# Traffic Impact Assessment

## Kempsey Road Remediation

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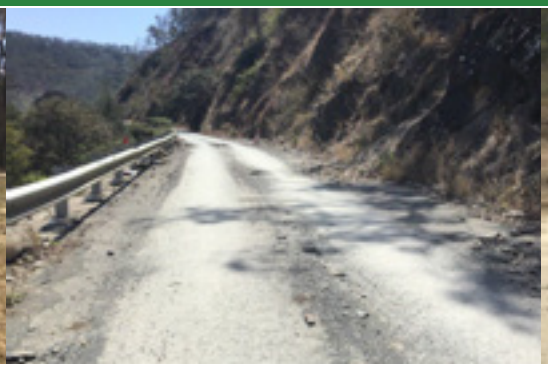


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# Executive Summary

Armidale Regional Council (ARC) proposes to carry out road restoration works for the Kempsey-Armidale Road (Kempsey Road) and Lower Creek Road, Armidale, NSW.

Kempsey Road and Lower Creek Roads are narrow, unsealed single lane roadways that predominately accommodate a combination of local, forestry, agricultural and tourist traffic. They also provide a critical connection between Armidale and Kempsey.

The local geology of the site makes the subject road prone to regular landslips and washouts causing ongoing drainage and pavement damage. The roadways were damaged by bushfires in 2019/ 20 and subsequent flooding in 2020. The condition of the roads has deteriorated, and emergency works have been undertaken to reopen the roads to the public.

ARC is proposing to rehabilitate and restore 43 kms of Kempsey Road and a 5.1 km section of Lower Creek Road to pre-disaster condition. The overall project construction is anticipated to be completed in a 41-month period.

The condition of Kempsey Armidale Road varies across its' extent, consists of both sealed and unsealed sections with varying widths. There are numerous sections of Kempsey Armidale Road that are extremely narrow with cliff drop off on one side and cliff face on the other, road width is restricted to 3.5 m in several sections with no opportunity for safe vehicle passing for extended periods (greater than 0.5 km). The sealed sections of Kempsey Armidale Road are in relatively good condition in most sections; however, the seam between the seal and unsealed section is generally poor and prone to heavy wear from vehicular traffic. The unsealed sections are showing signs of deterioration with loose aggregate, generally slippery during wet conditions and extensively dusty during dry conditions.

The Annual Average Daily Traffic (AADT) volume of traffic on Kempsey Armidale Road is typically under 1,000 vehicles. During construction, construction associated traffic will increase the AADT on the eastern portion of Kempsey Armidale Road by approximately 227% and on the western portion of Kempsey Armidale Road by approximately 147%.

The unsealed pavements along Kempsey Armidale Road are in poor condition with many areas showing signs of:

- Coarse texture where the aggregates/ rock are protruding from the pavement surface and noticeably loose.
- Corrugations.
- Loose powdery materials.
- Rutting.
- Channel erosion.
- Potholes.
- Shoving.

The Infrastructure Risk Rating (IRR) calculated for Kempsey Armidale Road indicates that it is a 'High' risk road in terms of safety. The condition and types of the pavement is a factor in the road's safety issues; however, most of the safety issues are due to the narrow design and poor sight distance on numerous sections of the road.

This traffic impact assessment for the Kempsey Road Restoration Works project has identified that the number of vehicles associated with the construction works will result in a significant increase in vehicle traffic on the entirety of Kempsey Armidale Road, thus impacting the existing road users.

The increased construction traffic will impact the existing pavements which will have detrimental impacts to the already poor condition unsealed pavements on both the east and western side of the proposed works area.

Managing road safety during the construction works will be essential. Appropriate traffic management measures will need to be implemented to ensure safety of all road users during the period of construction; management measures may include:

- Reducing the speed limit of Kempsey Armidale Road in sections that are narrow, winding, unsealed, or have obstructed sight distances to a maximum of 60 km/h.
- Installing give way signage and road markings on sections of road that are narrow but have good sight distance of oncoming traffic (e.g., Styx River Crossing bridge).
- Installing automated temporary traffic lights on sections that are narrow and have poor sight distance of oncoming traffic.
- Restricting construction traffic to designated periods of the day when existing traffic volumes are low.
- Pre-planning heavy vehicle movements and implementing convoy tactics with manned traffic control at appropriate locations to manage normal traffic movements.
- Regular dust management of unsealed roads.

It is recommended that Council consider:

- repairing existing defects (e.g., rutting, corrugations, etc.) along the subject roads prior to construction; and
- establishing a maintenance regime throughout construction to assess the condition on regular intervals with intervention levels for repair of defects created during construction.

The pavement of Kempsey Armidale Road will deteriorate with the additional traffic movements over the construction period, pre-planning by ARC and KSC to ensure road maintenance works are planned strategically after the Kempsey Road Restoration Works project has concluded would be advantageous and reduce future vehicle hazards.

# 1. Introduction

## 1.1 Proposed Works

Armidale Regional Council (ARC) proposes to carry out road restoration works for the Kempsey-Armidale Road (Kempsey Road) and Lower Creek Road, Armidale, NSW.

Kempsey Road and Lower Creek Roads are narrow, unsealed single lane roadways that predominately accommodate a combination of local, forestry, agricultural and tourist traffic. They also provide a critical connection between Armidale and Kempsey.

The local geology of the site makes the subject road prone to regular landslips and washouts resulting in drainage and pavement damage from. The roadways were damaged by bushfires in 2019/ 20 and subsequent flooding in 2020. In some areas, the road has required emergency works due to flooding and bushfires to reopen the road to the public.

ARC is proposing to rehabilitate and restore 43 kms of Kempsey Road and a 5.1 km section of Lower Creek Road to pre-disaster condition. The overall project construction is anticipated to be completed in a 41-month period.

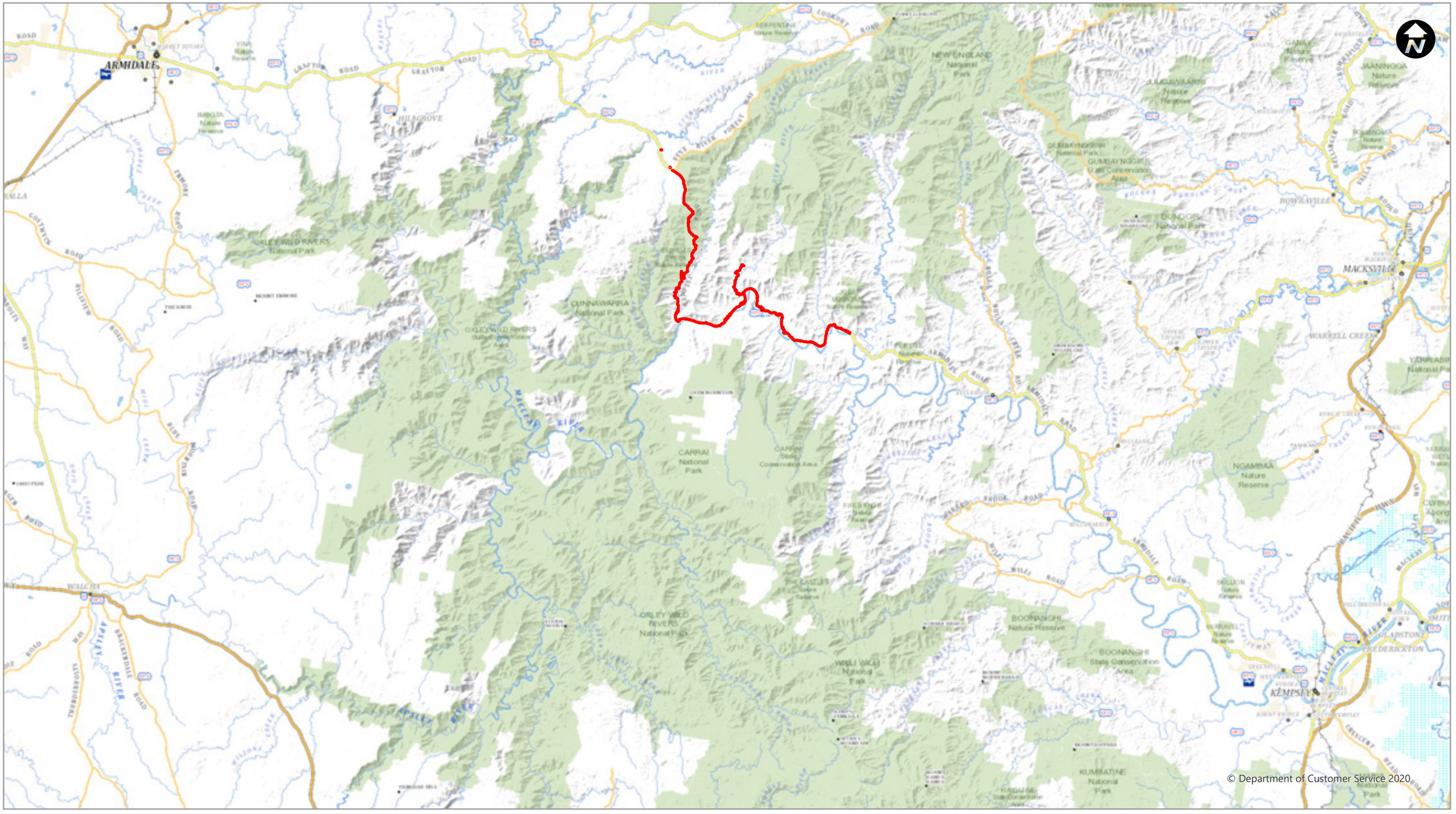
This traffic impact assessment (TIA) assesses the potential impacts of the proposed construction works associated with this project.

Throughout this report the road 'Kempsey Armidale Road' will refer to the road in its' entirety. Sections of the report where the road refers to the 'western' section of Kempsey Armidale Road which is in the Armidale Regional Council area the road will be referred to as 'Kempsey Road'. Sections of the report where the road refers to the 'eastern' section of Kempsey Armidale Road which is in the Kempsey Shire Council area the road will be referred to as 'Armidale Road'.

### 1.1.1 Site Description

Kempsey Armidale Road connects the Armidale and Kempsey townships in NSW. The road is approximately 132 km long and stretches across multiple suburbs, from Yarravel in the east to Wollomombi in the west (refer to **Illustration 1.1**). The road is currently a mixture of sealed and unsealed pavements, and the width of the road varies extensively between 3 m (where vehicles are unable to pass one another) and 8 m depending on the location.

Access to the Kempsey Armidale Road from the east is from River Street and North Street which connect to Macleay Valley Way. Access to Kempsey Armidale Road from the west is from Waterfall Way. Both Waterfall Way and Macleay Valley Way are major arterial roads.




**LEGEND**

Activity boundary

0 7 Km

## Site Locality - Illustration 1.1

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Review of Environmental Factors – ARC Kempsey Road Restoration
4055-1073

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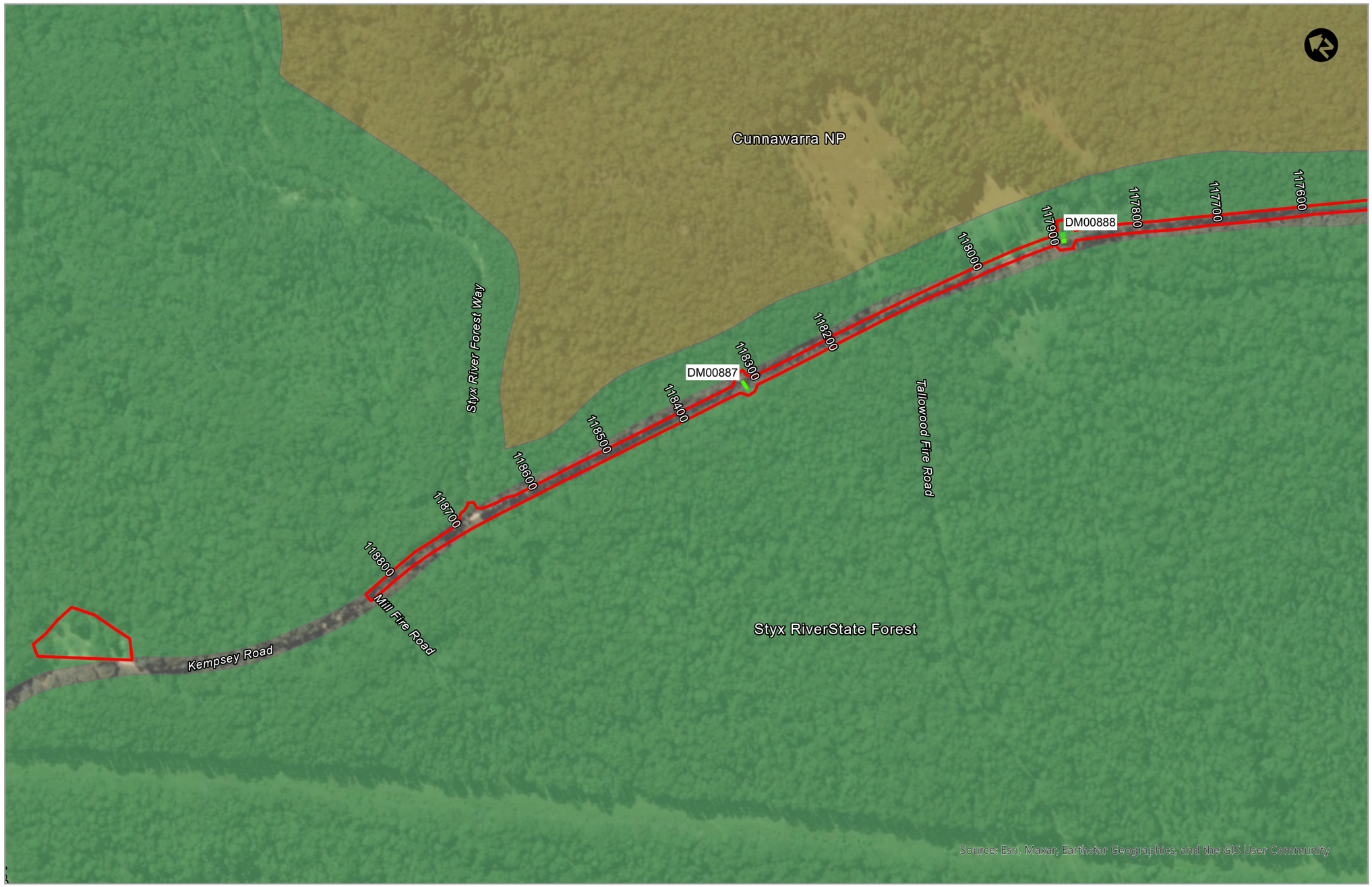
*Date: 13/11/2023*
*Revision: D*

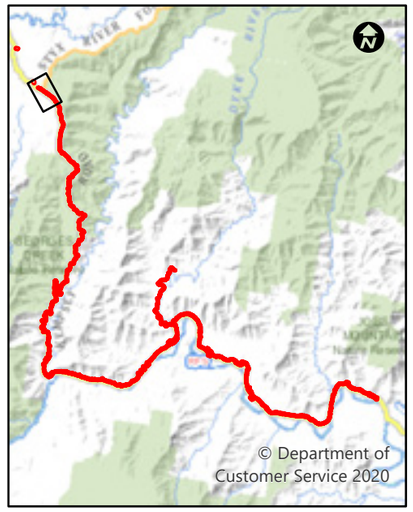
### 1.1.2 Works Location

The proposed project works includes:

- Disaster Recovery Works:
  - 43 km section of the Kempsey Road (ch72.95km - ch116.00km).
  - 5.1 km long section of Lower Creek Road.
- Improvement Works including:
  - Blackbird Flat – Pavement sealing at Blackbird Flat Cutting (ch73.50km-ch74.05km).
  - Flying Fox – Pavement sealing at Flying Fox Cutting (ch86.30km-ch88.15km).
  - Big Hill – Curve improvements on Big Hill, (ch112.888km - 113.193km, and ch108.563km – ch108.723km).

