cm)	Total Hollows	Limb Hollow*			Trunk Hollow*			Total Fissures	Total Basal Hollows	Nests	Comments
							Small	Medium	Large	Small	Medium	Large				
57	Broad-leaved Apple	*Angophora subvelutina*	Yes	18	100	2	0	2	0	0	0	0	0	0	0	-
58	Stag	-	Yes	12	100	1	0	0	0	0	0	1	0	0	0	-
59	Spotted Gum	*Corymbia maculata*	Yes	22	200	2	0	0	0	0	0	1	0	0	0	-
60	Spotted Gum	*Corymbia maculata*	Yes	18	100	2	0	1	0	0	0	1	0	0	0	-
61	Spotted Gum	*Corymbia maculata*	No	14	200	0	0	0	0	0	0	0	0	0	1	1 large stick nest
62	Spotted Gum	*Corymbia maculata*	Yes	16	150	1	0	0	0	0	0	1	0	0	0	-
63	New England Blackbutt	*Eucalyptus campanulata*	No	16	40	0	0	0	0	0	0	0	0	0	1	1 small mud nest
64	Stag	-	Yes	20	60	1	0	1	0	0	0	0	0	0	0	-
65	Rough-barked Apple	*Angophora floribunda*	Yes	8	30	1	0	0	0	0	0	1	0	0	0	-
66	Stag	-	Yes	2	25	1	0	0	0	1	0	0	0	0	0	-
67	Stag	-	Yes	6	30	2	2	0	0	0	0	0	0	0	0	-
68	Rough-barked Apple	*Angophora floribunda*	Yes	12	35	2	1	0	0	0	1	0	0	0	0	-
69	Rough-barked Apple	*Angophora floribunda*	Yes	6	30	1	1	0	0	0	0	0	0	0	0	-
70	Rough-barked Apple	*Angophora floribunda*	Yes	15	80	1	0	1	0	0	0	0	0	0	0	-
71	Stag	-	Yes	10	80	1	1	0	0	0	0	0	0	0	0	-
72	Stag	-	Yes	15	100	1	0	0	0	0	1	0	0	0	0	-
73	Forest Red Gum	*Eucalyptus tereticornis*	No	18	50	0	0	0	0	0	0	0	0	0	1	1 medium stick nest
74	Forest Red Gum	*Eucalyptus tereticornis*	No	10	20	0	0	0	0	0	0	0	0	0	1	1 medium stick nest
75	Forest Red Gum	*Eucalyptus tereticornis*	Yes	28	200	1	0	1	0	0	0	0	0	0	0	-
76	Broad-leaved Apple	*Angophora subvelutina*	Yes	18	100	1	0	0	0	0	0	1	0	0	0	-

Tree ID	Common Name	Scientific Name	Hollow-bearing Tree	Tree Height (m)	DBH (cm)	Total Hollows	Limb Hollow*			Trunk Hollow*			Total Fissures	Total Basal Hollows	Nests	Comments
							Small	Medium	Large	Small	Medium	Large				
77	Forest Red Gum	*Eucalyptus tereticornis*	Yes		200	2	1	1	0	0	0	0	0	0	0	-
78	Forest Red Gum	*Eucalyptus tereticornis*	Yes	30	120	1	1	0	0	0	0	0	0	0	0	-
79	Forest Red Gum	*Eucalyptus tereticornis*	Yes	22	250	2	2	0	0	0	0	0	0	0	0	-
80	Forest Red Gum	*Eucalyptus tereticornis*	Yes	20	90	1	1	0	0	0	0	0	0	0	0	-
81	Forest Red Gum	*Eucalyptus tereticornis*	Yes	25	120	3	0	3	0	0	0	0	0	0	0	-
82	Forest Red Gum	*Eucalyptus tereticornis*	No	16	100	0	0	0	0	0	0	0	0	0	1	1 medium stick nest
83	Grey Box	*Eucalyptus moluccana*	No	12	40	0	0	0	0	0	0	0	0	0	1	termitaria
84	Grey Box	*Eucalyptus moluccana*	No	12	40	0	0	0	0	0	0	0	0	0	1	termitaria
85	Broad-leaved Apple	*Angophora subvelutina*	Yes	12	100	1	0	1	0	0	0	0	0	0	0	-
86	Forest Red Gum	*Eucalyptus tereticornis*	Yes	15	130	8	4	2	0	0	1	1	0	0	0	-
87	Forest Red Gum	*Eucalyptus tereticornis*	Yes	18	50	1	1	0	0	0	0	0	0	0	0	-
88	Grey Box	*Eucalyptus moluccana*	Yes	16	250	5	2	3	0	0	0	0	0	0	0	-
89	Forest Red Gum	*Eucalyptus tereticornis*	Yes	18	60	1	0	0	0	0	0	1	0	0	0	
90	Forest Red Gum	*Eucalyptus tereticornis*	Yes	18	100	1	0	1	0	0	0	0	0	0	0	-
91	Forest Red Gum	*Eucalyptus tereticornis*	Yes	25	150	8	6	2	0	0	0	0	0	0	0	-
95	Rough-barked Apple	*Angophora floribunda*	Yes	15	50	1	0	0	0	1	0	0	0	0	0	-
96	Stag	-	Yes	6	60	1	0	0	0	0	0	1	0	0	0	-
97	River Oak	*Casuarina cunninhamiana*	No	13	40	0	0	0	0	0	0	0	1	0	0	Fissure providing non-breeding microbat roost habitat

Tree ID	Common Name	Scientific Name	Hollow-bearing Tree	Tree Height (m)	DBH (cm)	Total Hollows	Limb Hollow*			Trunk Hollow*			Total Fissures	Total Basal Hollows	Nests	Comments
							Small	Medium	Large	Small	Medium	Large				
98	Stag	-	Yes	5	40	1	0	0	0	0	1	0	0	0	0	Microbat roosting habitat
99	Rough-barked Apple	*Angophora floribunda*	Yes	12	40	1	1	0	0	0	0	0	0	0	0	-
100	A Fig	*Ficus sp.*	Yes	18	80	1	0	1	0	0	0	0	0	0	0	-
101	Forest Red Gum	*Eucalyptus tereticornis*	Yes	20	100	1	0	0	0	0	1	0	0	0	0	-
102	Forest Red Gum	*Eucalyptus tereticornis*	Yes	14	60	3	3	0	0	0	0	0	0	0	0	-
103	Spotted Gum	*Corymbia maculata*	Yes	15	30	1	0	0	0	1	0	0	0	0	0	-
104	Spotted Gum	*Corymbia maculata*	Yes	15	35	2	2	0	0	0	0	0	0	0	0	-
105	Stag	-	Yes	12	15	1	0	0	0	1	0	0	0	0	0	-
106	Eucalyptus	*Eucalyptus sp.*	Yes	25	80	2	1	0	0	0	0	0	0	1	0	-
Lower Creek Road																
1	Spotted Gum	*Corymbia maculata*	Yes	12	60	1	0	0	0	0	1	0	0	0	0	-
2	Spotted Gum	*Corymbia maculata*	Yes	14	40	1	0	1	0	0	0	0	0	0	0	-
3	Broad-leaved Apple	*Angophora subvelutina*	Yes	10	30	1	0	1	0	0	0	0	0	0	0	-

* small = <5cm aperture diameter; medium = 5 to 15cm aperture diameter; large = >15cm aperture diameter.

Appendix E

Culvert Microbat Survey Results

Project ID Number	Date Surveyed	Feature	No. of Cells	Approximate Culvert Diameter (mm)	Microbat Evidence	Conservation/ Habitat Value Category	Comments	Inspection required?	Photo
DM00983	18/10/2023	Pipe culvert	1	375	Nil	Nil	-	No	
DM00877	18/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	
DM00409	18/10/2023	Pipe culvert	1	200	Nil	Nil	-	No	
DM00320	-	-	-	-	-	-	Could not locate. Not surveyed	-	-

DM00741	18/10/2023	Pipe culvert	1	200	Nil	Nil	-	No	
DM00485	-	-	-	-	-	-	Could not locate. Not surveyed	-	-
DM00483	-	-	-	-	-	-	Could not locate. Not surveyed	-	-
DM00984	18/10/2023	Pipe culvert	1	975	Nil	Low	Small joint gaps and rough concrete	Yes	
DM00985	18/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	

DM00878	18/10/2023	Pipe culvert	1	600	Nil	Nil	-	No	
DM00999	18/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	
DM00879	18/10/2023	Pipe culvert	1	415	Nil	Nil	-	No	

DM00880	18/10/2023	Pipe culvert	1	600	Nil	Nil	-	No	
DM00743	-	-	-	-	-	-	Could not locate. Not surveyed	-	-
DM00986	18/10/2023	Pipe culvert	1	375	Nil	Nil	Culvert buried on inlet end	No	
DM00987	18/10/2023	Pipe culvert	1	375	Nil	Nil	-	No	
DM00437	-	-	-	-	-	-	Could not locate. Not surveyed	-	-

DM00988	18/10/2023	Pipe culvert	1	375	Nil	Nil	-	No	
DM01090	18/10/2023	Pipe culvert	1	750	Nil	Nil	-	No	
DM00881	18/10/2023	Pipe culvert	2	525	Nil	Nil	-	No	

DM00882	18/10/2023	Pipe culvert	2	450	Nil	Nil	-	No	
DM00883	18/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	
DM00990	18/10/2023	Pipe culvert	2	1200	Nil	Nil	Active Welcome Swallow nest	Yes	

DM00885	18/10/2023	Pipe culvert	1	900	Nil	Nil	-	No	
DM00991	18/10/2023	Pipe culvert	2	750	Nil	Nil	-	No	
DM00992	18/10/2023	Pipe culvert	3	900	Guano	Low	Mirobat guano obserbed within the culvert. Lift holes present	Yes	
DM00993	18/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	

DM00886	18/10/2023	Pipe culvert	1	600	Nil	Nil	-	No	
DM00061	18/10/2023	Pipe culvert	6	1200	Bat bugs obserbed in lift holes	Low	One unkown microbat obserbed in previous inspection of the culvert	Yes	
DM00984	18/10/2023	Pipe culvert	1	600	Nil	Nil	Joint gaps	No	
DM00995	18/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	
DM00996	18/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	

DM00998	18/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	
DM00901	18/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	
DM00902	18/10/2023	Pipe culvert	2	600	Nil	Nil	-	No	
DM00999	18/10/2023	Pipe culvert	1	525	Nil	Nil	-	No	
DM01000	18/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	

DM01001	-	-	-	-	-	-	Could not locate. Not surveyed	-	-
DM01002	18/10/2023	Pipe culvert	1	300	Nil	Nil	-	No	
DM01003	18/10/2023	Pipe culvert	1	250	Nil	Nil	-	No	
DM01004	18/10/2023	Pipe culvert	1	250	Nil	Nil	-	No	
DM00407	-	-	-	-	-	-	Could not locate. Not surveyed	-	-
DM00475	-	-	-	-	-	-	Could not locate. Not surveyed	-	-

DM01005	18/10/2023	Pipe culvert	1	375	Nil	Nil	-	No	
DM00375	-	-	-	-	-	-	Could not locate. Not surveyed	-	-
DM01006	18/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	
DM00411	-	-	-	-	-	-	Could not locate. Not surveyed	-	-
DM00394	-	-	-	-	-	-	Could not locate. Not surveyed	-	-
DM01007	18/10/2023	Pipe culvert	3	1050	Five Southern Myotis (*Myotis macropus*) bats roosting in lift holes	Medium	-	Yes	

DM00903	6/11/2023	Pipe culvert	1	450	Nil	Nil	-	No	
DM01008	18/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	
DM01009	19/10/2023	Pipe culvert	1	750	Nil	Nil	-	No	
DM01010	19/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	
DM01011	19/10/2023	Pipe culvert	2	1050	Guano	Low	Small joint gaps and rough concrete	Yes	