The location of the proposed work sections are shown in **Illustration** 1.2.




**Map Sheet Location**

**LEGEND**

- Activity boundary
- Culvert
- National Park reserve
- State Forest

0 100 Meters

The Site
Illustration 1.2 - Sheet 1 of 27

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Review of Environmental Factors – ARC Kempsey Road Restoration
4055-1076

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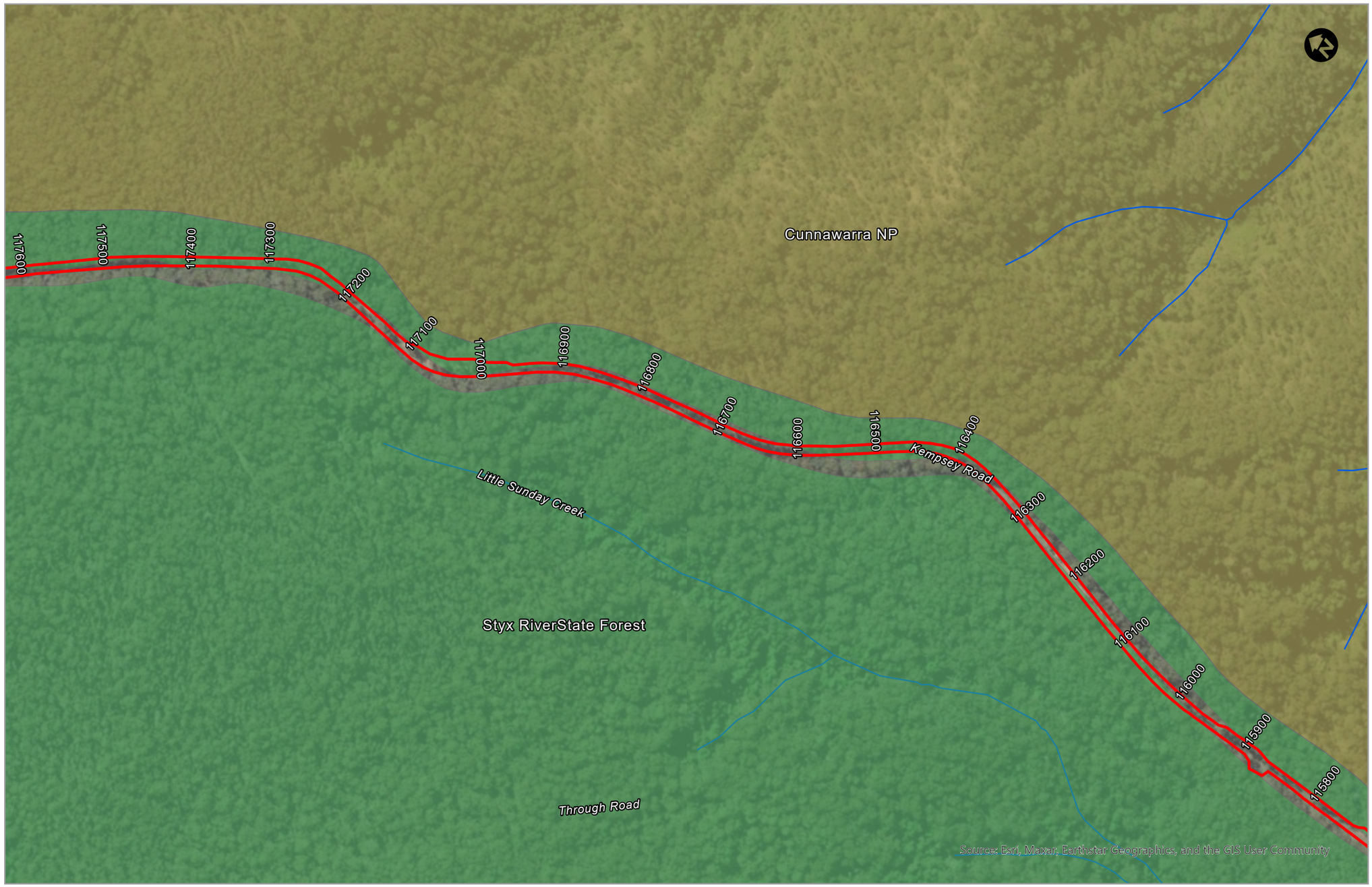


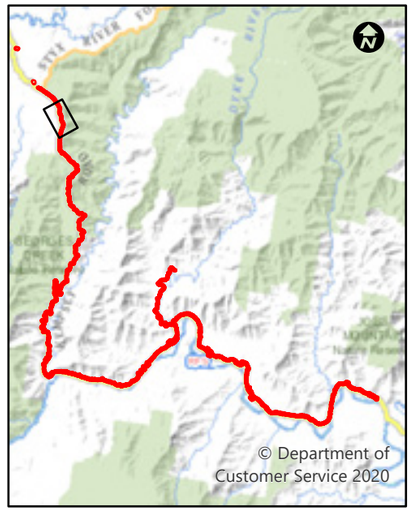


**Map Sheet Location**

**LEGEND**

Activity boundary
National Park reserve
State Forest
Watercourse

0 100 Meters



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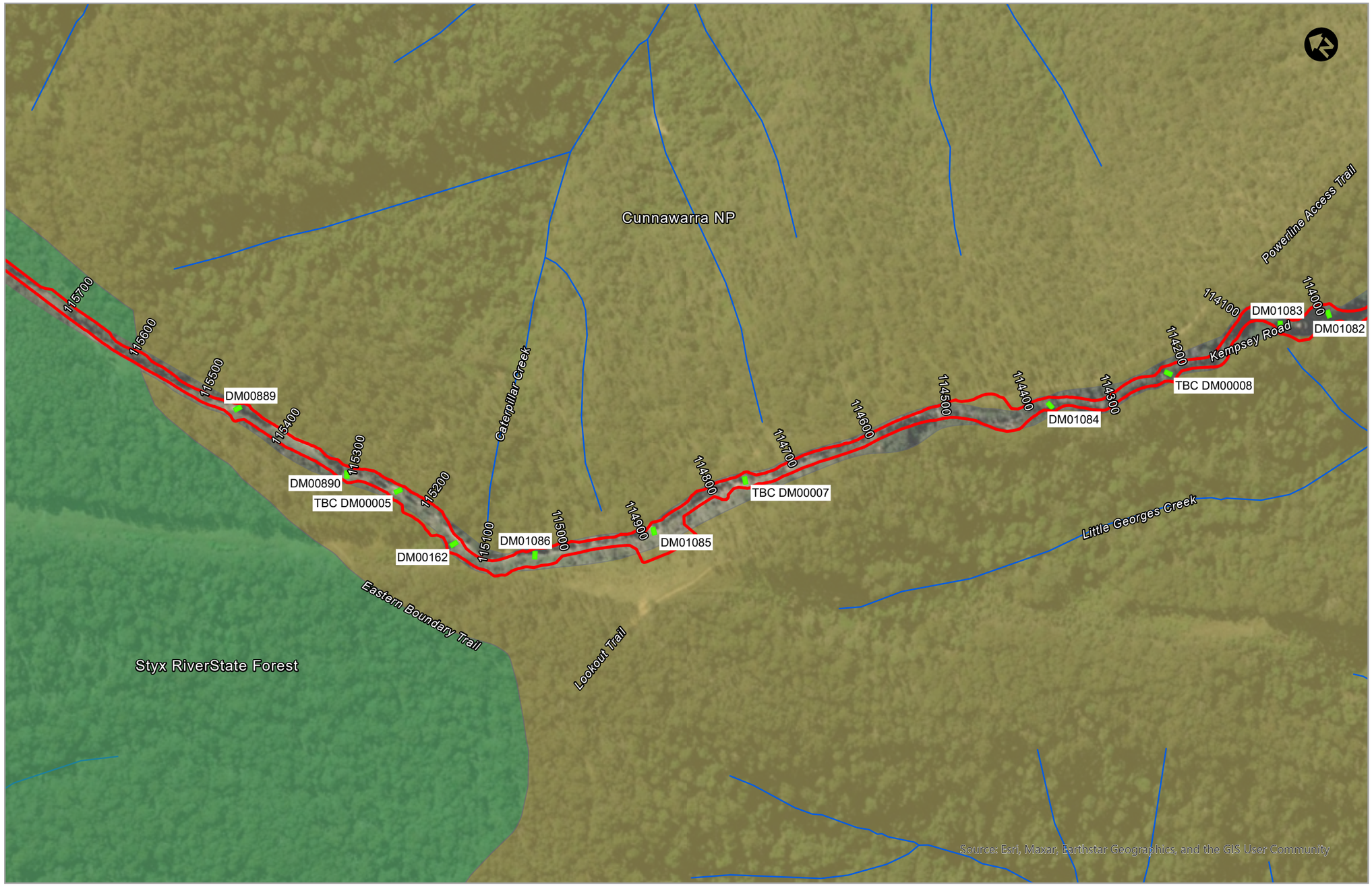


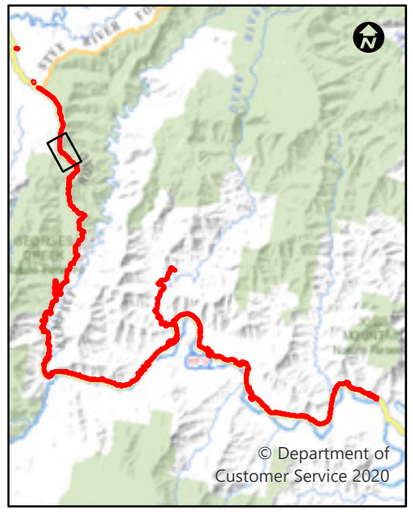


**Map Sheet Location**

**LEGEND**

- Activity boundary
- Culvert
- National Park reserve
- State Forest
- Watercourse

0 100 Meters

The Site
Illustration 1.2 - Sheet 3 of 27



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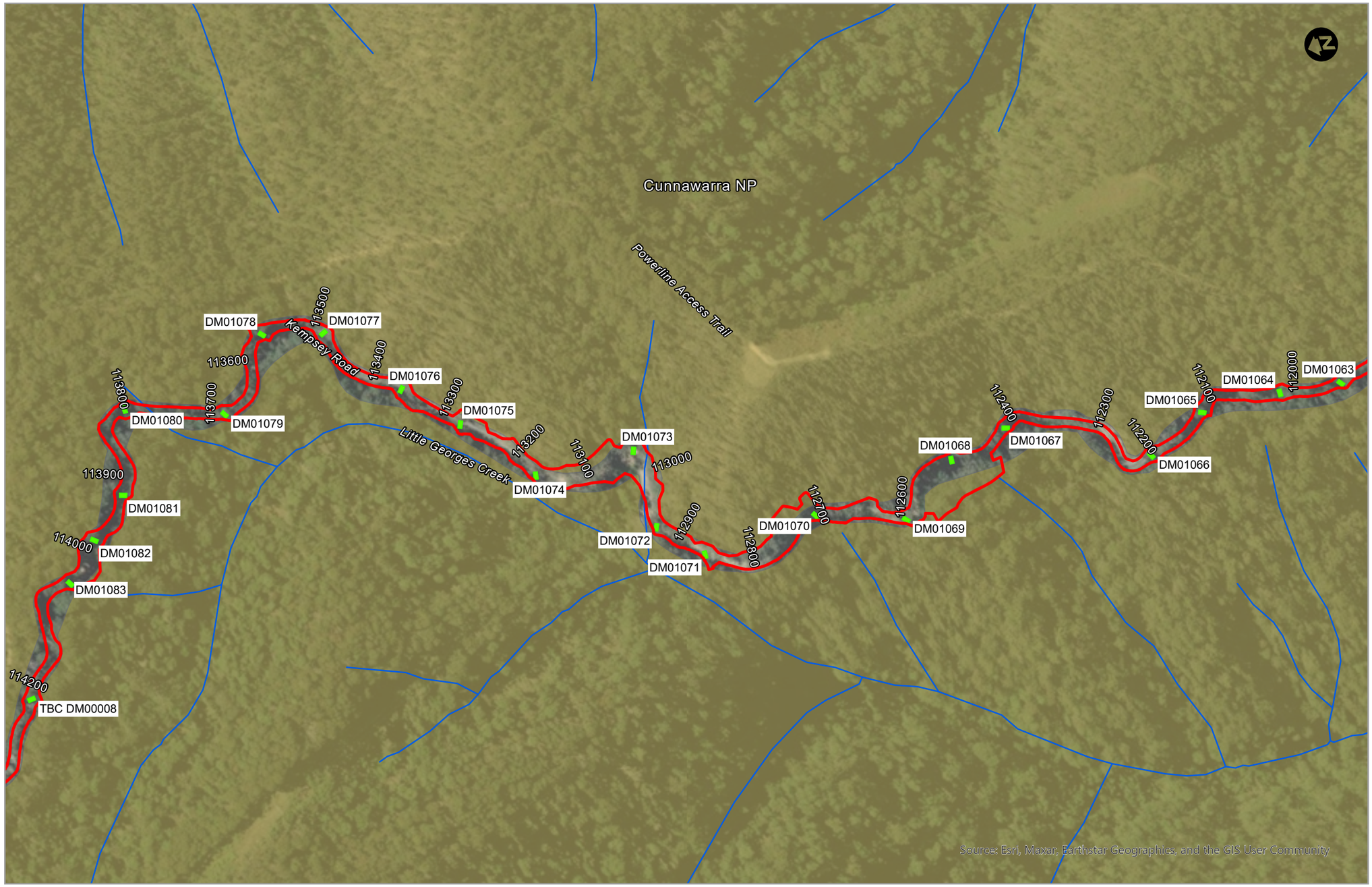