DM01012	19/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	
DM01013	19/10/2023	Pipe culvert	1	375	Nil	Nil	-	No	
DM00905	-	-	-	-	-	-	Could not locate. Not surveyed	-	-
DM01014	19/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	
DM00906	19/10/2023	Pipe culvert	1	375	Nil	Nil	-	No	

DM00907	19/10/2023	Pipe culvert	1	375	Nil	Nil	-	No	
DM00908	19/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	
DM00909	19/10/2023	Pipe culvert	1	375	Nil	Nil	-	No	
DM01015	19/10/2023	Pipe culvert	1	375	Nil	Nil	-	No	

DM00911	19/10/2023	Pipe culvert	1	375	Nil	Nil	-	No	
DM00910	19/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	
DM00463	-	-	-	-	-	-	Could not locate. Not surveyed	-	-
DM00912	19/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	
DM00913	19/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	

DM00914	19/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	
DM00915	19/10/2023	Pipe culvert	1	1200	Nil	Low	Joint gaps and Lift holes present	Yes	
DM00462	-	-	-	-	-	-	Could not locate. Not surveyed	-	-
DM01016	19/10/2023	Pipe culvert	1	1200	Nil	Nil	Active Welcome Swallow nest	Yes	
DM01017	19/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	

DM00387	-	-	-	-	-	-	Could not locate. Not surveyed	-	-
DM00458	-	-	-	-	-	-	Could not locate. Not surveyed	-	-
DM00916	19/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	
DM00786	-	-	-	-	-	-	Could not locate. Not surveyed	-	-
DM01018	19/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	
DM00520	-	-	-	-	-	-	Could not locate. Not surveyed	-	-
DM00454	-	-	-	-	-	-	Could not locate. Not surveyed	-	-
DM00453	-	-	-	-	-	-	Could not locate. Not surveyed	-	-

DM00787	19/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	
DM00450	-	-	-	-	-	-	Could not locate. Not surveyed	-	-
DM01019	19/10/2023	Pipe culvert	1	225	Nil	Nil	-	No	
DM01020	19/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	
DM01021	19/10/2023	Pipe culvert	1	375	Nil	Nil	-	No	

DM01022	19/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	
DM01023	19/10/2023	Pipe culvert	1	1200	Nil	Low	Joint gaps and Lift holes present	Yes	
DM01024	19/10/2023	Pipe culvert	1	375	Nil	Nil	-	No	
DM00357	-	-	-	-	-	-	Could not locate. Not surveyed	-	-
DM01025	19/10/2023	Pipe culvert	2	900			-		

DM00899	19/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	
DM00436	19/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	
DM01026	19/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	
DM01027	19/10/2023	Pipe culvert	1	750	Nil	Nil	Active Welcome Swallow nest with chicks	Yes	

DM01028	19/10/2023	Pipe culvert	1	600	Nil	Nil	-	No	
DM01029	19/10/2023	Pipe culvert	1	600	Nil	Nil	-	No	
C100.907	19/10/2023	Pipe culvert	1	1050	Guano	Low	Joint gaps	Yes	
DM01030	19/10/2023	Pipe culvert	1	1200	Nil	Nil	-	No	

DM01031	19/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	
DM01032	19/10/2023	Pipe culvert	1	750	Nil	Nil	-	No	
DM01033	19/10/2023	Pipe culvert	1	900	Nil	Nil	-	No	
DM01034	19/10/2023	Pipe culvert	1	750	Nil	Nil	-	No	
DM00897	-	-	-	-	-	-	Could not locate. Not surveyed	-	-

DM01035	19/10/2023	Pipe culvert	1	750	Nil	Nil	-	No	
DM01036	19/10/2023	Pipe culvert	2	1050	Nil	Low	Joint gaps. Microbat evidence found in previous 2021 site visit	Yes	
DM00896	19/10/2023	Pipe culvert	1	600	Nil	Nil	-	No	
DM00895	19/10/2023	Pipe culvert	1	1050	Nil	Nil	-	No	

DM01037	19/10/2023	Pipe culvert	1	600	Nil	Nil	-	No	
DM01038	19/10/2023	Pipe culvert	2	600	Nil	Nil	-	No	
DM01039	19/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	
DM01040	19/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	
DM00584	-	-	-	-	-	-	Could not locate. Not surveyed	-	-
DM00511	-	-	-	-	-	-	Could not locate. Not surveyed	-	-

DM00442	-	-	-	-	-	-	Could not locate. Not surveyed	-	-
DM01041	19/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	
DM01042	19/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	
DM01043	19/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	
DM01044	19/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	

DM01045	19/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	
DM01046	19/10/2023	Pipe culvert	1	375	Nil	Nil	-	No	
DM01047	19/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	
DM00596	19/10/2023	Pipe culvert	1	750	Nil	Nil	-	No	

DM01048	19/10/2023	Pipe culvert	1	375	Nil	Nil	-	No	
DM01049	19/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	
DM00359	-	-	-	-	-	-	Could not locate. Not surveyed	-	-
DM00894	-	-	-	-	-	-	Could not locate. Not surveyed	-	-
DM01050	19/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	
DM01051	19/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	

DM01052	19/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	
DM01053	19/10/2023	Pipe culvert	1	375	Nil	Nil	-	No	
DM01054	-	-	-	-	-	-	Could not locate. Not surveyed	-	-
DM00551	-	-	-	-	-	-	Could not locate. Not surveyed	-	-
DM01055	19/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	
DM01056	19/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	

DM01057	19/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	
DM01058	19/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	
DM00893	19/10/2023	Pipe culvert	1	400	Nil	Nil	-	No	
DM01059	19/10/2023	Pipe culvert	1	375	Nil	Nil	-	No	

DM00892	19/10/2023	Pipe culvert	1	375	Nil	Nil	-	No	
DM01060	19/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	
DM00891	19/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	
DM01061	19/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	

DM01062	19/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	
DM01063	19/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	
DM01064	19/10/2023	Pipe culvert	1	375	Nil	Nil	-	No	
DM01065	19/10/2023	Pipe culvert	1	300	Nil	Nil	-	No	

DM01066	19/10/2023	Pipe culvert	1	375	Nil	Nil	-	No	
DM01067	19/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	
DM01068	19/10/2023	Pipe culvert	1	375	Nil	Nil	-	No	
DM01069	19/10/2023	Pipe culvert	1	375	Nil	Nil	-	No	

DM01070	19/10/2023	Pipe culvert	1	450	Nil	Nil	Partially buried	No	
DM01071	19/10/2023	Pipe culvert	1	375	Nil	Nil	-	No	
DM01072	19/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	

DM01073	19/10/2023	Pipe culvert	1	600	Nil	Nil	-	No	
DM01074	19/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	
DM01075	19/10/2023	Pipe culvert	1	400	Nil	Nil	-	No	

DM01076	19/10/2023	Pipe culvert	1	600	Nil	Nil	-	No	
DM01077	19/10/2023	Pipe culvert	1	320	Nil	Nil	-	No	
DM01078	19/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	

DM01079	19/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	
DM01080	19/10/2023	Pipe culvert	1	370	Nil	Nil	-	No	
DM01081	19/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	

DM01082	19/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	
DM01083	19/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	
DM01089	19/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	
DM01084	19/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	
DM01088	19/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	

DM01085	19/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	
DM01086	19/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	
DM00162	19/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	

DM01087	19/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	
DM00890	19/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	
DM00889	19/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	

DM00888	19/10/2023	Pipe culvert	1	1000	Nil	Nil	-	No	
DM00887	19/10/2023	Pipe culvert	1	600	Nil	Nil	-	No	
DM00068	18/10/2023	Pipe culvert	1	300	Nil	Nil	-	No	
DM00069	-	-	-	-	-	-	Could not locate. Not surveyed	-	-

DM00870	18/10/2023	Pipe culvert	1	600	Nil	Nil	-	No	
DM00869	18/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	
DM00868	18/10/2023	Pipe culvert	1	750	Guano	Low	Joint gaps	Yes	
DM00867	18/10/2023	Pipe culvert	1	375	Nil	Nil	Existing pipe already removed and washed away	No	

DM00866	18/10/2023	Pipe culvert	1	525	Nil	Nil	-	No	
DM00864	18/10/2023	Pipe culvert	1	375	Nil	Nil	-	No	
DM00863	18/10/2023	Pipe culvert	2	600	Nil	Nil	-	No	
DM00862	18/10/2023	Pipe culvert	2	600	Nil	Nil	-	No	

DM00071	18/10/2023	Pipe culvert	2	750	Nil	Nil	-	No	
DM00072	18/10/2023	Pipe culvert	3	900	Nil	Nil	-	No	
DM00861	18/10/2023	Pipe culvert	1	600	Nil	Nil	-	No	
DM00860	18/10/2023	Pipe culvert	1	750	Nil	Nil	-	No	

DM00074	18/10/2023	Pipe culvert	1	450	Nil	Nil	-	No	
DM00075	-	-	-	-	-	-	Could not locate. Not surveyed	-	-
DM00859	6/11/2023	Pipe culvert	1	450	Nil	Nil	-	No	

Appendix F

BC Act Five-part Tests of Significance

Assessment of Significance for Threatened Flora:

- White-flowered Wax Plant (*Cynanchum elegans*).
- Slender Milkvine (*Marsdenia longiloba*).
- Scrub Turpentine (*Rhodamnia rubescens*).
- Cryptic Forest Twiner (*Tyloyphora woollsii*).
- Nightcap Plectranthus (*Plectranthus nitidus*).
- Trailing Woodruff (*Asperula asthenes*).

The study area habitat values and extent of local population per species/ species group are detailed below. To minimise repetition, the responses to the Five-part Tests are structured as follows:

Part (a), (c), (d) and (e) are answered per species or as a collective group of species depending on the nature of impacts.

Part (b) deals specifically with threatened ecological communities, and hence is not relevant to the subject threatened species assessment.

a) in the case of a threatened species, whether the proposed development or activity 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,

White-flowered Wax Plant

The species is restricted to eastern NSW where it is distributed from Brunswick Heads on the north coast to Gerroa in the Illawarra region. The species has been recorded as far west as Merriwa in the upper Hunter River valley.

The White-flowered Wax Plant usually occurs on the edge of dry rainforest vegetation. Other associated vegetation types include littoral rainforest; Coastal Tea-tree Leptospermum laevigatum – Coastal Banksia Banksia integrifolia subsp. integrifolia coastal scrub; Forest Red Gum Eucalyptus tereticornis aligned open forest and woodland; Spotted Gum Corymbia maculata aligned open forest and woodland; and Bracelet Honeymyrtle Melaleuca armillaris scrub to open scrub. Typically flowers between August and May, with a peak in November.

Threatening processes for this species include:

- Loss and fragmentation of habitat as a result of clearing for agriculture.
- Loss and fragmentation of habitat as a result of residential development.
- Competition and habitat degradation resulting from weed invasion.
- Loss of habitat as a result of quarry development and expansion.
- Inappropriate fire regime may result in population decline and alter the habitat structure and composition.
- Disturbance as a result of natural catastrophes or environmental changes.
- Disturbance as a result of landfill development and track construction/widening.
- Hydrological disturbance including urban runoff may impact on the species and its habitat.
- Grazing by domestic stock.
- Small population size puts the species as risk of local extirpation as a result of natural or human induced impacts.

Slender Milkvine

Scattered sites of Slender Milkvine have been recorded on the north coast of NSW north from Barrington Tops. Also occurs in south-east Queensland.

Slender Milkvine occurs in subtropical and warm temperate rainforest, lowland moist or open eucalypt forest adjoining rainforest and, sometimes, in areas with rock outcrops. It typically flowers in summer.

Threatening processes for this species include:

- Loss and fragmentation of habitat through land clearing for agriculture.
- Loss and fragmentation of habitat through land clearing for urban development.
- Invasion of habitat by introduced weeds.
- Grazing and trampling of plants by cattle.
- Disturbance of habitat and loss of individuals as a result of forestry activities.
- Risk of local extirpation because populations are small.
- At risk from the use of herbicides in weed control activities.
- Roadside populations are at risk from road works.

Cryptic Forest Twiner

The Cryptic Forest Twiner is found from the NSW north coast and New England Tablelands to southern Queensland, but is very rare within that range. Known on the Tablelands from the Bald Rock and Boonoo Boonoo areas north of Tenterfield.

This species grows in moist eucalypt forest, moist sites in dry eucalypt forest and rainforest margins. It typically flowers in summer and autumn, usually between January and March but sometimes as late as November.

Threatening processes for this species include:

- Habitat clearing for agriculture.
- Habitat clearing for rural and residential development.
- Physical damage, particularly to roadside populations due to vehicles and associated roadworks.
- Competition with weeds may prevent growth of seedlings and regenerating plants, and may increase fire risk.
- Slashing and spraying of roadsides in areas of habitat.
- Forestry operations may impact on individuals and their habitat.
- Risk of extinction because populations are small.
- Fungal infections such as Phytophthora cinnamomi may contribute to the rarity of this species.
- Difficulty in identification may lead to incorrect identification and detection.

Scrub Turpentine

Scrub Turpentine is a shrub or small tree to 25 m high that occurs in coastal districts ranging from Batemans Bay, NSW to areas inland of Bundaberg, Queensland.

This species grows in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils. It typically flowers from late winter to spring.

Threatening processes for this species include:

- Decline in health/loss of mature plants and a lack of seed-based recruitment due to infection by Austropuccinia psidii (Myrtle Rust).
- Degradation of habitat and competition from transformer weed species.
- Clearing from rural, agricultural and urban development leading to edge effects, degradation and further fragmentation.
- Habitat degradation and clearing due to forestry operations.
- Too frequent/intense fire destroying habitat and individual plants.
- Damage caused by inappropriate use of four-wheel drive vehicles.
- Road and track development and maintenance.

Potential impacts of the Activity - White-flowered Wax Plant, Scrub Turpentine, Cryptic Forest Twiner and Slender Milkvine

No occurrence of these species was recorded during the site survey; however, White-flowered Wax Plant, Cryptic Forest Twiner and Slender Milkvine can be difficult to detect.

The Activity would result in the removal of 46.38 ha of potential habitat for the subject vines associated with wet sclerophyll forest along the existing roads. This represents a small proportion (<0.33%) of the potential habitat available within remnant vegetation occurring in the locality (within 2 km of the site). The Activity is unlikely to result in significant habitat fragmentation or isolation of habitat for this species; nor adversely impact adjacent retained habitat as a result of edge effects. Overall, the Activity is unlikely to have an adverse effect on the life cycle of the subject species such that a viable local population is likely to be placed at risk of extinction.

Nightcap Plectranthus

The species occurs within north-east NSW and south-east Queensland. In NSW it was previously known only from Nightcap National Park near Terania Creek in northern NSW. However, the species has now been recorded as far south as Chaelundi National Park near Nymboida.

Nightcap Plectranthus occurs on rocky cliff-faces and boulders, in the shelter and shade provided by the adjacent rainforest and dry rainforest. It is known to co-occur with Plectranthus graveolens and Crofton Weed. It typically flowers between February to May.

Threatening processes for this species include:

- Invasion of habitat by introduced weeds.
- Modification of habitat by removal of surrounding vegetation for forestry.
- Modification of habitat by removal of surrounding vegetation for agricultural expansion.
- Inappropriate fire regime.
- Roadside maintenance activities.
- Vulnerable to local extinction as a result of fragmented populations and restricted distribution.
- Vulnerable to local extinction as a result of small population size.

Potential impacts of the Activity

No occurrence of this species was recorded during the site survey; however, it is a cryptic species.

The Activity would result in the removal of a small proportion (<5 ha) of wet gully vegetation along an existing road which provides potential Nightcap Plectranthus habitat in broad habitat terms. This represents a small portion (<0.33%) of the potential habitat available within remnant vegetation occurring in the locality (within 2 km of the site). The Activity is unlikely to result in significant habitat fragmentation or isolation of habitat for this species; nor adversely impact adjacent retained habitat as a result of edge effects. Overall, the Activity is unlikely to have an adverse effect on the life cycle of Nightcap Plectranthus such that a viable local population is likely to be placed at risk of extinction.

Trailing Woodruff

This small herb occurs only in NSW. It is found in scattered locations from the Central Coast north to near Kempsey, with several records from the Port Stephens/ Wallis Lakes area/ Forster (including Myall Lakes NP, New England NP, Wallingat NP and Darawank NR).

It typically occurs in damp sites, often along riverbanks.

Threatening processes for this species include:

- Disturbance from grazing stock.

- Invasion of habitat by introduced weeds, particularly near watercourses.
- Use of herbicides.
- Current or potential future land management practices do not support conservation
- Water table being raised to reduce acid sulphate discharge as part of a habitat rehabilitation program; effects of this manipulation could potentially be detrimental to the species.

Potential impacts of the Activity

No occurrence of Trailing Woodruff was recorded during the site survey; however, this species is cryptic.

The Activity would result in the removal of 2.59 ha of degraded riparian vegetation along an existing road that provides potential Trailing Woodruff habitat in broad habitat terms. This represents a small portion (<0.33%) of the potential habitat available within remnant vegetation occurring in the locality (within 2 km of the site). The Activity is unlikely to result in significant habitat fragmentation or isolation of habitat for this species; nor adversely impact adjacent retained habitat as a result of edge effects. Overall, the Activity is unlikely to have an adverse effect on the life cycle of Trailing Woodruff such that a viable local population is likely to be placed at risk of extinction.

b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

(i) 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

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

This part is not relevant to the subject species.

c) in relation to the habitat of a threatened species or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

The Activity would result in the removal of

- 46.38 ha of potential habitat for White-flowered Wax Plant, Cryptic Forest Twiner and Slender Milkvine.
- <5 ha of potential habitat for Nightcap Plectranthus
- 2.59 ha of potential habitat for Trailing Woodruff.

This habitat loss is linear and located along an existing road, and represents only a minor proportion of the potential habitat available in the locality for a local population of the subject species.

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and

The site comprises an existing road and the associated habitat loss will comprise a minor widening of the existing disturbed zone. Roughly the eastern two-thirds of the site is located within a fragmented landscape consisting of a mosaic of rural and agricultural land dissected by roads.

The proposed works would involve minor additional clearing along an already fragmented road corridor. Overall, the Activity is unlikely to significantly affect potential pollination or seed dispersal for the subject species; nor have a substantial impact on habitat fragmentation or isolation.

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,

The site comprises an existing road and the associated habitat loss will comprise a minor widening of the existing disturbed zone. The habitat affected is not known habitat for any of the subject species and large areas of better-quality habitat occur locally. Overall, the habitat impacted by the Activity is not considered important to the long-term survival of the subject species within the locality.

d) 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),

No areas of outstanding biodiversity value would be adversely affected by the Activity.

e) 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.

A key threatening process (KTP) is defined under the BC Act as a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species or ecological communities. The current list of KTP under the BC Act, and whether the Activity is recognised as a KTP is shown in **Table F.1**.

Table F1 Key threatening processes

Key Threatening Process (as per Schedule 4 of the BC Act)	Is the development or activity proposed of a class of development or activity that is recognised as a threatening process?		
	Likely	Possible	Unlikely
Aggressive exclusion of birds by noisy miners (*Manorial melanocephala*)			✓
Alteration of habitat following subsidence due to longwall mining			✓
Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands			✓
Anthropogenic climate change			✓
Bushrock removal			✓
Clearing of native vegetation	✓		
Competition and grazing by the feral European Rabbit (Oryctolagus cuniculus)			✓
Competition and habitat degradation by feral goats (*Capra hircus*)			✓

Key Threatening Process (as per Schedule 4 of the BC Act)	Is the development or activity proposed of a class of development or activity that is recognised as a threatening process?		
	Likely	Possible	Unlikely
Competition from feral honeybees (*Apis mellifera*)			✓
Death or injury to marine species following capture in shark control programs on ocean beaches			✓
Entanglement in or ingestion of anthropogenic debris in marine and estuarine environments			✓
Forest eucalypt dieback associated with over-abundant psyllids and bell miners			✓
Herbivory and environmental degradation caused by feral deer			✓
High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition			✓
Importation of red imported fire ants (*Solenopsis invicta*)			✓
Infection by Psittacine circoviral (beak and feather) disease affecting endangered psittacine species and populations			✓
Infection of frogs by amphibian chytrid causing the disease chytridiomycosis		✓	
Infection of native plants by *Phytophthora cinnamomi*		✓	
Introduction and Establishment of Exotic Rust Fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae		✓	
Introduction of the large earth bumblebee (*Bombus terrestris*)			✓

Key Threatening Process (as per Schedule 4 of the BC Act)	Is the development or activity proposed of a class of development or activity that is recognised as a threatening process?		
	Likely	Possible	Unlikely
Invasion and establishment of exotic vines and scramblers		✓	
Invasion and establishment of Scotch Broom (*Cytisus scoparius*)			✓
Invasion and establishment of the Cane Toad (*Bufo marinus*)			✓
Invasion, establishment and spread of Lantana (*Lantana camara*)		✓	
Invasion of native plant communities by African Olive (*Olea europaea* L. subsp. *cuspidata*)			✓
Invasion of native plant communities by *Chrysanthemoides monilifera* (bitou bush and boneseed)			✓
Invasion of native plant communities by exotic perennial grasses		✓	
Invasion of the Yellow Crazy Ant (*Anoplolepis gracilipes*) into NSW			✓
Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants			✓
Loss of hollow-bearing trees	✓		
Loss or degradation (or both) of sites used for hill-topping by butterflies			✓
Predation and hybridisation by feral dogs (*Canis lupus familiaris*)			✓

Key Threatening Process (as per Schedule 4 of the BC Act)	Is the development or activity proposed of a class of development or activity that is recognised as a threatening process?		
	Likely	Possible	Unlikely
Predation by the European Red Fox (*Vulpes vulpes*)			✓
Predation by the feral cat (*Felis catus*)			✓
Predation by Gambusia holbrooki (Plague Minnow or Mosquito Fish)			✓
Predation by the Ship Rat (*Rattus rattus*) on Lord Howe Island			✓
Predation, habitat degradation, competition and disease transmission by feral pigs (*Sus scrofa*)			✓
Removal of dead wood and dead trees	✓		

The Activity is likely to contribute to three KTPs: *clearing of native vegetation, loss of hollow-bearing trees* and *removal of dead wood and dead trees*. The magnitude to which the Activity contributes to these KTPs is unlikely to place a potential local population of the subject species at significant risk of extinction.

The Activity has potential to contribute to six other KTPs, however the probability is low with implementation of the safeguards of this biodiversity assessment and associated REF.

Conclusion

Although 48.97 ha of native habitat would be impacted by the activity it would only amount to 0.33 % of potential habitat available within 2 km of the site. Given that the impacts would largely be limited to the existing road corridor along a 45 km stretch of Kempsey Road and 5 km stretch of Lower Creek Road and that associated habitat loss will comprise a minor widening of the existing disturbed zone, it is unlikely to place a potential local population of any of the subject species at significant risk.