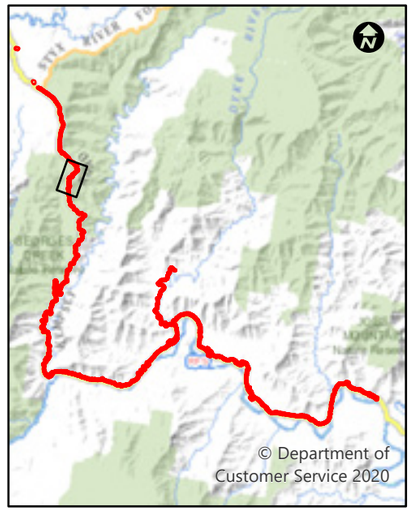


**Map Sheet Location**

**LEGEND**

- Activity boundary
- Culvert
- National Park reserve
- Watercourse

0 100 Meters

The Site
Illustration 1.2 - Sheet 4 of 27



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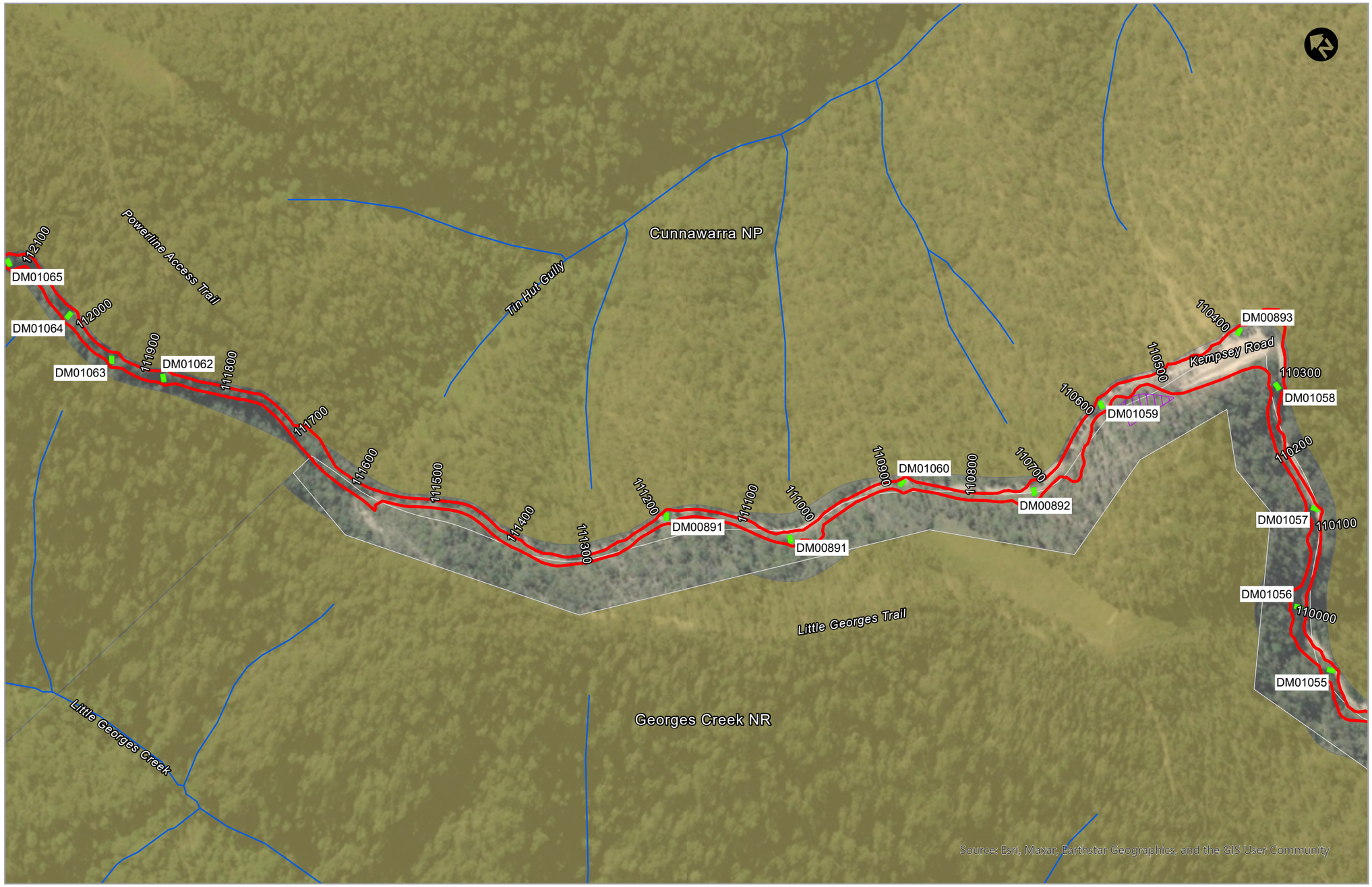


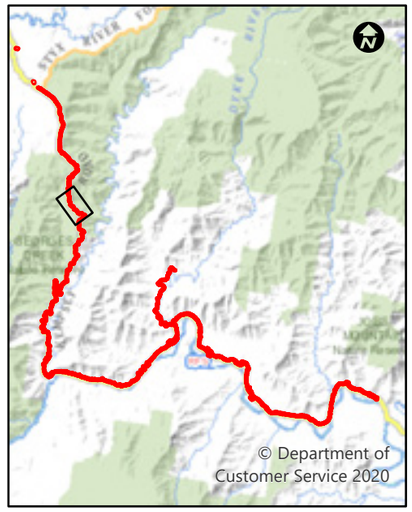


**Map Sheet Location**

**LEGEND**

- Activity boundary
- Cadastre
- Culvert
- White Cliff Quarry
- National Park reserve
- Watercourse

0 100 Meters

The Site
Illustration 1.2 - Sheet 5 of 27



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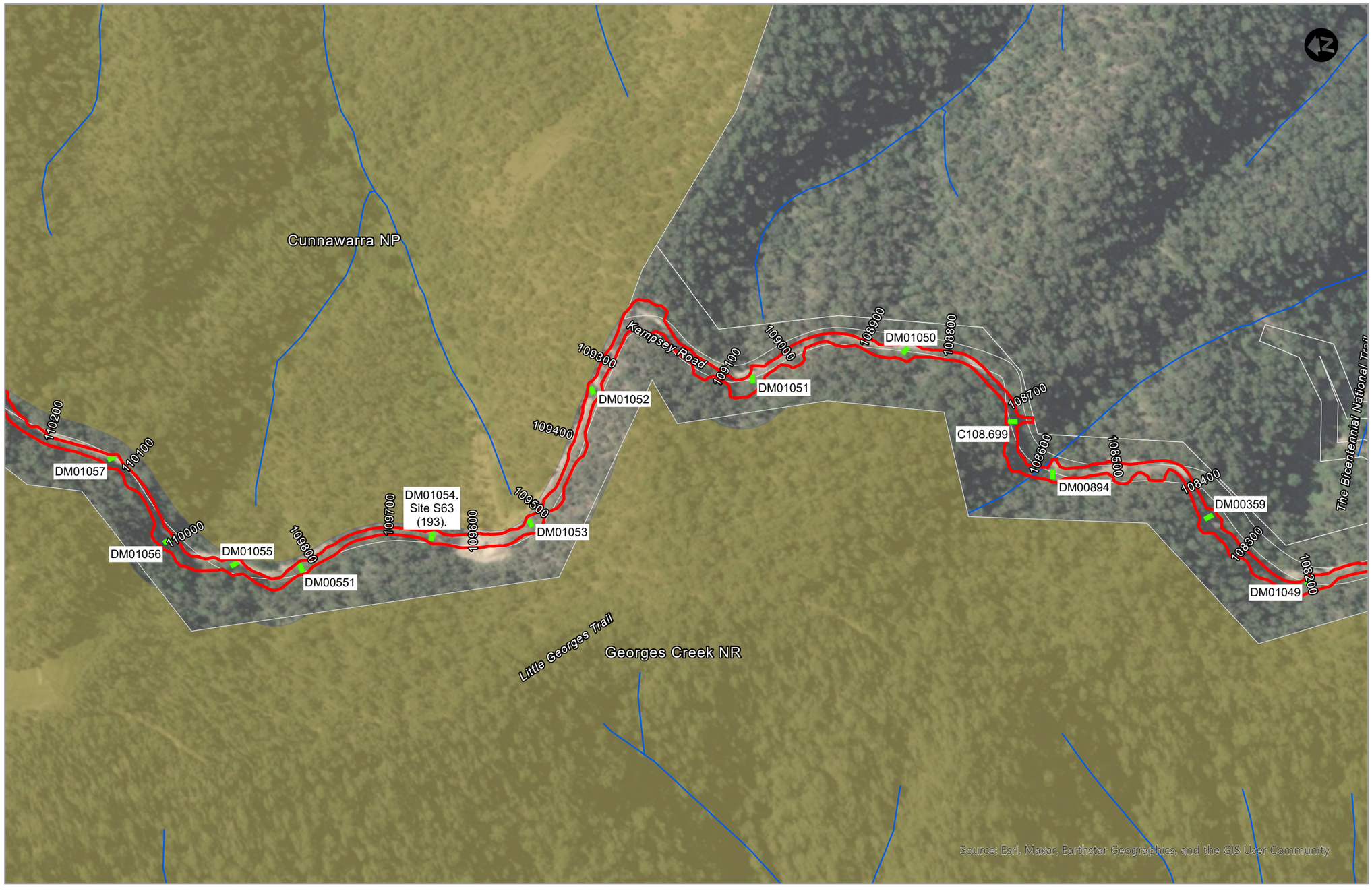


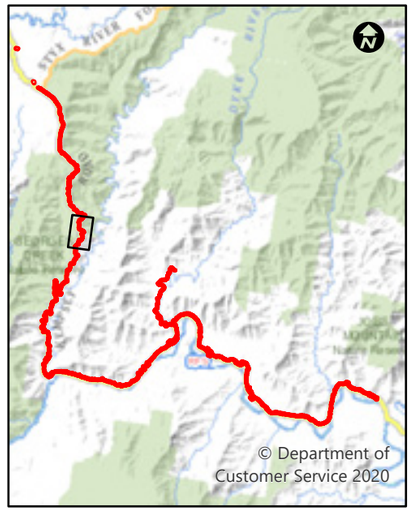


**Map Sheet Location**

**LEGEND**

- Activity boundary
- Cadastre
- Culvert
- National Park reserve
- Watercourse

0 100 Meters

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Review of Environmental Factors – ARC Kempsey Road Restoration
4055-1076

The Site
Illustration 1.2 - Sheet 6 of 27

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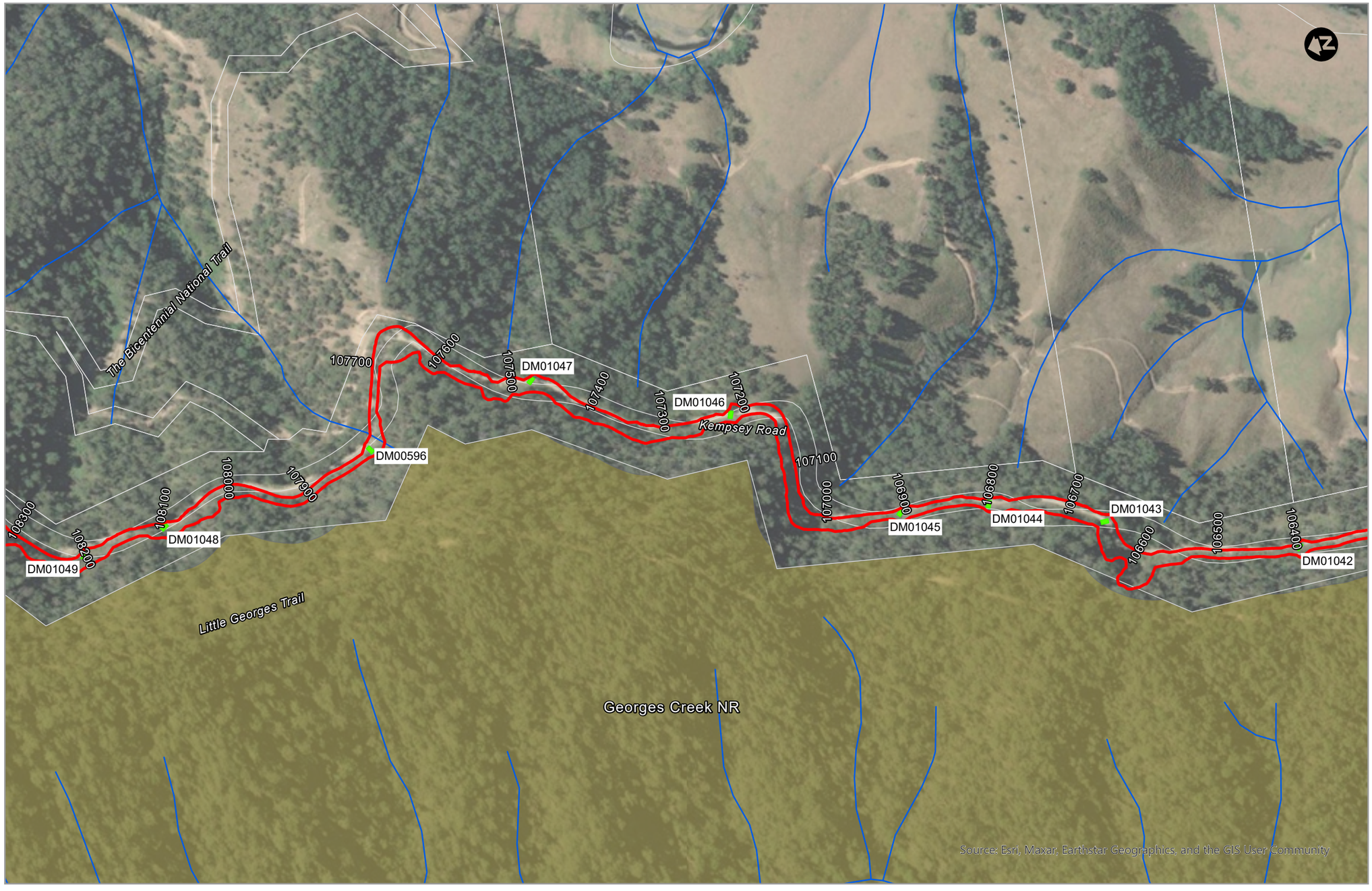