Assessment of Significance for Threatened Fauna:

Tests of significance ('five-part tests') under Section 7.3 of the BC Act have been completed for the following threatened fauna species that have potential to occur at the site:

Frogs

- Davies' Tree Frog (*Litoria daviesae*)
- Glandular Frog (*Litoria subglandulosa*)
- Stuttering Frog (*Mixophyes balbus*)
- Sphagnum Frog (*Philoria sphagnicolus*)

Birds

- Regent Honeyeater (*Anthochaera phrygia*)
- Glossy Black-Cockatoo (*Calyptorhynchus lathami*)
- Speckled Warbler (*Chthonicola sagittata*)
- Brown Treecreeper (*Climacteris picumnus victoriae*)
- Varied Sittella (*Daphoenositta chrysoptera*)
- Little Lorikeet (*Glossopsitta pusilla*)
- White-bellied Sea-eagle (*Haliaeetus leucogaster*)
- Square-tailed Kite (*Lophoictinia isura*)
- Black-chinned Honeyeater (eastern subspecies) (*Melithreptus gularis gularis*)
- Barking Owl (*Ninox connivens*)
- Powerful Owl (*Ninox strenua*)
- Eastern Osprey (*Pandion cristatus*)
- Scarlet Robin (*Petroica boodang*)
- Flame Robin (*Petroica phoenicea*)
- Wompoo Fruit-dove (*Ptilinopus magnificus*)
- Masked Owl (*Tyto novaehollandiae*)
- Sooty Owl (*Tyto tenebricosa*)

Mammals

- Spotted-tailed Quoll (*Dasyurus maculatus*)
- Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)
- Eastern Coastal Free-tailed Bat (*Micronomus norfolkensis*)
- Little Bent-winged Bat (*Miniopterus australis*)
- Large Bent-winged Bat (*Miniopterus orianae oceanensis*)
- Southern Myotis (*Myotis Macropus*)
- Parma Wallaby (*Notamacropus parma*)
- Southern Greater Glider (*Petauroides volans*)
- Yellow-bellied Glider (south-eastern) (*Petaurus australis australis*)
- Squirrel Glider (*Petaurus norfolcensis*)
- Brush-tailed Rock Wallaby (*Petrogale penicillata*)
- Brush-tailed Phascogale (*Phascogale tapoatafa*)
- Koala (*Phascolarctos cinereus*)
- Golden-tipped Bat (*Phoniscus papuensis*)
- Long-nosed Potoroo (*Potorous tridactylus*)
- Hastings River Mouse (*Pseudomys oralis*)
- Grey-headed Flying-fox (*Pteropus poliocephalus*)
- Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*)
- Greater Broad-nosed Bat (*Scoteanax rueppellii*)
- Eastern Cave Bat (*Vespadelus troughtoni*)

a) in the case of a threatened species, whether the proposed development or activity 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,

Frogs: Davies' Tree Frog, Glandular Frog, Stuttering Frog, Sphagnum Frog

The subject frogs can be found in freshwater streams in hilly or mountainous topography, near rainforest, moist and dry eucalypt forest or in subalpine swamps. Stuttering Frog feeds on insects and smaller frogs. The subject frogs breed in spring and summer.

Threatening processes for these species include:

- Modification and loss of habitat.
- Disease - chytrid fungus.
- Changes to natural water flows and water quality.
- Predation of eggs and tadpoles by introduced fish.
- Damage to habitat and impacts on water quality from forestry activities.
- Damage (vegetation removal, disturbance, turbidity) to habitat by domestic stock, feral cattle and pigs.
- Poor knowledge of the species' distribution, taxonomy and history of local extinction.
- Clearing of habitat for agriculture or development.
- Habitat disturbance from timber harvesting.
- Alteration to stream flows resulting from development.
- Reduction in water quality through pasture fertilisation and weed spraying.
- Reduction of leaf-litter and cover of fallen logs through grazing and associated burning.
- Degradation of habitat by weeds
- Potential for predation on eggs and tadpoles by introduced trout.

Potential Impacts of the Activity

Potential direct impacts for the subject frogs include:

- Localised instream works at seven waterways.
- Mortality or injury during clearing of riparian vegetation and creek banks.

Potential indirect impacts include:

- Water quality impacts during construction.
- The potential introduction or spread of pathogens.

Implementation of the safeguards of this biodiversity assessment and corresponding REF would minimise the risk and potential magnitude of these impacts.

With consideration of the nature of the works along an existing road and extent of potential habitat for the subject species along local waterways; the Activity is unlikely to adversely affect the life cycle of the subject frog species such that a viable local population is likely to be placed at risk of extinction.

Forest/ Woodland Birds: Regent Honeyeater, Speckled Warbler, Brown Treecreeper, Varied Sittella, Little Lorikeet, Black-chinned Honeyeater, Scarlet Robin, Flame Robin

The subject forest/ woodland birds forage on a variety of resources such as, insects, seeds, fruit, leaves and nectar.

Threatening processes for these species include:

- Historical loss of woodland, forest and mallee habitats as a result of agriculture, forestry, mining and residential development.
- Fragmentation of woodland and forest remnants which isolates populations and causes local extinctions.
- Ongoing degradation of habitat, particularly the loss of tree hollows and fallen timber from firewood collection and overgrazing.
- Lack of regeneration of eucalypt overstorey in woodland due to overgrazing and too-frequent fires.
- Loss of ground litter from compaction and overgrazing.
- Inappropriate forestry management practices.
- Loss of understorey habitat.
- Competition from invasive weeds.
- Aggressive exclusion from forest and woodland habitat by over abundant Noisy Miners.
- Predation of eggs and nestlings by increased populations of native predators, particularly, predation of Scarlet Robin by over-abundant populations of pied currawong (Strepera graculina) which are supported by planted exotic berry-producing shrubs; this pressure, is addition to that from other native and exotic predators, may be a potentially severe threat to the breeding success of scarlet robin populations.
- Predation by feral cats (Felis catus).
- Risk of local extinction due to small, isolated populations
- Decline in extent and productivity of sheoak foraging habitat due to feral herbivores.
- Reduced access to surface water in close proximity to foraging and nesting habitat.
- Change in the spatial and temporal distribution of resources due to global warming.
- Illegal bird smuggling and egg-collecting.
- Logging and roading in moist eucalypt forest with well-developed rainforest understorey.
- Burning and other causes of reduction in remnant rainforest habitat patches.
- Competition with the introduced Honeybee for both nectar and hollows exacerbates these resource limitations.

Potential Impacts of the Activity

The Activity would result in minor localised impacts to 48.97 ha of potential foraging and nesting habitat for the subject woodland bird species. Temporary disturbance and habitat loss for the road works would be short term and occur primarily along an existing 45 km stretch of Kempsey Road. The native habitat removed for the works would only make up 0.33 % of available habitat for the subject species within the locality (within 2 km of the site). Removal of native habitat proposed for the project would not hinder movement of the species or significantly affect foraging or breeding habitat in a local context.

The Activity is unlikely to significantly impact any of the woodland bird species, hence the Activity is not considered likely to adversely affect the life cycle of any species in such that a viable local population is likely to be placed at risk of extinction.

Glossy Black Cockatoo

Glossy Black Cockatoo (GBC) inhabit coastal woodland, dry open forests, open inland woodland or along timbered watercourses where Casuarina and Allocasuarina species commonly occur. In Northern NSW their key food trees belong to the genus Allocasuarina and include Forest Oak (*A. torulosa*) and Black Oak (*A. littoralis*). This species is dependent on large hollow bearing Eucalypts for

breeding where nests are located within large hollows where single egg is laid between March and May. The female predominantly feeds the chick however and both parents have been observed to feed the young.

Threatening processes for this species include:

- Habitat loss via clearing of woodland areas containing Allocasuarina (food) trees or large eucalyptus (hollow bearing) trees.
- Habitat fragmentation of food resources in relation to nesting trees sites.
- Changing patterns of bushfires in eastern Australia. Casuarina and Allocasuarina trees are very fire sensitive and are easily killed in an intense fire. Large dead trees where the birds nest may also be destroyed by fire.
- Threats from other animals such as feral cats and possums, which raid bird nests.
- Competition with Galah and feral honeybees for hollow resources.
- Climate change and reduction in resources due to drought.
- Illegal bird smuggling and egg collection.
- Habitat infestation by weeds.

Potential Impacts from the Proposal

The proposal would result in the removal of 46.38 ha of sclerophyll forest. The subject vegetation comprises a relatively minor amount of potential foraging habitat (<0.33%) for the Glossy Black Cockatoo within the locality (within 2 km of the site). This includes Forest Oak (*Allocasurina torulosa*) (a primary food tree for the Glossy Black Cockatoo) within the proposal footprint and surrounding forest vegetation. The proposal footprint does not support important breeding habitat for the species due to the limited number of large hollow bearing trees which these birds rely on for breeding and nesting. Glossy Black Cockatoo may also disperse across the site and opportunistically forage on occasions when moving between key forest habitat areas and nesting sites more broadly within the surrounding forest.

On this basis it would be highly unlikely that an adverse effect on the life cycle of the Glossy Black Cockatoo would occur such that a viable local population of the species is likely to be placed at risk of extinction.

Birds of prey: White-bellied Sea-Eagle, Square-tailed Kite, Barking Owl, Powerful Owl, Eastern Osprey, Masked Owl, Sooty Owl

The listed birds of prey species inhabit a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest.

The species all require large tracts of forest or woodland habitat but can occur in fragmented landscapes as well. They breed and hunt in open or closed sclerophyll forest or woodlands and occasionally hunt in open habitats. All four owl species have a similar diet, mainly feeding on arboreal mammals such as the Common Ringtail Possum (*Pseudocheirus peregrinus*), Common Brush-tail Possum and various glider species, with the Masked Owl also feeding heavily on rats. The White-bellied Sea-Eagle feed mainly on fish and freshwater turtles, but also waterbirds, reptiles, mammals and carrion, while the Eastern Osprey feeds mainly on fish. The Square-tailed Kite is specialist hunter of passerines, especially honeyeaters, and most particularly nestlings.

All four owls nest in very large tree hollows. The White-bellied Sea-Eagle, Eastern Osprey and Square-tailed Kite nest in trees in mature tall open forest, open forest, tall woodland, and swamp sclerophyll forest close to foraging habitat.

Threatening processes for these species include:

- Historical loss and fragmentation of suitable forest and woodland habitat from land clearing for residential and agricultural development. This loss also affects the populations of arboreal prey species, particularly the Greater Glider.
- Inappropriate forest harvesting practices that have changed forest structure and removed old growth hollow-bearing trees. Loss of hollow-bearing trees reduces the availability of suitable nest sites and prey habitat.
- Can be extremely sensitive to disturbance around the nest site, particularly during pre-laying, laying and downy chick stages. Disturbance during the breeding period may affect breeding success.
- High frequency hazard reduction burning may also reduce the longevity of individuals by affecting prey availability.
- Road kills.
- Secondary poisoning.
- Poor organisation and availability of species data.
- Predation of fledglings by foxes, dogs and cats.
- Predation of nestlings goannas and brush-tailed possums.
- Illegal egg collection and shooting.

Potential Impacts of the Activity

The Activity would result in the loss of 48.97 ha of potential foraging habitat for the subject birds of prey. The subject vegetation comprises a relatively minor amount of potential foraging habitat (<0.33%) within 2 km of the site. Construction phase impacts (road, culvert improvement, slip remediation and scour protection works) would be short term and would not hinder movement of the species or significantly affect foraging or breeding habitat in a local context.

The Activity is unlikely to significantly impact any of the subject birds of prey, hence the Activity is not considered likely to adversely affect the life cycle of any species in such way that a viable local population is likely to be placed at risk of extinction.

Rainforest Birds: Wompoo Fruit Dove

Occurs along the coast and coastal ranges from the Hunter River in NSW to Cape York Peninsula. It is rare south of Coffs Harbour. Habitat includes rainforests, low elevation moist eucalypt and brush box forests. Most often seen in mature forests, but also found in remnant and regenerating rainforest. Feeds on a diverse range of tree and vine fruits and is locally nomadic - following ripening fruit. Thought to be an effective medium to long-distance vector for seed dispersal.

Breeds in spring and early summer. Typical pigeon nest - a flimsy platform of sticks on a thin branch or a palm frond, often over water, usually 3 - 10 m above the ground. A single egg is laid.

Threatening processes for this species include:

- Clearing and fragmentation of low to mid-elevation rainforest due to coastal development and grazing.
- Logging and roading in moist eucalypt forest with well-developed rainforest understorey.
- Burning, which reduces remnant rainforest habitat patches.
- Infestation of rainforest habitat by invasive weeds.