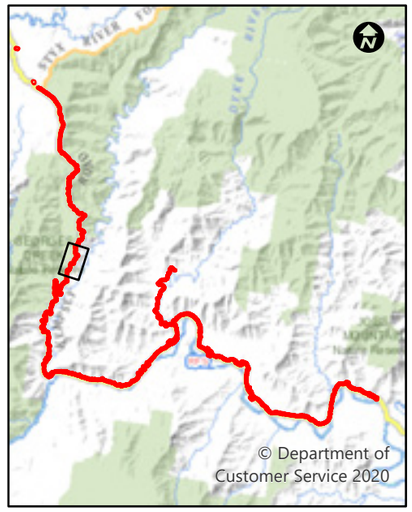


**Map Sheet Location**

**LEGEND**

- Activity boundary
- Cadastre
- Culvert
- National Park reserve
- Watercourse

0 100 Meters

The Site
Illustration 1.2 - Sheet 7 of 27



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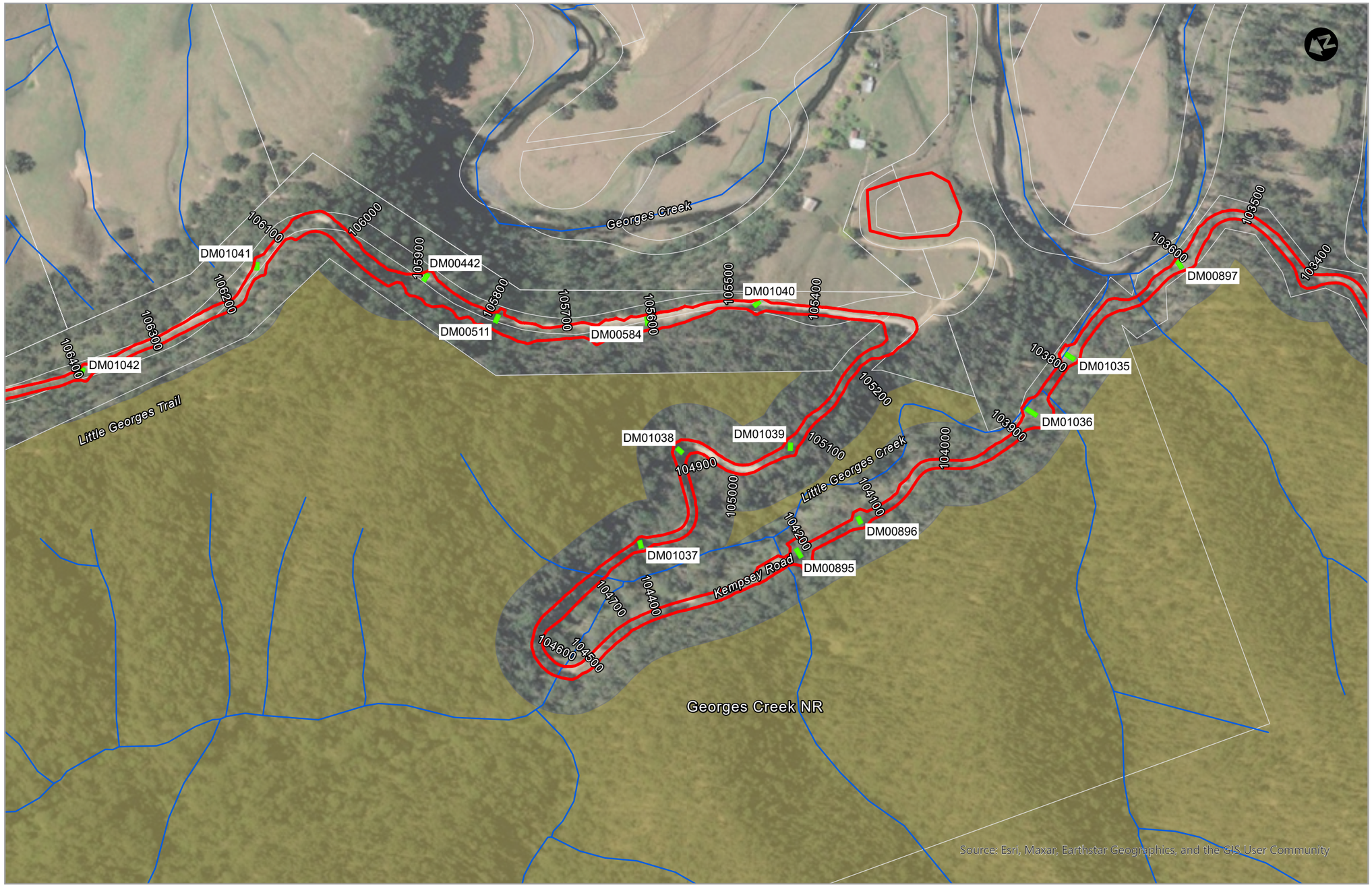


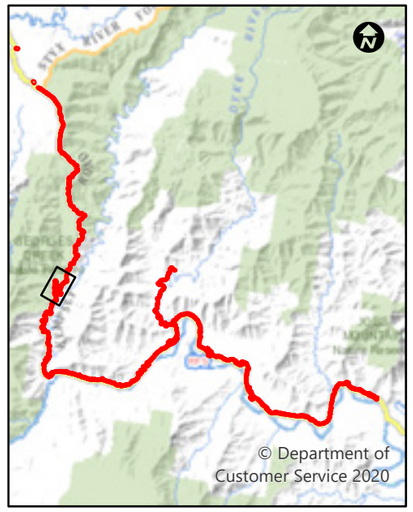


**Map Sheet Location**

**LEGEND**

- Activity boundary
- Cadastre
- Culvert
- National Park reserve
- Watercourse

0 100 Meters

The Site
Illustration 1.2 - Sheet 8 of 27



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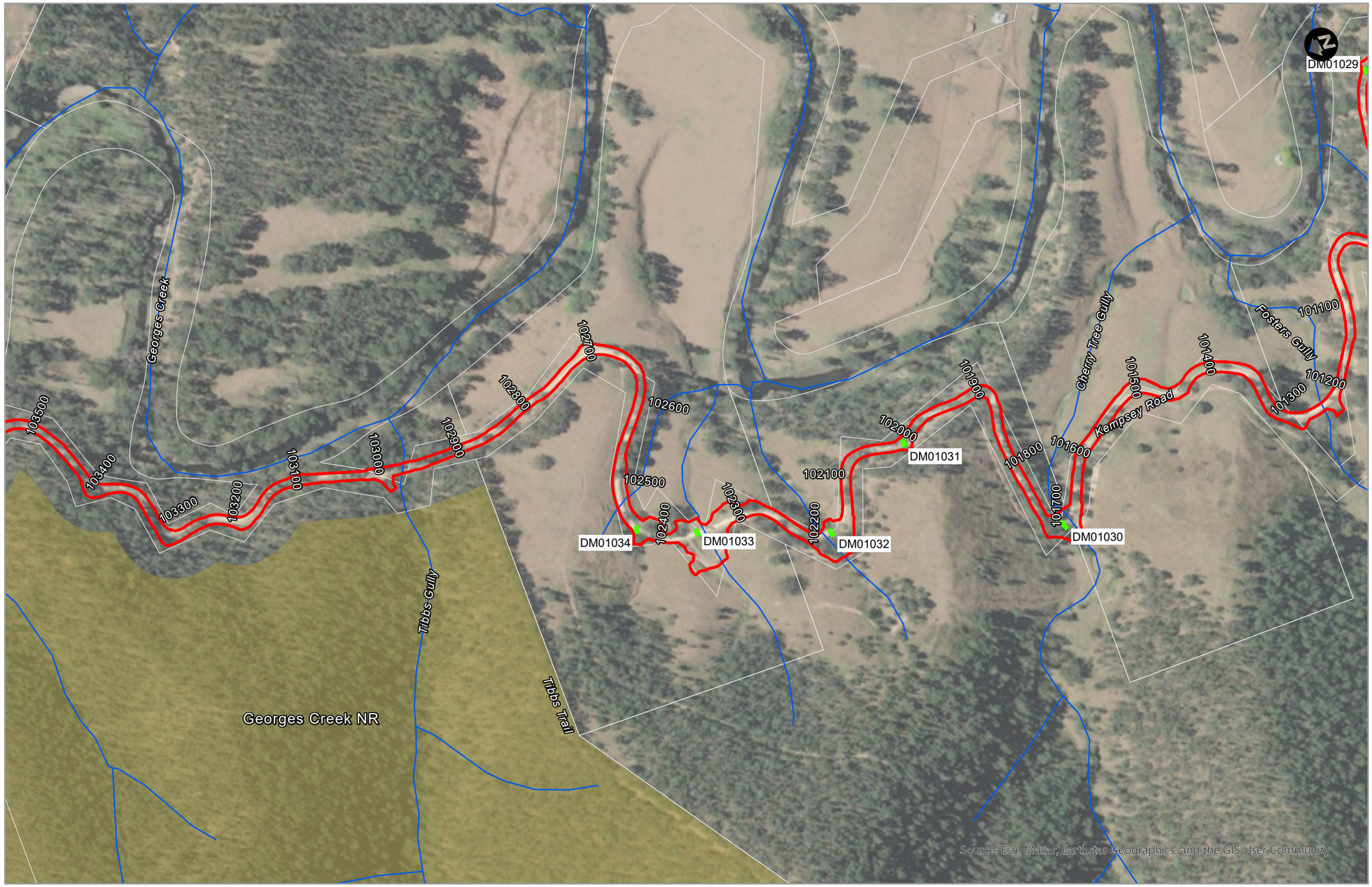


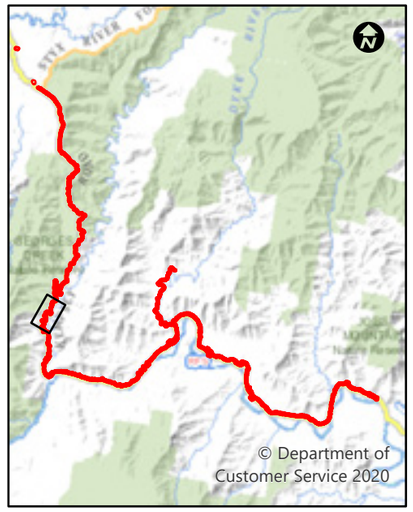


**Map Sheet Location**

**LEGEND**

- Activity boundary
- Cadastre
- Culvert
- National Park reserve
- Watercourse

0 100 Meters

The Site
Illustration 1.2 - Sheet 9 of 27



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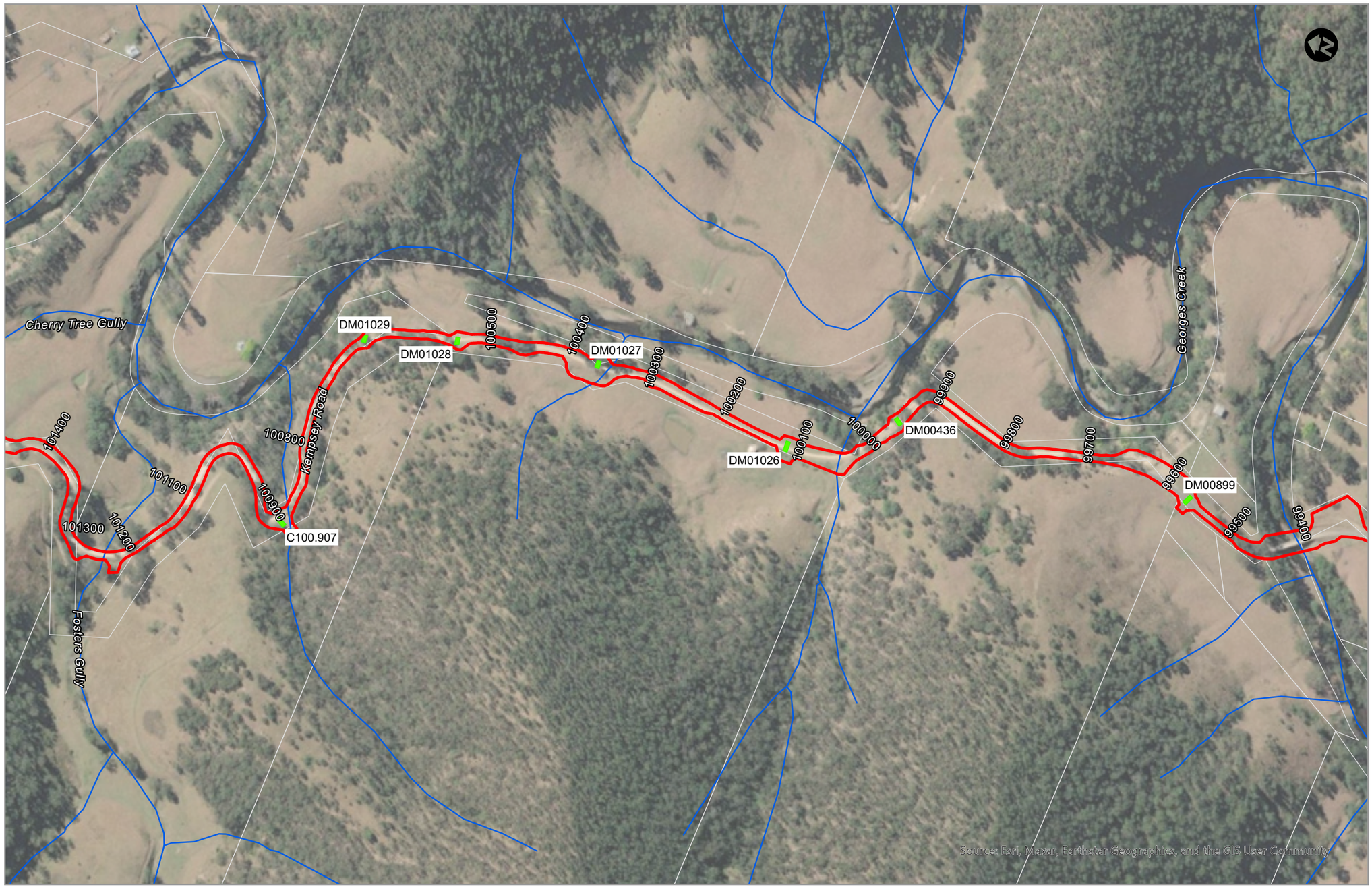