Potential Impacts of the Proposal

The works would result in the removal of <5 ha of potential foraging habitat by way of removal of gully vegetation within wet sclerophyll forest along a 45 km stretch of Kempsey Road. The subject vegetation comprises a negligible amount of potential foraging or nesting habitat for these highly

mobile birds in a local context (within 2 km of the site). Given the occurrence of extensive forested habitat within the locality, the proposal represents a minor reduction of foraging or nesting habitat which may be utilised by these Fruit-dove species.

On this basis it would be highly unlikely that an adverse effect on the life cycle of the Wompoo Fruit-dove could occur such that a viable local population of the species is likely to be placed at risk of extinction.

Spotted-tailed Quoll

The range of the Spotted-tailed Quoll has contracted considerably since European settlement. It is now found in eastern NSW, eastern Victoria, south-east and north-eastern Queensland, and Tasmania. Only in Tasmania is it still considered relatively common.

Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline.

Individual animals use hollow-bearing trees, fallen logs, small caves, rock outcrops and rocky-cliff faces as den sites.

Mostly nocturnal, although will hunt during the day; spends most of the time on the ground, although also an excellent climber and will hunt possums and gliders in tree hollows and prey on roosting birds. A generalist predator with a preference for medium-sized (500g-5kg) mammals. Consumes a variety of prey, including gliders, possums, small wallabies, rats, birds, bandicoots, rabbits, reptiles and insects. Also eats carrion and takes domestic fowl.

Use communal 'latrine sites', often on flat rocks among boulder fields, rocky cliff-faces or along rocky stream beds or banks. Such sites may be visited by multiple individuals and can be recognised by the accumulation of the sometimes characteristic 'twisty-shaped' faeces deposited by animals.

Females occupy home ranges up to about 750 ha and males up to 3500 ha. Are known to traverse their home ranges along densely vegetated creeklines.

Threatening processes for this species include:

- Loss, fragmentation and degradation of habitat.
- Competition with introduced predators such as cats and foxes.
- Deliberate poisoning, shooting and trapping, primarily in response to chicken predation.
- Roadkill.
- Competition for habitat and other resources by the cane toad.

Potential Impacts of the Activity

The Activity would result in minor localised impacts to potential foraging habitat for the Spotted-tailed Quoll. Temporary disturbance and habitat loss for the road works would be short term and would not hinder movement of the species or significantly affect foraging or breeding habitat in a local context.

The Activity would result in the loss of 46.38 ha of potential foraging habitat for Spotted-tail Quoll. This impact would make up <0.33% of potential habitat within the locality (within 2 km of the site). Construction phase impacts (road, culvert improvement, slip remediation and scour protection works) would be short term and would not hinder movement of the species or significantly affect foraging or breeding habitat in a local context.

Microbats (Eastern False Pipistrelle, Eastern Coastal Free-tailed Bat, Golden-tipped Bat, Greater Broad-nosed Bat, Southern Myotis, Yellow-bellied Sheathtail Bat)

These species are known to roost in tree hollows, amongst other structures including buildings and timber bridges. The Golden-tipped Bat has also been found to roost in abandoned Yellow-throated Scrubwren and Brown Gerygone nests. These species use a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest as aerial foraging habitat catching insects while in flight. Southern Myotis trawl the surface of creeks and open water bodies for small fish and insects.

Threatening processes for these species include:

- Disturbance to roosting and summer breeding sites.

- Foraging habitats are being cleared for residential and agricultural developments, including clearing by residents within rural subdivisions.
- Loss of hollow-bearing trees.
- Pesticides and herbicides may reduce the availability of insects or result in the accumulation of toxic residues in individuals' fat stores.
- Changes to water regimes are likely to impact food resources, as is the use of pesticides and herbicides near waterways.
- Climate change and reduction in resources due to drought.
- Loss of riparian rainforest for roosting and foraging habitat.
- Exotic weeds, particularly lantana and vines, that degrade habitat and alter the structure of rainforest and adjacent wet and dry sclerophyll forest vegetation communities.

Potential Impacts of the Activity

The Activity would result in the removal of 48.97 ha of woody vegetation and minor impacts to aquatic foraging habitat for Myotis. Impacts to potential foraging habitat for these species is minor, consisting of only 0.33% of native habitat available within 2 km of the site. While native foraging habitat would be removed/modified, the Activity is unlikely to result in significant impacts to foraging or dispersal resources which may be utilised by hollow dwelling microbats in a local context.

Non-breeding roost for Southern Myotis at up to 10 locations will be removed during the works, in the form of culverts. New culverts with suitable microbat roosting features (40 mm joint gaps and unfilled lift holes) would be installed following the culvert removal. Alternatively, if it is deemed unfeasible to retain the lift holes, artificial microbat habitat would be installed.

On this basis, it would be highly unlikely that an adverse effect on the life cycle of hollow dwelling microbats would occur such that a viable local population of a species is likely to be placed at risk of extinction.

Cave roosting microbats (Large Bent-winged Bat, Little Bent-winged Bat, Eastern Cave Bat)

Cave roosting bats forage in moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub. Roosting occurs in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings during the day. At night they forage for small insects beneath the canopy of densely vegetated habitats. These cave dwelling bats have often been found to share roosting habitat with other microbat species.

Threatening processes for these species include:

- Disturbance of colonies, especially in nursery or hibernating caves, may be catastrophic.
- Destruction of caves that provide seasonal or potential roosting sites.
- Changes to habitat, especially surrounding maternity/ nursery caves and winter roosts.
- Pesticides on insects and in water consumed by bats bio accumulates, resulting in poisoning of individuals.
- Predation from foxes, particularly around maternity caves, winter roosts and roosts within culverts, tunnels and under bridges.
- Predation from feral cats, particularly around maternity caves, winter roosts and roosts within culverts, tunnels and under bridges.
- Introduction of exotic pathogens such as the White-nosed fungus.
- Hazard reduction and wildfire fires during the breeding season.
- Large scale wildfire or hazard reduction can impact on foraging resources.
- Poor knowledge of reproductive success and population dynamics.
- Climate change and reduction in resources due to drought.

Potential Impacts from the Activity

The Activity would result in the removal of 48.97 ha of woody vegetation. The subject vegetation comprises a relatively minor amount of potential foraging and dispersal habitat (0.33%) within the locality (within 2 km of the site). While native foraging habitat would be removed/modified, the Activity is unlikely to result in significant impacts to foraging or dispersal resources which may be utilised by cave dwelling microbats in a local context.

Overwintering non-breeding roost for Large Bent-winged Bats, Little Bent-winged Bats and Eastern Cave Bats at up to ten locations will be removed during the works, in the form of culverts. New culverts with suitable microbat roosting features (40 mm joint gaps and unfilled lift holes) would be installed following the culvert removal. Alternatively, if it is deemed unfeasible to retain the lift holes, artificial microbat habitat would be installed.

On this basis, it would be highly unlikely that an adverse effect on the life cycle of cave roosting bats would occur such that a viable local population of these species is likely to be placed at risk of extinction.

Southern Greater Glider, Yellow-bellied Gilder, Squirrel Glider, Brush-tailed Phascogale

Gliders and Brush-tailed Phascogale predominantly occur in tall mature Eucalypt Forest with sparse groundcover. Forest type preferences include tall montane, mixed coastal and dry escarpment forests, moist gullies and creek flats and tend to vary depending on latitude and elevation. In coastal areas, the Squirrel Glider inhabits Blackbutt-Bloodwood forest with a heath understorey. Southern Greater Gliders feed exclusively on eucalypt leaves, buds, flowers and mistletoe. Yellow-bellied Gliders feed primarily on plant and insect exudates including nectar from flowers, sap, honeydew and manna. Protein is acquired from pollen and insects. Distinctive V shaped scars indicate Yellow-bellied Glider feed trees where the animal bites or incises the trunk or limbs of preferred trees to encourage the edible sap to flow. The Brush-tailed Phascogale feeds mostly on arthropods but will also eat other invertebrates, nectar and sometimes small vertebrates. These species depend on a range of hollow bearing trees for denning and breeding.

Threatening processes for this species include:

- Loss and fragmentation of habitat.
- Loss of hollow-bearing trees.
- Loss of feed trees.
- Climate change and reduction in resources due to drought.
- Inappropriate fire regimes.
- Reduction in food resources due to drought.
- Mortality due to entanglement on barbed wire.
- Occupation of hollows by exotic species.
- Mortality due to collision with vehicles.
- Predation by exotic predators.

Potential Impacts of the Activity

The Activity would result in the removal of 48.97 ha of woody vegetation. The subject vegetation comprises a relatively minor (0.33%) amount of potential foraging, denning and dispersal habitat for Gliders and Brush-tailed Phascogale. While native potential food trees and vegetation for dispersal would be removed, the Activity is unlikely to result in significant impacts to foraging or dispersal resources which may be utilised by the Gliders and Brush-tailed Phascogale in a local context (within 2 km of the site). Up to 31 hollow bearing trees or suitable denning and breeding habitat would be removed, however, this would not be significant in the context of the site and adjacent areas of suitable breeding and denning habitat.

On this basis it would be highly unlikely that an adverse effect on the life cycle of the subject species would occur such that a viable local population of the species is likely to be placed at risk of extinction.

Koala

The Koala has a fragmented distribution throughout eastern Australia from north-east Queensland to the Eyre Peninsula in South Australia. In New South Wales it mainly occurs on the central and north coasts, with populations on the western side of the Great Dividing Range.

Habitat consists of eucalypt woodlands and forests, in which the Koala feeds on more than 70 eucalypt species and 30 non-eucalypt species. Preferred browse species are different across regions. Koalas are inactive for most of the day and do most of their feeding and moving during the night. Although predominantly arboreal, Koalas would descend and traverse open ground to move between trees. Home range size varies with quality of habitat, ranging from less than two hectares to several hundred hectares in size. Generally solitary, the Koala has complex social hierarchies based on a dominant male with a territory that overlaps that of several females, with sub-ordinate males on the periphery. Females breed at two years of age and produce one young per year.

Threatening processes for this species include:

- Loss, modification and fragmentation of habitat.
- Predation by feral and domestic dogs.
- Intense fires that scorch or kill the tree canopy.
- Road-kills.
- Climate change and reduction in resources due to drought.

Potential Impacts of the Activity

The Activity would result in the removal of 48.97 ha of native vegetation including Forest Red Gums (listed preferred Koala feed trees). Removal of this habitat would only comprise 0.33% of the available habitat within the locality (within 2 km of the site). Given the occurrence of extensive forested habitat within the locality, the Activity represents a minor reduction of potential foraging and temporary refuge habitat which may be utilised by Koalas on an opportunistic basis. The Activity would not result in barriers to Koala movement nor significantly increase the likelihood of vehicle strike to Koalas in the locality. Low numbers of Koala records within the vicinity of the site and lack of evidence of Koala activity on site, indicates the area is unlikely to support a resident breeding population of Koala at or in close proximity to the site.

On this basis it would be highly unlikely that an adverse effect on the life cycle of the Koala would occur such that a viable local population of the species is likely to be placed at risk of extinction.

Hastings River Mouse

The Hastings River Mouse is a small rodent with a head-and-body length of about 17 cm. It is found throughout dry open forest types within the Great Dividing Range from the Hunter Valley, south of Mt Royal to the Bunya Mountains near Kingaroy in south-east Queensland at elevations of 300 m to 1100 m. The Hastings River Mouse feeds on seeds, leaves, insects, and fungi. Nesting occurs in either gully areas or ridges and slopes.

Threatening processes for this species include:

- Loss, modification and fragmentation of habitat.
- Canopy reduction, resulting in reduced groundwater and stream flow.
- Cattle grazing and trampling of preferred habitat.
- Too frequent fires, which may destroy or severely reduce species diversity ground cover.
- Predation by cats and foxes.
- Loss of habitat due fires.