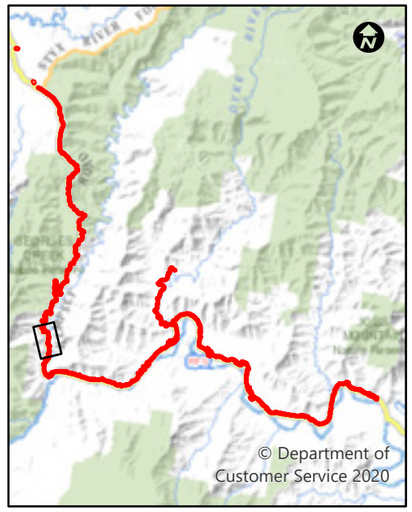


**Map Sheet Location**

**LEGEND**

- Activity boundary
- Cadastre
- Culvert
- Watercourse

0 100 Meters

The Site
Illustration 1.2 - Sheet 10 of 27



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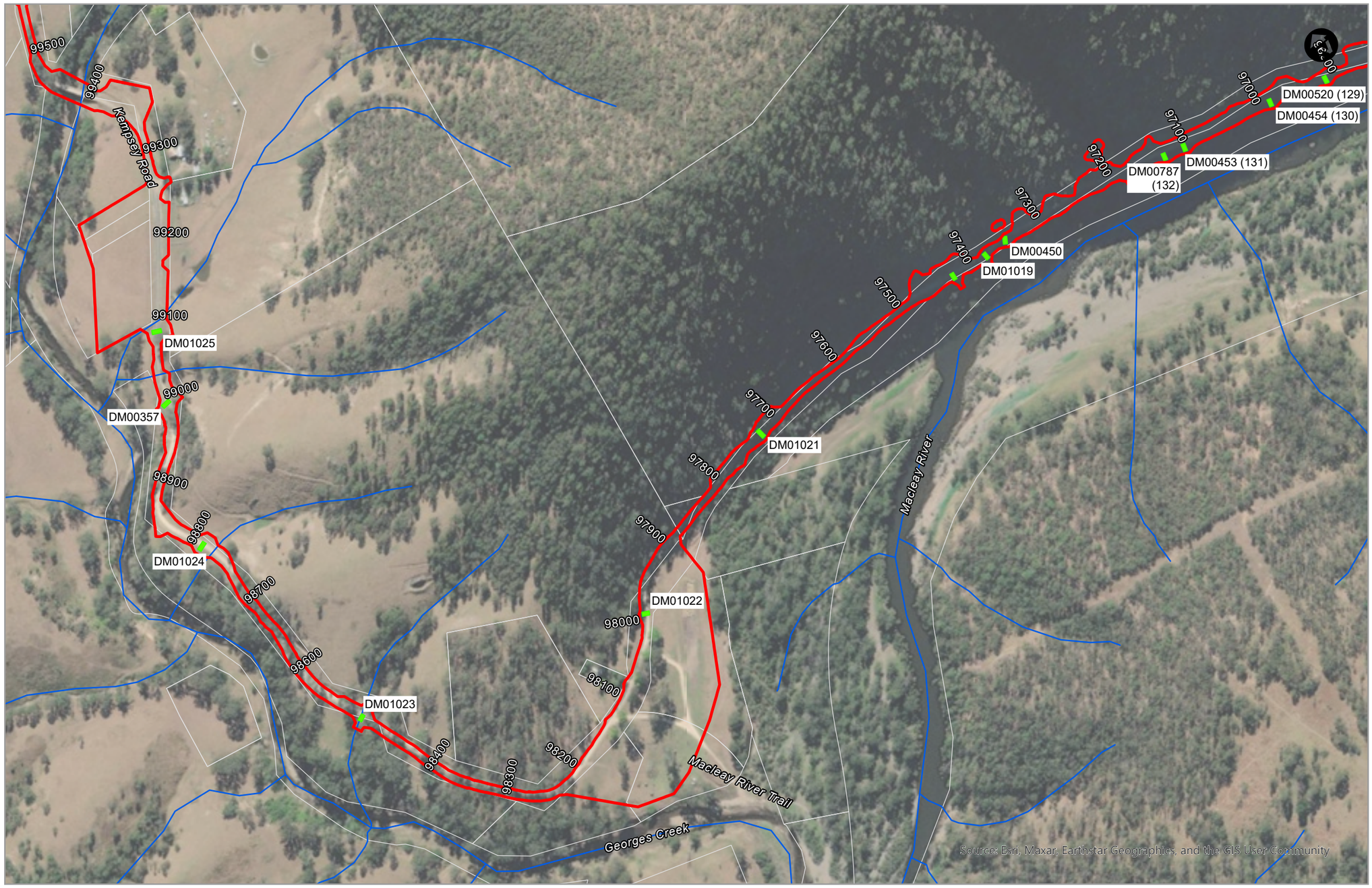


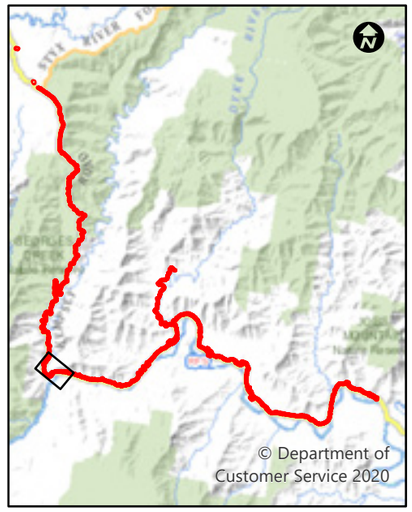


**Map Sheet Location**

**LEGEND**

- Activity boundary
- Cadastre
- Culvert
- Watercourse

0 100 Meters

The Site
Illustration 1.2 - Sheet 11 of 27



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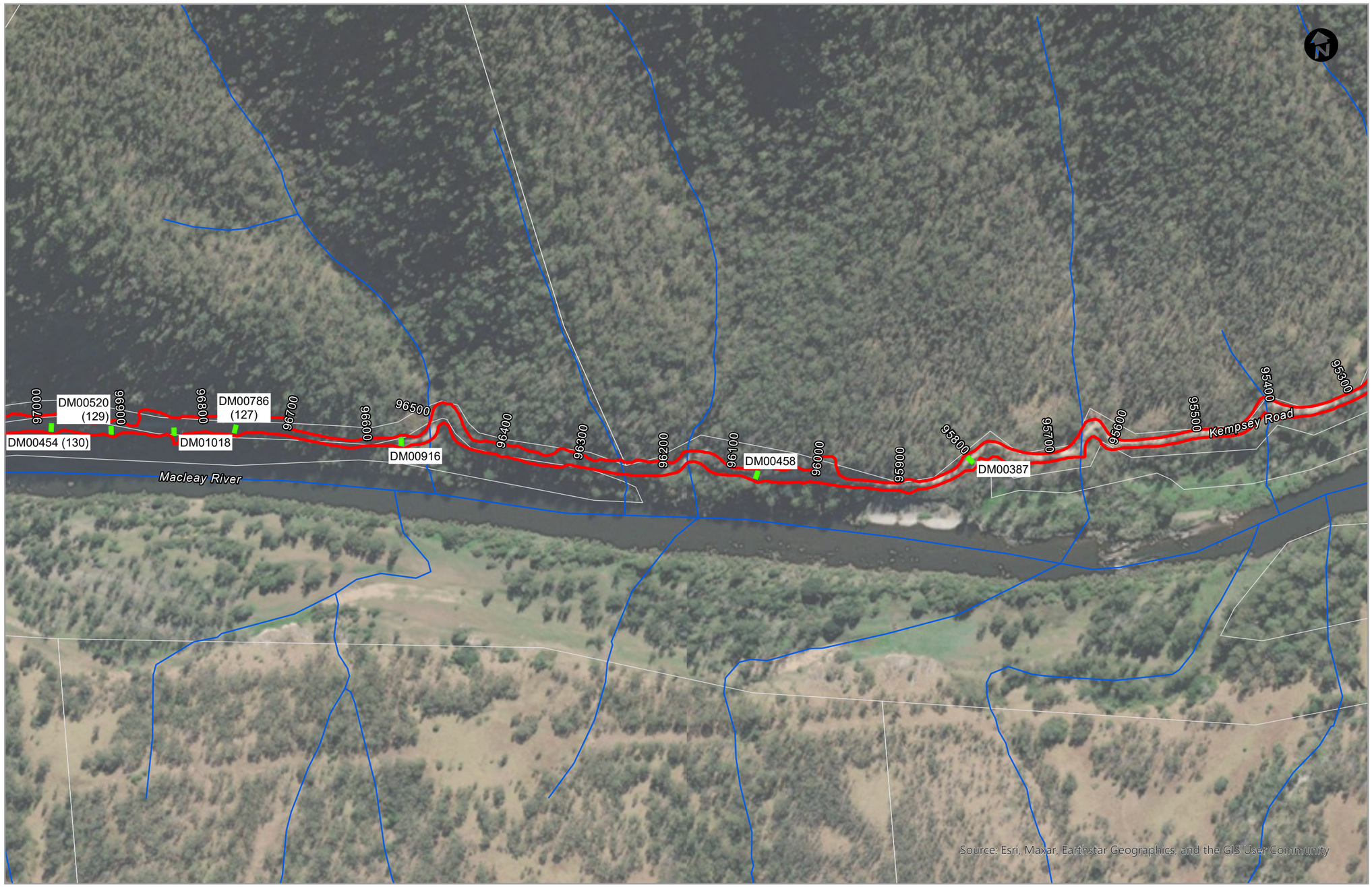


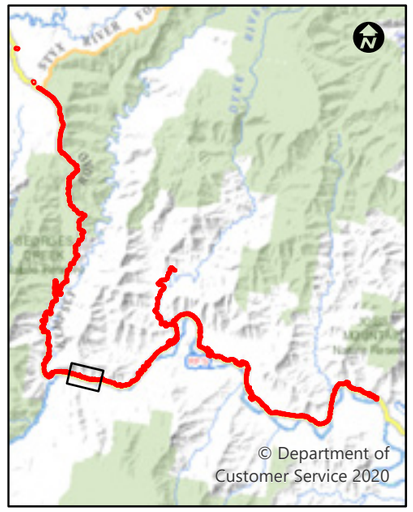


**Map Sheet Location**

**LEGEND**

- Activity boundary
- Cadastre
- Culvert
- Watercourse

0 100 Meters

The Site
Illustration 1.2 - Sheet 12 of 27



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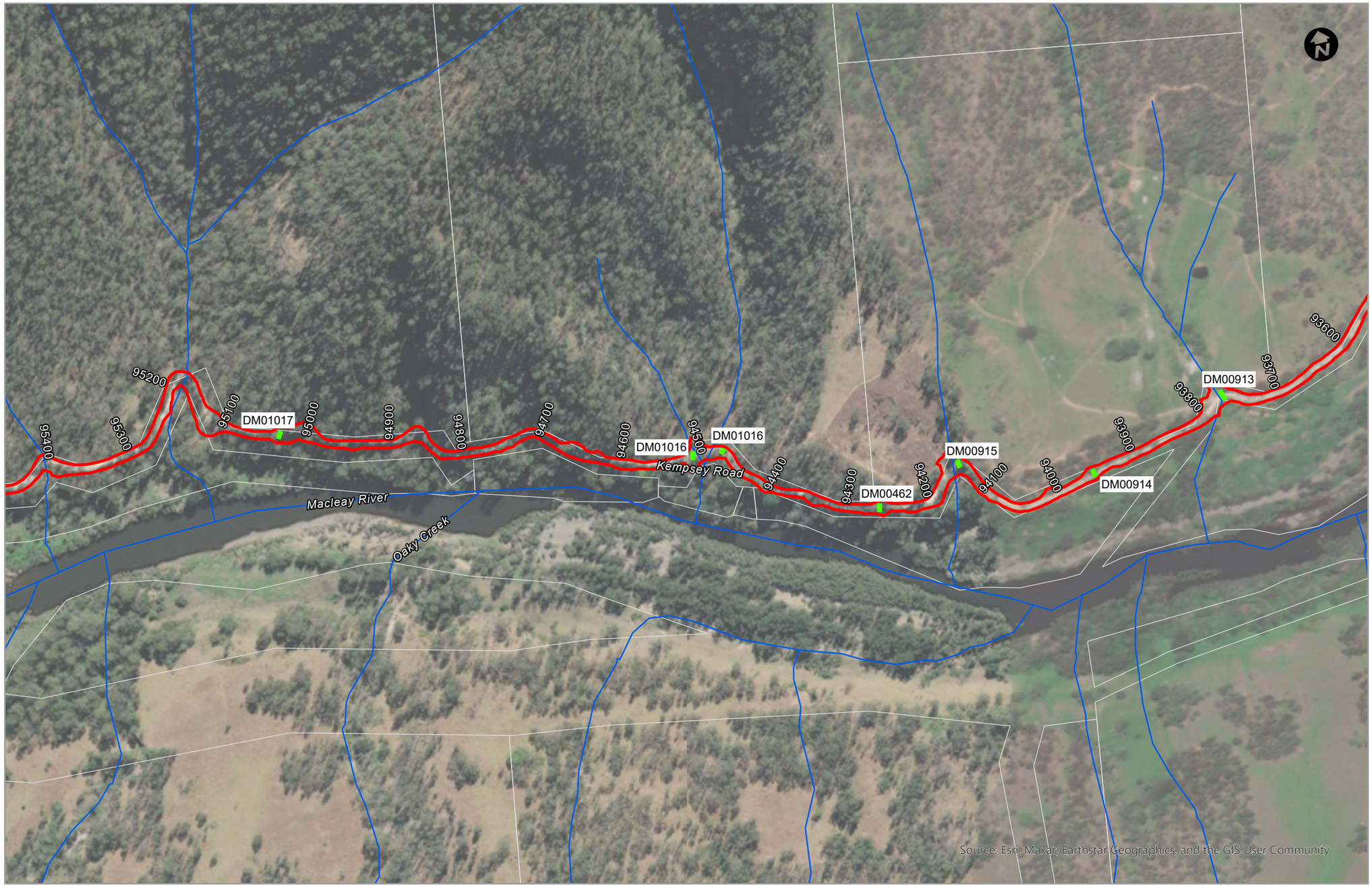