Potential Impacts of the Activity

The Activity would result in minor localised impacts to 46.38 ha of sclerophyll forest which is potential habitat for the Hastings River Mouse. This would only impact 0.33% of low to moderate quality habitat for Hastings River Mouse within 2 km of the site. Temporary disturbance and habitat loss for the road works would be short term and would not hinder movement of the species or significantly affect foraging or breeding habitat.

On this basis it would be highly unlikely that an adverse effect on the life cycle of the Hastings River Mouse would occur such that a viable local population of the species is likely to be placed at risk of extinction.

Long-nosed Potoroo

The Long-nosed Potoroo is a medium sized marsupial with a head-and-body length of about 360 mm and a tail length of about 200-260 mm. It is found throughout the south-eastern coast of Australia, from Queensland to eastern Victoria and Tasmania, including some of the Bass Strait islands. There are geographically isolated populations in western Victoria. In NSW it is generally restricted to coastal heaths and forests east of the Great Dividing Range, with an annual rainfall exceeding 760 mm. The Long-nosed Potoroo largely feeds on fruit-bodies of hypogeous (underground-fruiting) fungi, however roots, tubers, insects and their larvae and other soft-bodied animals in the soil also make up their diet. Nesting occurs during the day in dense vegetation.

Threatening processes for this species include:

- Habitat loss and fragmentation from land clearing for residential and agricultural development.
- Predation from foxes, wild dogs and cats.
- Inappropriate fire regimes reduce the density and floristic diversity of understorey vegetation.
- Logging or other disturbances that reduce the availability and abundance food resources, particularly hypogeous fungi, and ground cover.
- Unplanned clearing in areas where the species occurs on private property is likely to degrade the species' habitat.
- Removal of wild dogs and dingoes potentially exposes potoroos to other threats (competition from other macropods/fox predation) due to removal of top order predator.

Potential Impacts of the Activity

The Activity would result in localised impacts to 46.38 ha of sclerophyll forest which is potential habitat for the Long-nosed Potoroo. This would only impact 0.33% of low to moderate quality habitat for the Long-nosed Potoroo within 2 km of the site. Temporary disturbance and habitat loss for the road works would be short term and would not hinder movement of the species or significantly affect foraging or breeding habitat.

On this basis it would be highly unlikely that an adverse effect on the life cycle of the Long-nosed Potoroo would occur such that a viable local population of the species is likely to be placed at risk of extinction.

Wallabies: Parma Wallaby, Brush-tailed Rock-wallaby

The Parma Wallaby and Brush-tailed Rock-wallaby are small wallabies, with a head and body length up to 52 cm and 60 cm respectively. The Pama Wallaby is found throughout moist eucalypt forest with thick, shrubby understorey, often with nearby grassy areas, rainforest margins and occasionally drier eucalypt forest in the coast and ranges of central and northern NSW from the Gosford district to south of the Bruxner Highway between Tenterfield and Casino. The Parma Wallaby feeds on grasses and herbs. During the day they shelter in dense cover. The Brush-tailed Rock-wallaby occupies rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and

ledges. The Brush-tailed Rock-wallaby feeds on vegetation in and adjacent to rocky areas eating grasses and forbs as well as the foliage and fruits of shrubs and trees.

Threatening processes for these species include:

- Predation by foxes.
- Predation by domestic and wild dogs/dingos.
- Loss and fragmentation of habitat through clearing and under scrubbing.
- Inappropriate fire regime reducing or degrading habitat, especially as a result of overly frequent or intense fires and regular burning of forest margins.
- Climate change altering habitat and increasing risks associated with fire.
- Removal of the understorey and shrub layer by grazing stock.
- Predation by feral cats.
- Habitat degradation and grazing competition by feral horses, cattle, pigs and rabbits.
- Intensive forestry practices resulting in, or exacerbating, habitat loss and fragmentation.
- Competition for food and shelter from wallaroos and other native macropods.
- Poor understanding of the distribution, abundance and population structure at some locations
- Habitat degradation and grazing competition by domestic stock.
- Vehicle strike.
- Lack of information about disease prevalence and susceptibility.

Potential Impacts of the Activity

The Activity would result in localised impacts to 46.38 ha of sclerophyll forest which is potential habitat for the species. This would only impact 0.33% of low to moderate quality habitat for threatened wallabies within 2 km of the site. Temporary disturbance and habitat loss for the road works would be short term and would not hinder movement of the species or significantly affect foraging or breeding habitat.

On this basis it would be highly unlikely that an adverse effect on the life cycle of the threatened wallabies would occur such that a viable local population of the species is likely to be placed at risk of extinction.

Grey-headed Flying-fox

Grey-headed Flying-foxes have a distribution that typically extends approximately 200 km from the coast of Eastern Australia, from Rockhampton in Queensland to Adelaide in South Australia. Foraging areas include subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Feed on the nectar and pollen of native trees, in particular Eucalyptus, Melaleuca and Banksia, and fruits of rainforest trees and vines, as well as from cultivated gardens and orchards. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. Individual camps may have tens of thousands of animals and are used for mating, and for giving birth and rearing young. Annual mating commences in January and conception occurs in April or May; a single young is born in October or November. Site fidelity to camps is high; some camps have been used for over a century. Can travel up to 50 km from the camp to forage; commuting distances are more often <20 km.

Eby and Law (2008) have identified 10 trees that are key foraging resource for the Grey-headed Flying-fox in north-east NSW, consisting of Swamp Mahogany (*Eucalyptus robusta*), Coastal Blackbutt (*E. pilularis*), Grey Ironbark (*E. siderophloia*), Forest Red Gum (*E. tereticornis*), Spotted Gum (*Corymbia variegata*), Large-leaved Spotted Gum (*C. henryi*), Red Bloodwood (*C. gummifera*), Pink Bloodwood (*C. intermedia*), Broad-leaved Paperbark (*Melaleuca quinquenervia*) and Silky Oak (*Grevillea robusta*).

Threatening processes for this species include:

- Clearing of woodlands for agriculture.
- Loss of roosting and foraging sites.
- Electrocution on powerlines, entanglement in netting and on barbed-wire.
- Heat stress.
- Conflict with humans.
- Incomplete knowledge of abundance and distribution across the species' range.
- Climate change and reduction in resources due to drought.

Potential Impacts of the Activity

The Activity would result in the removal of 46.38 ha of sclerophyll forest. This would only impact 0.33% of low to moderate quality habitat for the Grey-headed Flying-fox within 2 km of the site. Given the occurrence of extensive forested habitat within the locality, the Activity represents a minor reduction of foraging habitat which may be utilised by the Grey-headed Flying-fox. No roosting habitat would be affected.

On this basis it would be highly unlikely that an adverse effect on the life cycle of the Grey-headed Flying-fox would occur such that a viable local population of the species is likely to be placed at risk of extinction.

b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

(i) 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

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

No threatened ecological communities occur, no further assessment required.

c) in relation to the habitat of a threatened species or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

The Activity would require the removal of up to 46.38 ha of sclerophyll forest and 2.59 ha of riparian woodland. This would only impact 0.33% of low to moderate quality habitat for the subject species. This habitat occurs primarily along a linear 45 km section of Kempsey Road and is subject to existing edge effects. Given that clearing would mostly be contained to the existing road corridor and the availability of similar or better-quality foraging, dispersal and roosting/nesting habitats nearby in the locality; the impacts to habitat by the Activity is unlikely to have any significant or long-term impacts on foraging, denning, nesting or roosting habitat or breeding territory defended the above listed species.

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and

Habitat at the site is already fragmented due to previous clearing for road/culvert construction and maintenance. The activity would not significantly increase the current level of fragmentation or isolate habitat for any of the subject species.

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,

The habitat to be removed comprises predominantly regrowth of native sclerophyll forest and riparian habitat where there has been historic fragmentation due to road construction. No barriers to dispersal for any of the subject species would be created due to the Activity. The habitat to be removed is unlikely to be of any significant importance to the subject species.

d) 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),

No areas of outstanding biodiversity value have been declared within the Armidale Regional LGA.

e) 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.

A key threatening process (KTP) is a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species or ecological communities. The current list of KTP under the BC Act, and whether the Activity is recognised as a KTP is shown in Table F.2.

Table F2 Key Threatening Processes

Key Threatening Process (as per Schedule 4 of the BC Act)	Is the development or activity proposed of a class of development or activity that is recognised as a threatening process?		
	Likely	Possible	Unlikely
Aggressive exclusion of birds by noisy miners (*Manorina melanocephala*)			✓
Alteration of habitat following subsidence due to longwall mining			✓
Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands			✓
Anthropogenic climate change			✓
Bushrock removal			✓
Clearing of native vegetation	✓		
Competition and grazing by the feral European Rabbit (*Oryctolagus cuniculus*)			✓
Competition and habitat degradation by feral goats (*Capra hircus*)			✓
Competition from feral honeybees (*Apis mellifera*)			✓
Death or injury to marine species following capture in shark control programs on ocean beaches			✓
Entanglement in or ingestion of anthropogenic debris in marine and estuarine environments			✓

Key Threatening Process (as per Schedule 4 of the BC Act)	Is the development or activity proposed of a class of development or activity that is recognised as a threatening process?		
	Likely	Possible	Unlikely
Forest eucalypt dieback associated with over-abundant psyllids and bell miners			✓
Habitat degradation and loss by Feral Horses, *Equus caballus*			✓
Herbivory and environmental degradation caused by feral deer			✓
High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition			✓
Importation of red imported fire ants (*Solenopsis invicta*)			✓
Infection by *Psittacine circoviral* (beak and feather) disease affecting endangered psittacine species and populations			✓
Infection of frogs by amphibian chytrid causing the disease chytridiomycosis		✓	
Infection of native plants by *Phytophthora cinnamomi*		✓	
Introduction and Establishment of Exotic Rust Fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae		✓	
Introduction of the large earth bumblebee (*Bombus terrestris*)			✓
Invasion and establishment of exotic vines and scramblers		✓	
Invasion and establishment of Scotch Broom (*Cytisus scoparius*)			✓
Invasion and establishment of the Cane Toad (*Bufo marinus*)			✓
Invasion, establishment and spread of Lantana (*Lantana camara*)		✓	
Invasion of native plant communities by African Olive (*Olea europaea L. subsp. cuspidata*)			✓

Key Threatening Process (as per Schedule 4 of the BC Act)	Is the development or activity proposed of a class of development or activity that is recognised as a threatening process?		
	Likely	Possible	Unlikely
Invasion of native plant communities by *Chrysanthemoides monilifera*			✓
Invasion of native plant communities by exotic perennial grasses		✓	
Invasion of the Yellow Crazy Ant (*Anoplolepis gracilipes*) into NSW			✓
Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants			✓
Loss of hollow-bearing trees	✓		
Loss or degradation (or both) of sites used for hill-topping by butterflies			✓
Predation and hybridisation by feral dogs (*Canis lupus familiaris*)			✓
Predation by the European Red Fox (*Vulpes vulpes*)			✓
Predation by the feral cat (*Felis catus*)			✓
Predation by *Gambusia holbrooki* (Plague Minnow or Mosquito Fish)			✓
Predation by the Ship Rat (*Rattus rattus*) on Lord Howe Island			✓
Predation, habitat degradation, competition and disease transmission by feral pigs (*Sus scrofa*)			✓
Removal of dead wood and dead trees	✓		

The Activity is such that three KTPs are considered likely to be substantially contributed to.

Clearing of native vegetation: Clearing is defined 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. The proposal would have a relatively minor contribution to this KTP. Considering the relatively small area (0.33%) of native vegetation to be removed within 2 km of the site, it is unlikely that the proposal would contribute significantly to this KTP more broadly.

The proposal would require the removal of native vegetation, hollow-bearing trees and dead wood and dead trees from within five PCTs, consisting of:

- PCT 3205 - Northern Escarpment New England Blackbutt-Tallowwood Wet Forest – removal of up to 4.03 ha.
- PCT 4073 - Lower North Hinterland River Oak Forest – removal of up to 2.59 ha.
- PCT 3251 Northern Gorges Diverse Grassy Forest – removal of up to 15.24 ha.
- 3240 - Lower North Escarpment Red Gum Grassy Forest – removal of up to 27.11 ha.