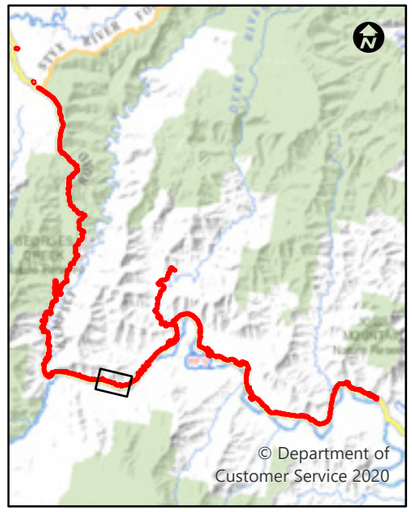


**Map Sheet Location**

**LEGEND**

- Activity boundary
- Cadastre
- Culvert
- Watercourse

0 100 Meters

The Site
Illustration 1.2 - Sheet 13 of 27



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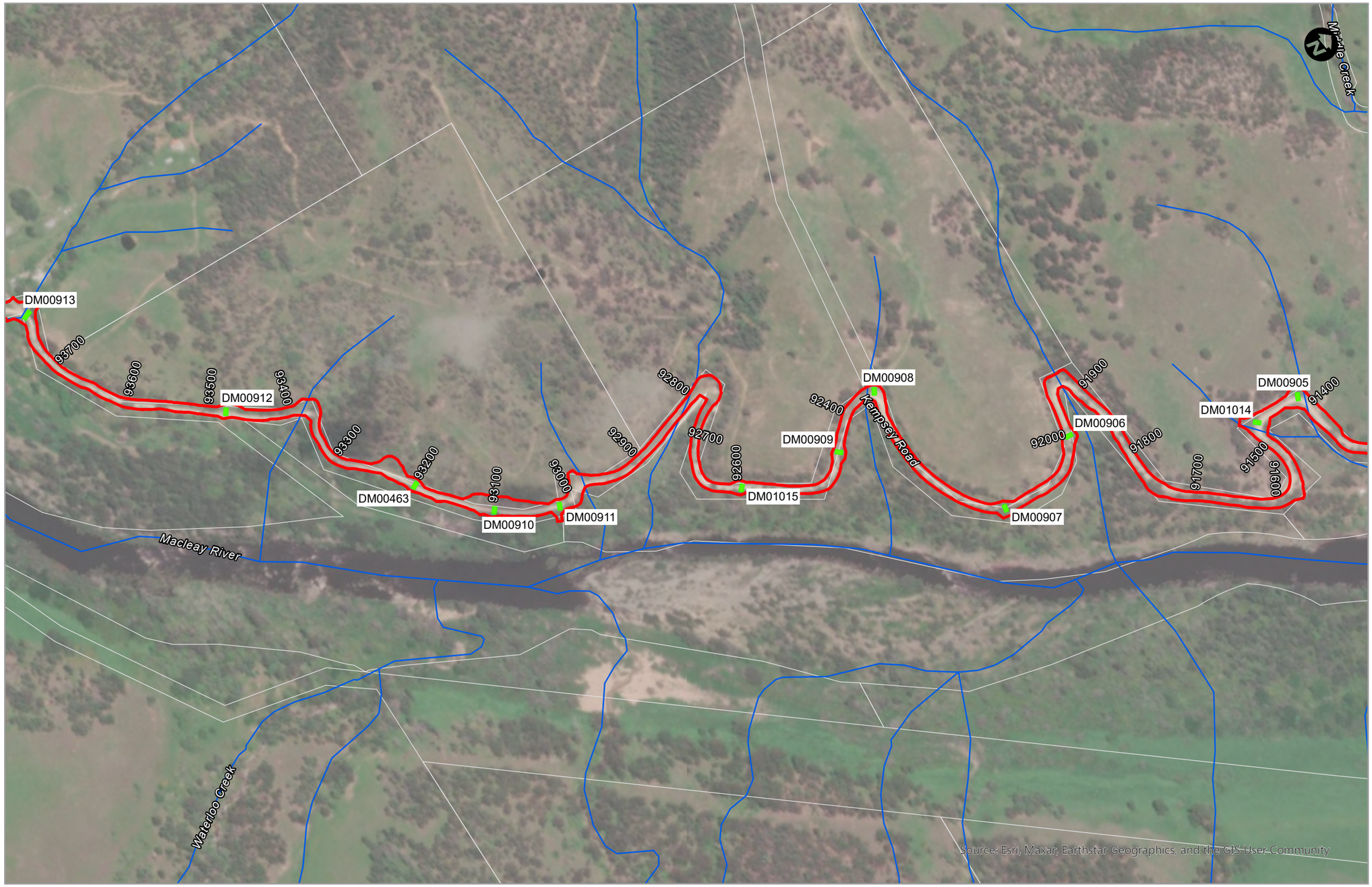


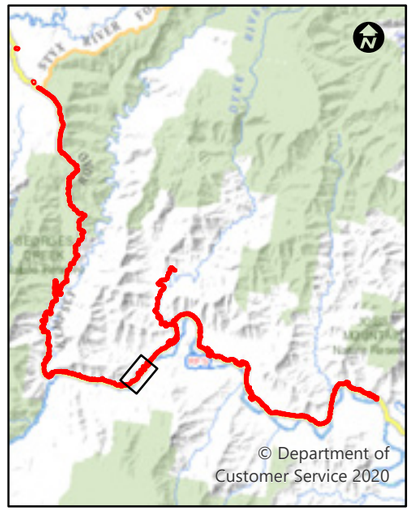


**Map Sheet Location**

**LEGEND**

- Activity boundary
- Cadastre
- Culvert
- Watercourse

0 100 Meters

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Review of Environmental Factors – ARC Kempsey Road Restoration
4055-1076

The Site
Illustration 1.2 - Sheet 14 of 27

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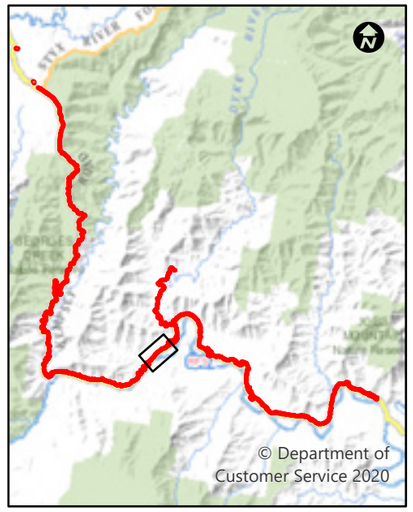


**Map Sheet Location**

**LEGEND**

- Activity boundary
- Cadastre
- Culvert
- Watercourse

0 100 Meters

The Site
Illustration 1.2 - Sheet 15 of 27



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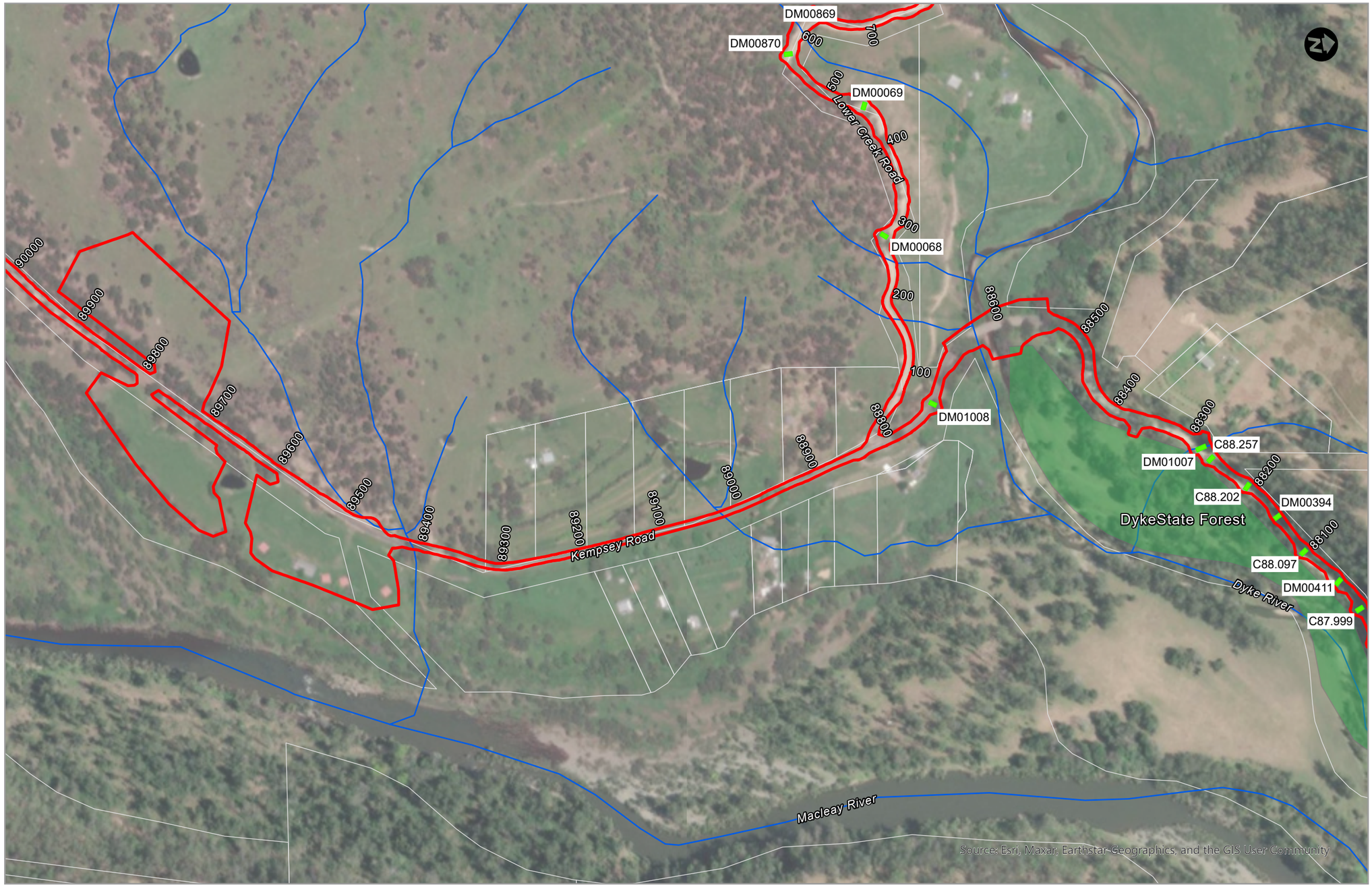