Considering the vegetation proposed for removal along an existing disturbed road corridor, it is unlikely that the proposal would contribute significantly to this KTP more broadly.

Conclusion

It is considered unlikely that the local population of any of the subject species would be placed at significant risk of extinction as a result of the Activity considering:

- The Activity would require the removal of up to 46.38 ha of sclerophyll forest and 2.59 ha comprising only 0.33% of low to moderate quality habitat for the subject species within the locality (within 2 km of the site).
- The linear and the disturbed nature of the site along a 45 km stretch of Kempsey Road and 5 km stretch of Lower Creek Road.
- The availability of similar or better-quality foraging, dispersal and roosting/nesting habitats nearby in the locality.
- There are no barriers to dispersal for any of the subject species would be created due to the Activity.
- The habitat to be removed comprises predominantly regrowth of native sclerophyll forest and riparian habitat where there has been historic fragmentation due to road construction.

Appendix G

EPBC Act Assessment of Significance

Assessment of Significance (EPBC Act Matters of National Environmental Significance assessment)

Definitions: An 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:

- key source populations either for breeding or dispersal;
- populations that are necessary for maintaining genetic diversity, and/or;
- populations that are near the limit of the species range.

Threatened Flora

Endangered

- Nightcap Plectranthus (*Plectranthus nitidus*).
- White-flowered Wax Plant (*Cynanchum elegans*).
- Slender Milkvine (*Marsdenia longiloba*).
- Scrub Turpentine (*Rhodamnia rubescens*).

Vulnerable

- Cryptic Forest Twiner (*Tylophora woollsii*).
- Trailing Woodruff (*Asperula asthenes*).

Endangered Flora

An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:

a) lead to a long-term decrease in the size of a population

Nightcap Plectranthus, Scrub Turpentine, White-flowered Wax Plant or Slender Milkvine were not recorded in the site survey. The potential habitat for this species to be removed at the site for the proposal consists of 46.38 ha of wet sclerophyll forest that is potential habitat for Scrub Turpentine, White-flowered Wax Plant or Slender Milkvine and <5 ha of gully vegetation that is potential habitat for Nightcap Plectranthus. This vegetation is in low to moderate condition.

The proposal is unlikely to lead to a long-term decrease in the size of a population of the subject species considering that only 0.33% of potential habitat would be removed within the locality (within 2 km of the site), and that equivalent or better habitat is present in the broader locality that can be utilised.

b) reduce the area of occupancy of the species

The proposal is unlikely to reduce the area of occupancy of the species considering that equivalent or better habitat is present in the broader locality that can be utilised and that this habitat will not be affected by the proposal.

c) fragment an existing population into two or more populations

The proposal would result in only a minor increase in the fragmentation of the landscape. The existing landscape is substantially fragmented, consisting of a mosaic of forest remnants and cleared farmland. Post-works, the increase to vegetation fragmentation relating to the proposal would be of such a minor nature as to be negligible.

No area of habitat for the subject species would become substantially fragmented or isolated from other nearby areas of habitat as a result of the proposal.

Considering the above, a minor increase in the width of the cleared road corridor is unlikely to result in significant fragmentation or isolation of habitat for the Nightcap Plectranthus, Scrub Turpentine, White-flowered Wax Plant or Slender Milkvine or result in a disruption to genetic transfer between potential occurrences.

d) adversely affect habitat critical to the survival of a species

Nightcap Plectranthus, Scrub Turpentine, White-flowered Wax Plant or Slender Milkvine were not recorded in the site survey. The habitat affected occurs within a previously disturbed landscape. The vegetation proposed for removal consists of 46.38 ha of sclerophyll forest that is potential habitat for Scrub Turpentine, White-flowered Wax Plant or Slender Milkvine and <5 ha of gully vegetation that is potential habitat for Nightcap Plectranthus. This vegetation is in low to moderate condition.

These site habitats are of relatively low importance to the subject species considering that equivalent or better habitat is present in the broader locality that can be utilised, and that the habitat proposed for removal consists of only 0.33% of the habitat available within 2 km of the site.

e) disrupt the breeding cycle of a population

The proposal is unlikely to result in significant fragmentation or isolation of habitat for the Nightcap Plectranthus, Scrub Turpentine, White-flowered Wax Plant or Slender Milkvine or result in a disruption to genetic transfer between potential occurrences.

Consequently, the proposal is unlikely to disrupt the breeding cycle of a population of the Nightcap Plectranthus, Scrub Turpentine, White-flowered Wax Plant or Slender Milkvine.

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

The habitat affected occurs within a previously disturbed landscape. The vegetation proposed for removal consists of 46.38 ha of sclerophyll forest that is potential habitat for Scrub Turpentine, White-flowered Wax Plant or Slender Milkvine and <5 ha of wet gully vegetation that is potential habitat for Nightcap Plectranthus. This vegetation is in low to moderate condition.

These site habitats are considered to be of relatively low importance to the subject species considering that equivalent or better habitat is present in the broader locality that can be utilised, and that the habitat impacted makes up only 0.33% of the habitat available within 2 km of the site.

Considering the above, the proposal is considered unlikely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the Nightcap Plectranthus, Scrub Turpentine, White-flowered Wax Plant or Slender Milkvine are likely to decline.

g) result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat

The proposal is unlikely to assist invasive species harmful to the Nightcap Plectranthus, Scrub Turpentine, White-flowered Wax Plant or Slender Milkvine to become established, particularly with the effective implementation of the recommended safeguards in relation to weed control and weed hygiene protocols (refer to **Section 5**).

h) introduce disease that may cause the species to decline, or

The proposal is unlikely to introduce a disease that may cause the Nightcap Plectranthus, Scrub Turpentine, White-flowered Wax Plant or Slender Milkvine to decline, particularly with the effective

implementation of the recommended safeguards in relation to machinery hygiene protocols (refer to **Section 5**).

i) interfere with the recovery of this species

The proposal would not be an impediment to the overall recovery of this species, considering that the proposal is relatively minor in nature, and would involve the removal of only up to 46.38 ha of sclerophyll forest that is potential habitat for Scrub Turpentine, White-flowered Wax Plant or Slender Milkvine and <5 ha of wet gully vegetation that is potential habitat for Nightcap Plectranthus. This vegetation exists within an existing disturbed road corridor and makes up only 0.33% of potential habitat within the locality. Alternative habitat, both in the study area and broader locality, would not be substantially adversely affected by the proposal.

Vulnerable Flora

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

a) lead to a long-term decrease in the size of a population

An 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:

- key source populations either for breeding or dispersal
- populations that are necessary for maintaining genetic diversity, and/or
- populations that are near the limit of the species range.

No important population of Cryptic Forest Twiner or Trailing Woodruff occurs at the site. These species are cryptic but widespread and occurs on, in moderately disturbed areas such as cleared woodland, grassy roadside remnants and highly disturbed pasture (Bluegrass) and in damp sites, often along riverbanks (Trailing Woodruff).

b) reduce the area of occupancy of an important population

No important population of Cryptic Forest Twiner or Trailing Woodruff occurs at the site.

c) fragment an existing important population into two or more populations

No important population of Cryptic Forest Twiner or Trailing Woodruff occurs at the site.

d) adversely affect habitat critical to the survival of a species

Cryptic Forest Twiner or Trailing Woodruff were not recorded in the site survey. The habitat affected occurs within a previously disturbed landscape, within the existing road reserve. The vegetation proposed for removal consists of up to approximately 46.38 ha of sclerophyll forest vegetation that is potential habitat for Cryptic Forest Twiner and 2.59 ha of previously disturbed riparian vegetation that is potential habitat for Trailing Woodruff. This vegetation is in low to moderate condition.

These site habitats are considered to be of relatively low importance to Cryptic Forest Twiner or Trailing Woodruff considering that the habitat impacted makes up only 0.33% of equivalent or better habitat present in the broader locality.

e) disrupt the breeding cycle of an important population

No important population of Cryptic Forest Twiner or Trailing Woodruff occurs at the site.

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

The habitat affected occurs within a previously disturbed landscape. The vegetation proposed for removal consists of up to approximately 46.38 ha of sclerophyll forest vegetation that is potential habitat for Cryptic Forest Twiner and 2.59 ha of previously disturbed riparian vegetation that is potential habitat for Trailing Woodruff. This vegetation is in low to moderate condition. This habitat makes up only 0.33% of equivalent or better habitat present in the broader locality

These site habitats are considered to be of relatively low importance to the subject species considering that equivalent or better habitat is present in the broader locality that can be utilised and will not be affected by the Activity.

Considering the above, the Activity is considered unlikely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the Cryptic Forest Twiner or Trailing Woodruff is likely to decline.

g) result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

The Activity is unlikely to assist invasive species harmful to the Cryptic Forest Twiner or Trailing Woodruff to become established, particularly with the effective implementation of the recommended safeguards in relation to machinery hygiene protocols.

h) introduce disease that may cause the species to decline, or

The Activity is unlikely to introduce a disease that may cause the Cryptic Forest Twiner or Trailing Woodruff to decline, particularly with the effective implementation of the recommended safeguards in relation to machinery hygiene protocols.

i) interfere substantially with the recovery of this species

The Activity would not be an impediment to the overall recovery of these species, considering that the Activity is relatively minor, and would only involve the removal of 0.33% of potential habitat for the subject species within the locality (within 2 km of the site). This vegetation occurs along a previously disturbed 45 km stretch of road with existing edge effects.

Threatened Fauna

Critically Endangered or Endangered

- Koala
- Regent Honeyeater
- Spotted-tailed Quoll
- Hastings River Mouse
- Southern Greater Glider

Vulnerable

- Stuttering Frog
- Sphagnum Frog
- South-eastern Glossy Black-Cockatoo
- Brown Treecreeper
- Grey-headed Flying-fox
- Long-nosed Potoroo
- New Holland Mouse
- Parma Wallaby
- Yellow-bellied Glider

An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:

a) lead to a long-term decrease in the size of a population

The subject species (Koala, Regent Honeyeater, Spotted-tailed Quoll, Hastings River Mouse, Southern Greater Glider) were not detected at the site. A proportionally minor (0.33%) and linear section (46.38 ha) of sclerophyll forest vegetation within the existing 50 km stretch of Armidale-Kempsey Road and Lower Creek Road reserve will be removed.

The Activity is unlikely to lead to a long-term decrease in the size of the subject species populations, considering only a relatively small area of potential foraging, nesting, breeding or denning habitat would be removed. Better-quality habitat is available adjacent to the site that can be utilised by the subject species and that will not be affected by the Activity.

b) reduce the area of occupancy of the species

A relatively minor area (46.38 ha) of sclerophyll forest vegetation will be removed from within the existing road reserve of Armidale-Kempsey Road and temporary disturbance by localised instream works at seven waterways. Removal of this habitat amounts to only 0.33% of potential habitat for the subject species within the locality (within 2 km of the site). The Activity is unlikely to reduce the area of occupancy of the subject species considering that equivalent or better foraging, nesting, breeding or denning habitat is present in the broader locality that is available and will not be affected by the Activity.

c) fragment an existing population into two or more populations

The Activity would result in only a minor increase in the fragmentation of the landscape. The existing landscape is already fragmented, consisting of a native woodland and riparian habitat dissected by roads. Once the road rehabilitation works are complete the habitat at the site will be similar to the existing environment.

No area of foraging, nesting, breeding or denning habitat for the listed species would become substantially fragmented or isolated from other nearby areas of habitat as a result of the Activity.