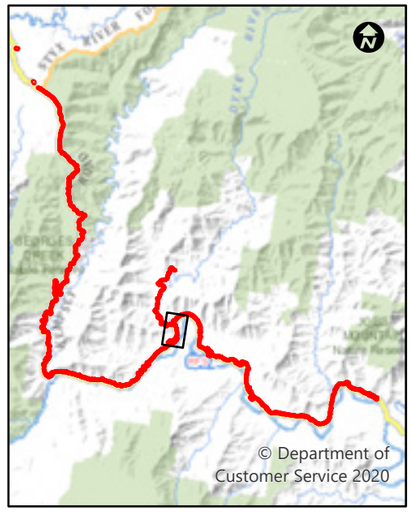


**Map Sheet Location**

**LEGEND**

- Activity boundary
- Cadastre
- Culvert
- State Forest
- Watercourse

0 100 Meters

The Site
Illustration 1.2 - Sheet 16 of 27



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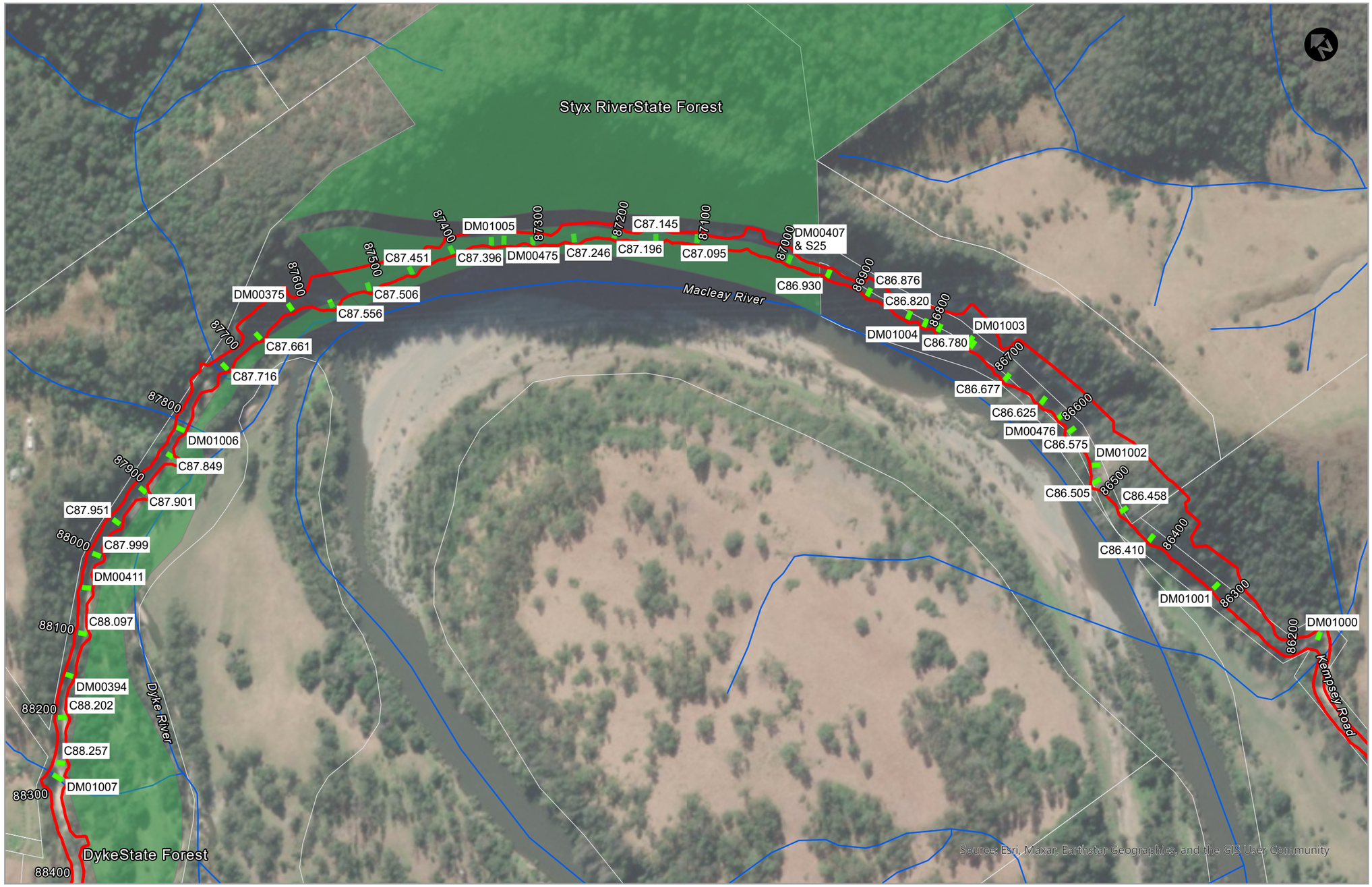


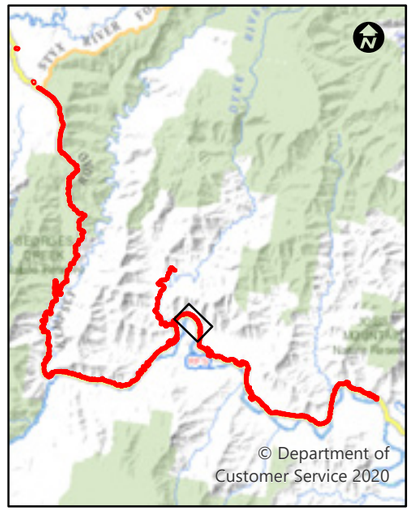


**Map Sheet Location**

**LEGEND**

- Activity boundary
- Cadastre
- Culvert
- State Forest
- Watercourse

0 100 Meters

The Site
Illustration 1.2 - Sheet 17 of 27



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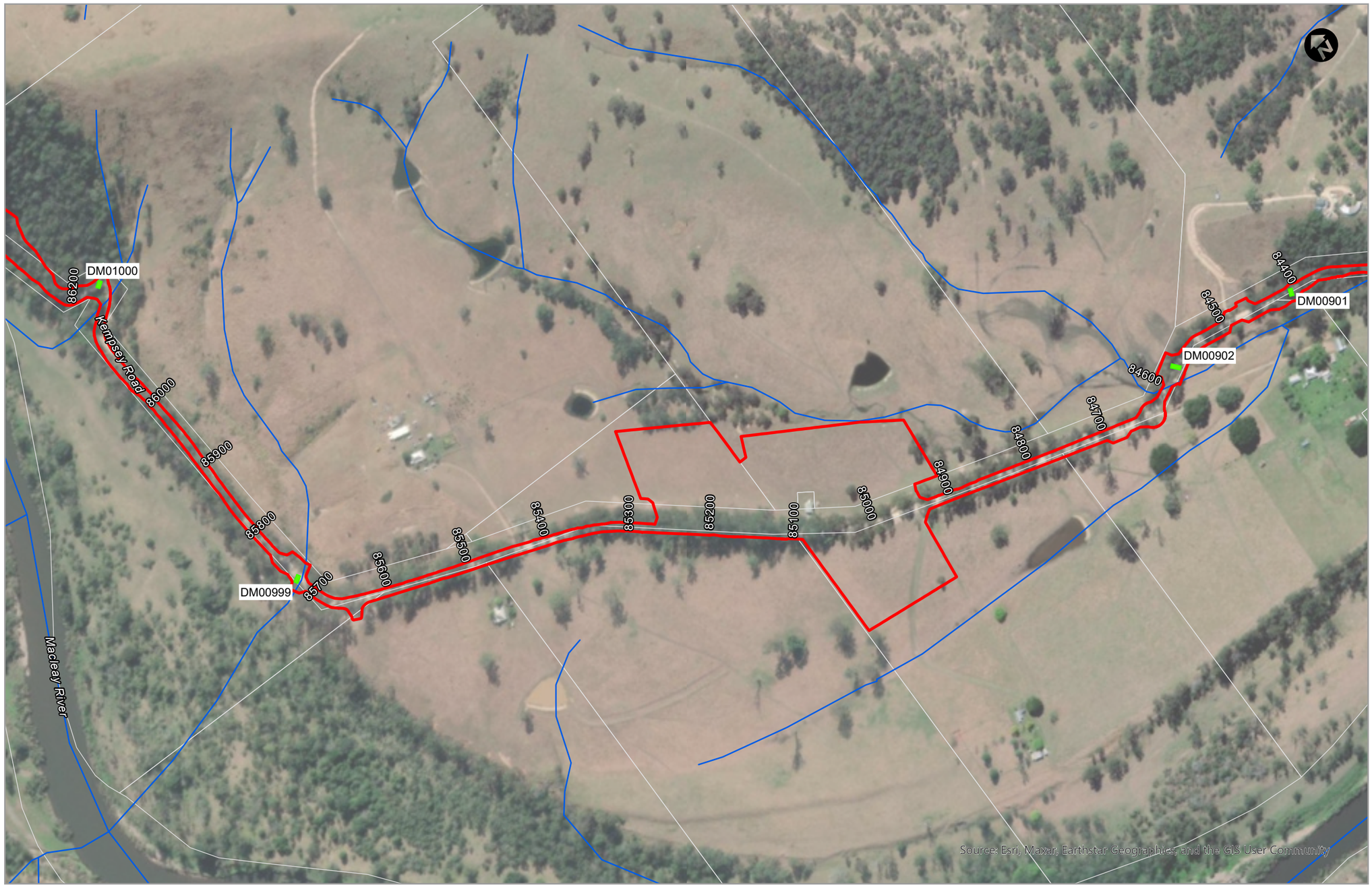


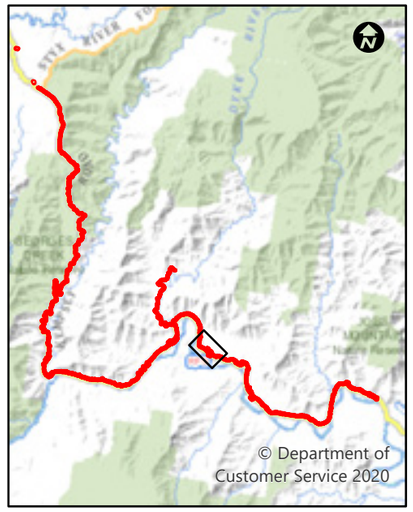


**Map Sheet Location**

**LEGEND**

- Activity boundary
- Cadastre
- Culvert
- Watercourse

0 100 Meters

The Site
Illustration 1.2 - Sheet 18 of 27



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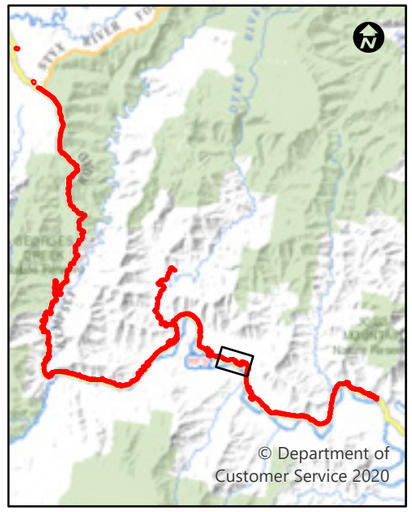


**Map Sheet Location**

**LEGEND**

- Activity boundary
- Cadastre
- Culvert
- Smiths Creek Quarry
- Watercourse

0 100 Meters

The Site
Illustration 1.2 - Sheet 19 of 27



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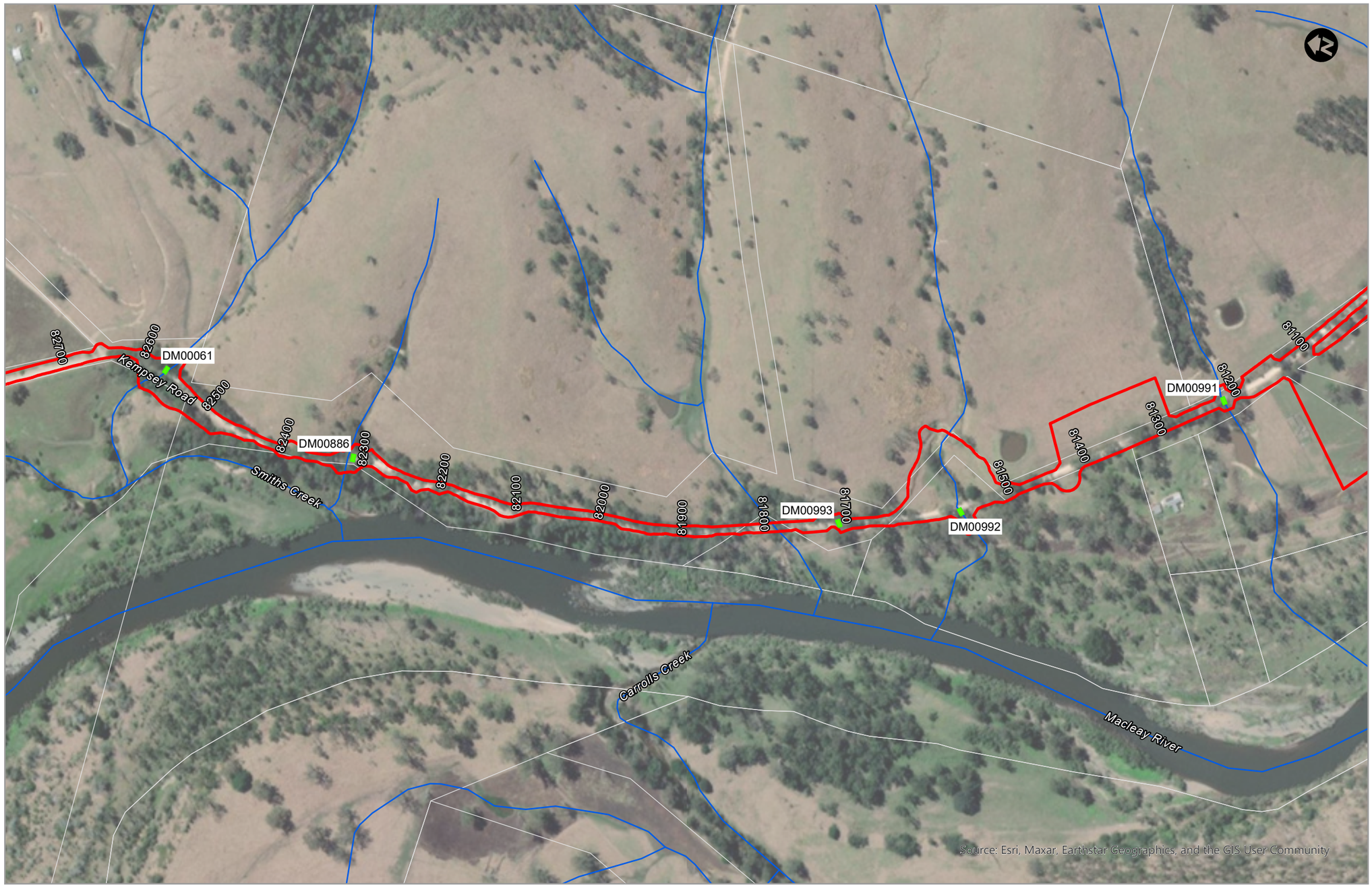