Considering the above, a minor increase in the width of the cleared road corridor is unlikely to result in significant fragmentation or isolation of habitat for the subject species or result in a disruption to genetic transfer between potential occurrences.

d) adversely affect habitat critical to the survival of a species

None of the subject species were recorded in the site survey. The habitat affected occurs within a previously disturbed landscape. The vegetation proposed for removal consists of 46.38 ha of sclerophyll forest vegetation and localised instream works at seven waterways that is potential foraging, nesting, breeding or denning habitat for the subject species. This habitat is in low to moderate condition. Up to 31 hollow bearing trees or suitable denning and breeding habitat would be removed. However, this would not be significant in the context of the linear and disturbed nature of the site along a 50 km stretch of road. Additionally, adjacent areas of suitable breeding and denning habitat are available for the subject species to occupy.

These site habitats are considered to be of relatively low importance to the subject species considering that equivalent or better habitat is present in the broader locality that will not be affected by the Activity.

e) disrupt the breeding cycle of a population

Up to 31 hollow bearing trees or suitable denning and breeding habitat would be removed and localised instream works at seven waterways, however, this would not be significant in the context of the site and adjacent areas of suitable breeding and denning habitat. Only a minor impact to potential foraging and dispersal habitat for the subject species will be affected (0.33% of habitat available in the locality). Consequently, the Activity is unlikely to disrupt the breeding cycle of a population of any subject species.

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

The habitat affected occurs within a previously disturbed landscape and only impacts on 46.38 ha of sclerophyll forest vegetation, and localised instream works at seven waterways that is low to moderate quality potential foraging, nesting, breeding or denning habitat. Given the linear nature of the works along 50 km of road it is considered unlikely that will diminish the quality of habitat available. Additionally, the works would largely remain within the road reserve and hence not lead to further isolation of potential habitat.

These site habitats are considered to be of relatively low importance to the subject species considering that equivalent or better habitat is present in the broader locality that can be utilised and that this habitat will not be affected by the Activity.

Considering the above, the Activity is considered unlikely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that any of the subject species are likely to decline.

g) result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat

The Activity is unlikely to assist invasive species harmful to the subject species to become established, particularly with the effective implementation of the recommended safeguards in relation to weed control and hygiene protocols.

h) introduce disease that may cause the species to decline, or

The Activity is unlikely to introduce a disease that may cause the subject species to decline, particularly with the effective implementation of the recommended safeguards in relation to machinery hygiene protocols.

i) interfere with the recovery of this species

The Activity would not be an impediment to the overall recovery of the subject species, considering that the Activity is relatively minor in nature, removing only 0.33% of the habitat available within the locality (within 2km of the site). The Activity would require the removal of only up to 46.38 ha of potential foraging, nesting, breeding or denning habitat. Given that alternative habitat, both in the study area and broader locality, would not be substantially adversely affected by the Activity, it is unlikely that the Activity will interfere with the recovery of the subject species.

Vulnerable Fauna

An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:

a) lead to a long-term decrease in the size of a population

An 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:

- key source populations either for breeding or dispersal
- populations that are necessary for maintaining genetic diversity, and/or
- populations that are near the limit of the species range.

The Activity is unlikely to lead to a long-term decrease in the size of the subject species populations, considering only a relatively small area of potential foraging, nesting, breeding or denning habitat would be removed. Better-quality habitat is available adjacent to the site that can be utilised by the subject species and that will not be affected by the Activity.

b) reduce the area of occupancy of an important population

No important population of Stuttering Frog, Sphagnum Frog, South-eastern Glossy Black-Cockatoo, Brown Treecreeper, Grey-headed Flying-fox, Long-nosed Potoroo, New Holland Mouse, Parma Wallaby, or Yellow-bellied Glider occurs at the site.

c) fragment an existing important population into two or more populations

No important population of Stuttering Frog, Sphagnum Frog, South-eastern Glossy Black-Cockatoo, Brown Treecreeper, Grey-headed Flying-fox, Long-nosed Potoroo, New Holland Mouse, Parma Wallaby, or Yellow-bellied Glider occurs at the site.

d) adversely affect habitat critical to the survival of a species

Stuttering Frog, Sphagnum Frog, South-eastern Glossy Black-Cockatoo, Brown Treecreeper, Grey-headed Flying-fox, Long-nosed Potoroo, New Holland Mouse, Parma Wallaby, and Yellow-bellied Glider were not recorded in the site survey. The habitat affected occurs within a previously disturbed landscape, within the existing road reserve. The vegetation proposed for removal consists of up to approximately 46.38 ha of sclerophyll forest vegetation that is potential foraging, breeding, nesting and roosting habitat for the subject species. This vegetation is in low to moderate condition.

These site habitats are considered to be of relatively low importance to the subject species considering that only 0.33% of the habitat within the locality (within 2 km of the site) would be removed and that equivalent or better habitat is present in the broader locality that can be utilised.

e) disrupt the breeding cycle of an important population

No important population of the subject species occurs at the site.

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

The habitat affected occurs within a previously disturbed landscape. The vegetation proposed for removal consists of up to approximately 46.38 ha of sclerophyll forest vegetation that is potential foraging, breeding, nesting and roosting habitat for the subject species. This vegetation is in low to moderate condition. Additionally, this vegetation only makes up 0.33% of the habitat available within the locality (within 2 km of the site).

These site habitats are considered to be of relatively low importance to the subject species considering that equivalent or better habitat is present in the broader locality that can be utilised and will not be affected by the Activity.

Considering the above, the Activity is considered unlikely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the Stuttering Frog, Sphagnum Frog, South-eastern Glossy Black-Cockatoo, Brown Treecreeper, Grey-headed Flying-fox, Long-nosed Potoroo, New Holland Mouse, Parma Wallaby, or Yellow-bellied Glider is likely to decline.

g) result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

The Activity is unlikely to assist invasive species harmful to the Stuttering Frog, Sphagnum Frog, South-eastern Glossy Black-Cockatoo, Brown Treecreeper, Grey-headed Flying-fox, Long-nosed Potoroo, New Holland Mouse, Parma Wallaby, or Yellow-bellied Glider to become established, particularly with the effective implementation of the recommended safeguards in relation to machinery hygiene protocols.

h) introduce disease that may cause the species to decline, or

The Activity is unlikely to introduce a disease that may cause the subject species to decline, particularly with the effective implementation of the recommended safeguards in relation to machinery hygiene protocols.

i) interfere substantially with the recovery of this species

The Activity is relatively minor in nature and would involve the removal of only up to approximately 46.38 ha of sclerophyll forest vegetation that is potential foraging, breeding, nesting and roosting habitat for the subject species. Additionally, this vegetation only makes up 0.33% of the habitat available within the locality (within 2 km of the site). Given that alternative habitat, both in the study area and broader locality, would not be substantially adversely affected by the Activity, it is considered unlikely that the Activity would be an impediment to the overall recovery of these species.

Appendix H

Seven-part Tests of Significance (Aquatic Fauna)

The *Fisheries Management Act 1994* (FM Act) maps the following as potential habitat for the threatened fish species, the Southern Purple Spotted Gudgeon (*Mogurnda adspersa*):

- Armidale-Kempsey Road
  - Georges Creek.
  - Dyke River.
  - Lagoon Creek.
- Lower Creek Road
  - Branch Creek.

Due to the potential for indirect impacts on threatened fish habitat, a seven-part test of significance under the FM Act has been completed as follows:

a) 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.

Species Profile

The Southern Purple Spotted Gudgeon (*Mogurnda adspersa*; SPSG) occurs in inland drainages of the Murray-Darling basin as well as coastal drainages of northern NSW and Queensland. SPSG are found in a variety of lotic and lentic habitats including small coastal streams, rainforest streams, large rivers and in dune lake and stream systems. There are also reports of the SPSG being found in estuaries. SPSG are classified as a pool dwelling species, occurring in slow-flowing weedy areas and slow moving or still waters in rivers, creeks and billabongs (Pusey 2004). Miles (2013) suggests that ideal SPSG habitat comprises “stagnant” pools or backwaters, <61 m long and 16 m wide, depth <600 mm, one to 60 per cent riparian cover, 40-60 per cent riparian shading, >21 per cent macrophyte cover, mud or rocky bottom, dissolved oxygen between 6-12 mg/L-1, conductivity 101-300 µm, pH 6-8.99 and 30-150 cm Secchi depth.

SPSG may occur across a range of mesohabitat conditions ranging from small, shallow riffles with moderately fast current velocities to long, moderately deep pools with no obvious flow (Pusey 2004). Substrates may range from complete dominance by mud and sand to those dominated by rock or bedrock. On average, SPSG typically occur in streams less than 10 m in width, about 40 cm deep and with a moderate current velocity (Pusey 2004). PSG feed mainly on insect larvae, but also consume worms, tadpoles, small fish and some plant matter. Female SPSG may lay several batches of eggs per season (30-1300 per batch). The eggs are deposited in clusters on solid objects such as rocks, wood or broad-leaved plants. The male guards and fans the eggs until hatching (three to eight days). The spawning period in northern NSW is not known with any certainty.

Threats to SPSG include:

- Predation by introduced fish such as gambusia and redfin perch.
- Habitat degradation, particularly the loss of aquatic plants.
- Fluctuations in water levels as a result of river regulation, leading to negative impacts on reproduction and recruitment.

Potential impacts of the activity

Potential impacts from the activity include habitat degradation, particularly impacts to water quality as part of the scour protection work, and associated vegetation removal within the banks of the site, as a result of erosion or sedimentation runoff from disturbed areas. These impacts would be localised at existing road drainage structures. With consideration of the extent of potential habitat along the

subject waterways, the Activity is unlikely to impact the SPSG or its habitat to the point adversely affecting the life cycle of the species such that a viable local population is placed at risk of extinction.

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

This part is not relevant to the SPSG.

c) In the case of an endangered ecological community, or critically endangered ecological community whether the action proposed:

(i) 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

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

This part is not relevant to the SPSG.

d) In relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed,

The potential for erosion or sedimentation runoff from disturbed areas as a result of the Activity has the potential to impact the aquatic habitat of SPSG through potential water quality impacts. The risks of these potential impacts would be managed through the implementation of safeguards and is considered unlikely to have significant impacts on the potential habitat of the SPSG.

(ii) 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

The activity would not require blocking of fish passage. The flow of the channel of the waterways would be available for fish movement should there be flows during the duration of the work.

(iii) the importance of the habitat to be removed, modified fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

Better quality SPSG habitat occurs within the locality which would be retained. No fragmentation or isolation or direct impacts to SPSG habitat is likely to occur as a result of the work. The activity is unlikely to result in a reduction in the habitat values of the subject sections of the waterways during the Activity. Post vegetation removal, the habitat values would largely be retained.

e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

No areas of critical habitat have been declared for the subject species.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threatened abatement plan.

Recovery plans under the FM Act have not been prepared for SPSG. A Priorities Action Statement (PAS) has been prepared for SPSG. The activity is not inconsistent with any of these recovery actions.

g) whether the action proposed constitutes or is part of a threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

An assessment of the activity with regards to potential contribution towards or operation of key threatening processes (KTPs) listed under Schedule 6 of the FM Act is provided in **Table H.1**.

Table H1 Assessment of Key Threatening Process (FM Act)

Listed Key Threatening Process (FM Act)	***Is the development or activity proposed of a class of development or activity that is recognised as a threatening process?***		
	Likely	***Possible***	***Unlikely***
Current shark meshing program in NSW waters			✓
Hook and line fishing in areas important for the survival of threatened fish species			✓
Human-caused climate change		✓	
Instream structures and other mechanisms that alter natural flow		✓	
Introduction of non-indigenous fish and marine vegetation to the coastal waters of NSW			✓
The introduction of fish to fresh waters within a river catchment outside their natural range			✓
The removal of large woody debris from NSW rivers and streams		✓	
The degradation of native riparian vegetation along NSW water courses		✓	

The activity is not characteristic any KTPs. With the prescribed safeguards implemented (as outlined in **Section 5**) the impacts to fauna via impacts to habitat, injury or mortality is reduced. The degree that the proposed activity would contribute to any key threatening process is not considered likely to place the local population of any of the subject species at significant risk of extinction.