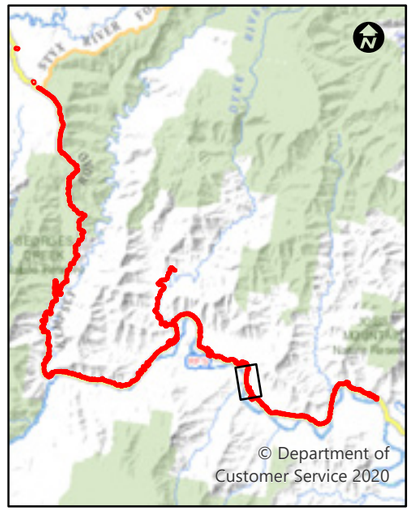


**Map Sheet Location**

**LEGEND**

- Activity boundary
- Cadastre
- Culvert
- Watercourse

0 100 Meters

The Site
Illustration 1.2 - Sheet 20 of 27



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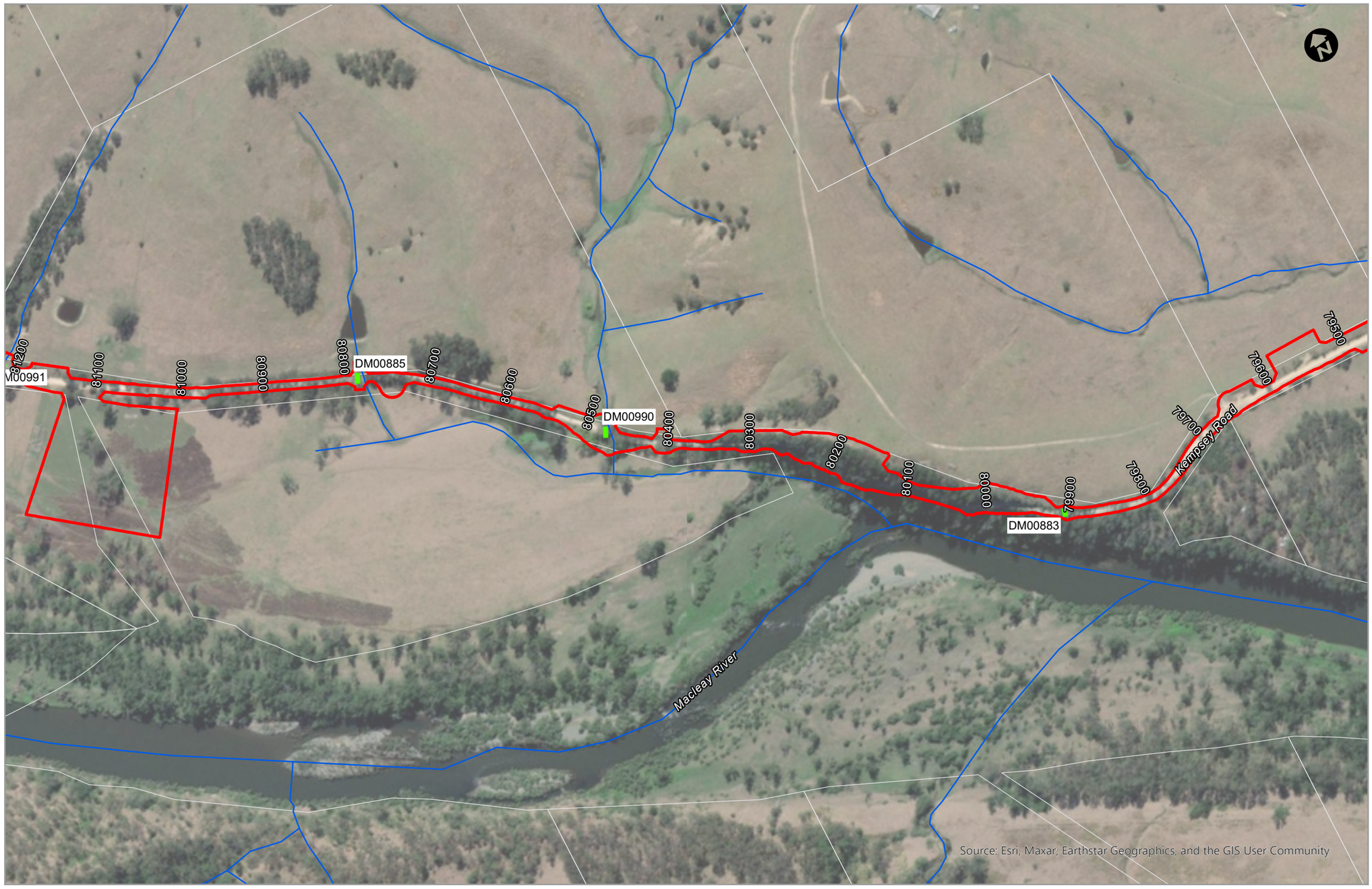


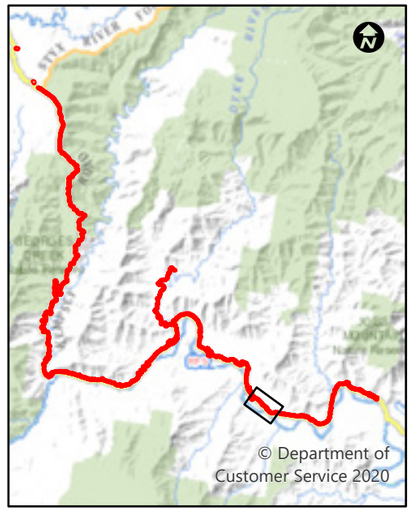


**Map Sheet Location**

**LEGEND**

- Activity boundary
- Cadastre
- Culvert
- Watercourse

0 100 Meters

The Site
Illustration 1.2 - Sheet 21 of 27



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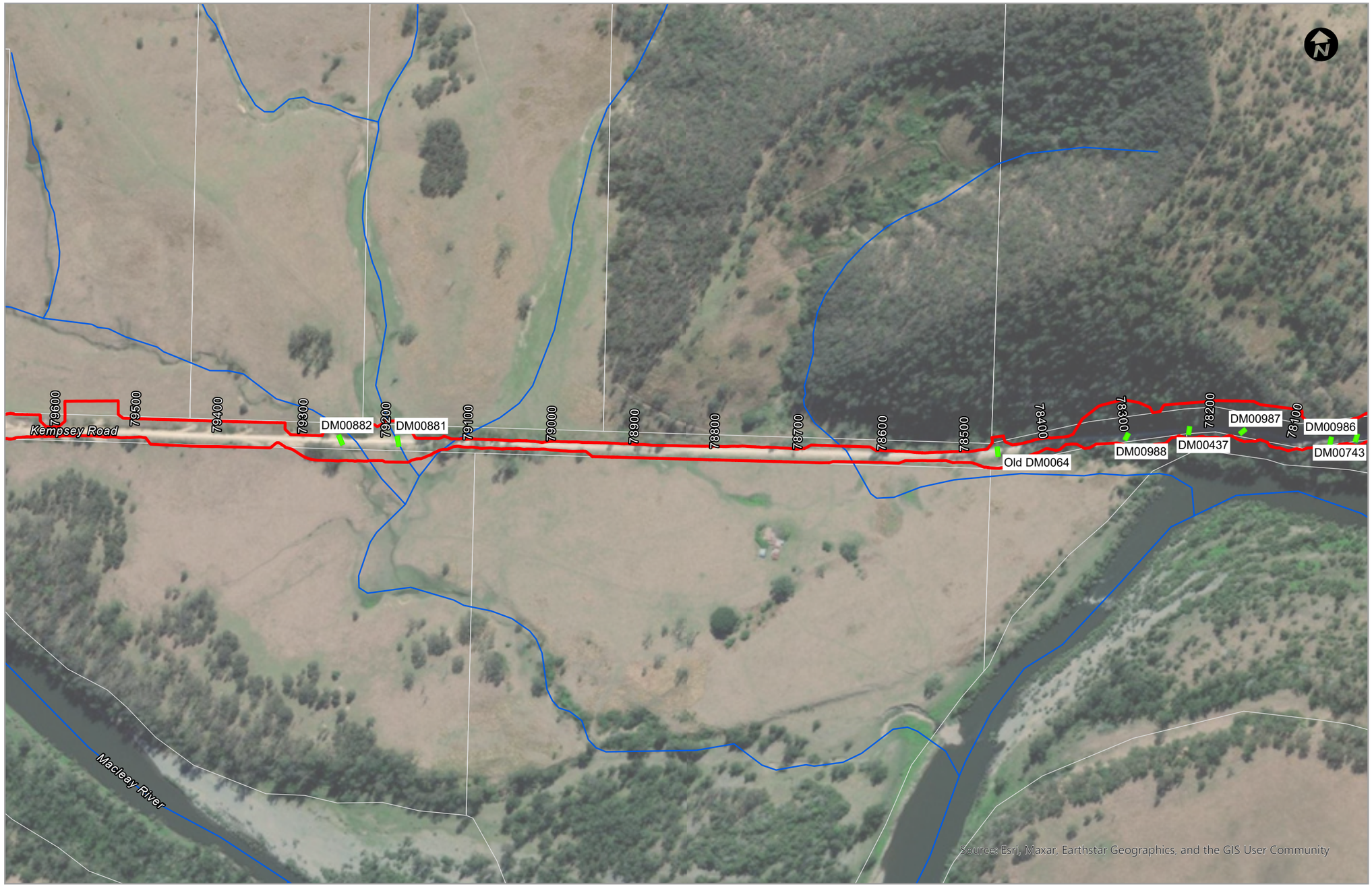


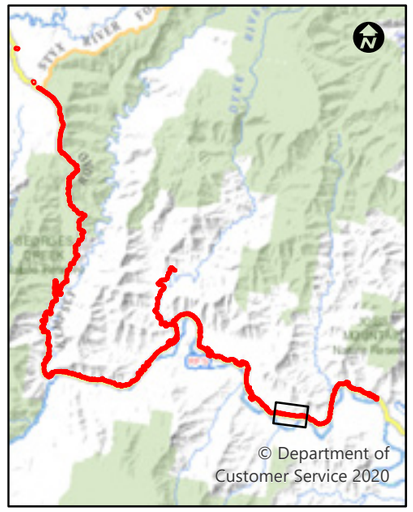


**Map Sheet Location**

**LEGEND**

- Activity boundary
- Cadastre
- Culvert
- Watercourse

0 100 Meters

The Site
Illustration 1.2 - Sheet 22 of 27



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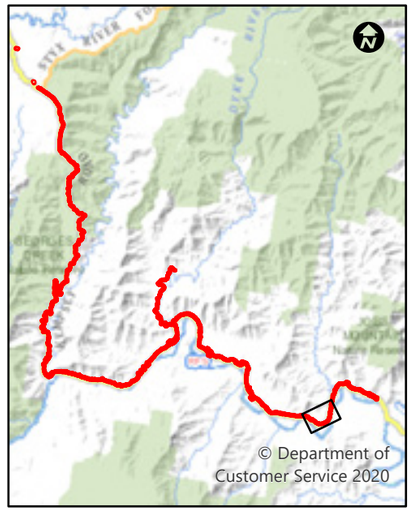


**Map Sheet Location**

**LEGEND**

- Activity boundary
- Cadastre
- Culvert
- Watercourse

0 100 Meters

The Site
Illustration 1.2 - Sheet 23 of 27



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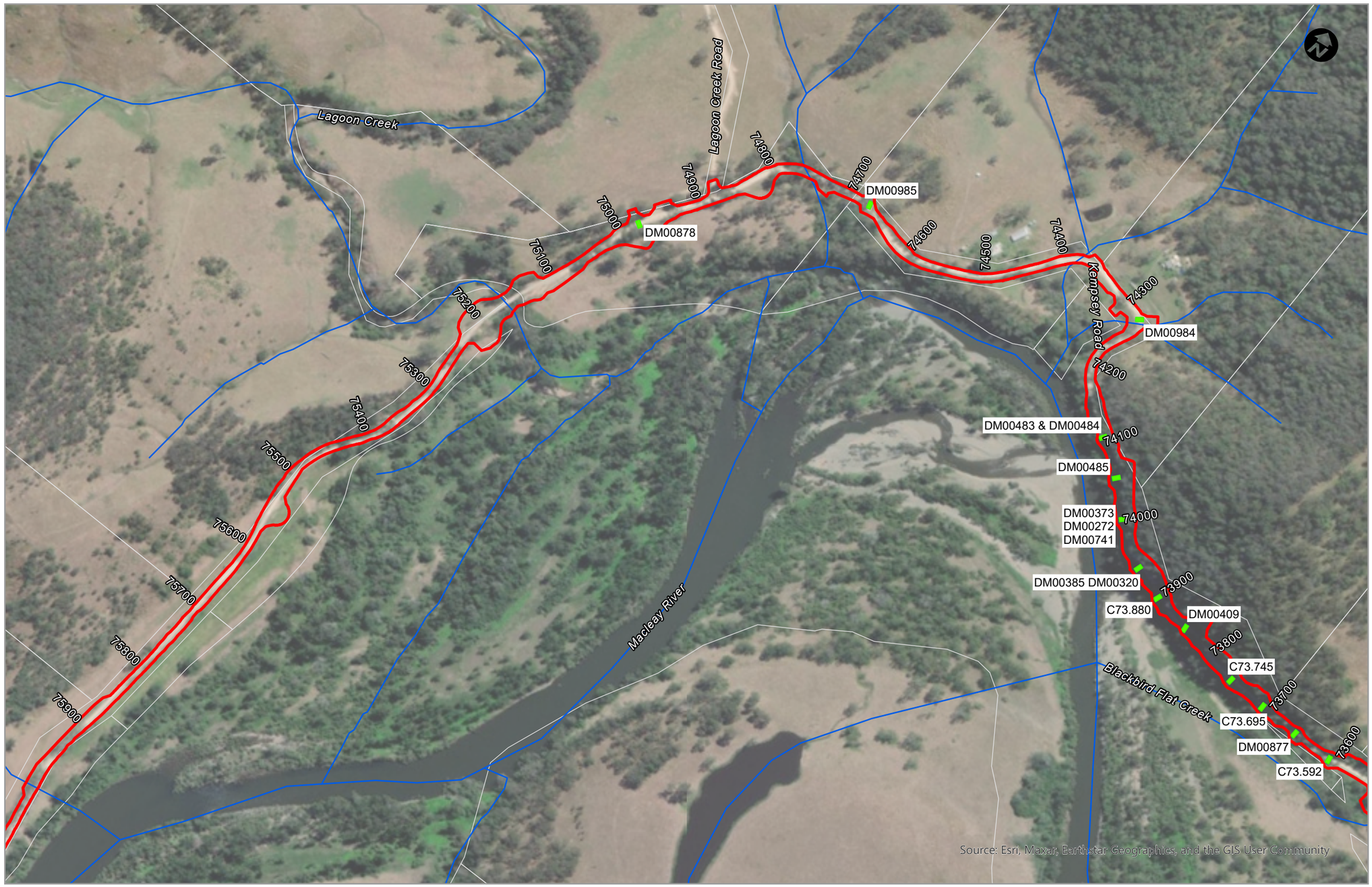


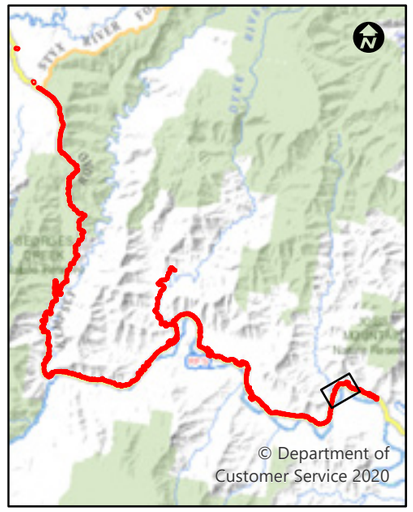


**Map Sheet Location**

**LEGEND**

- Activity boundary
- Cadastre
- Culvert
- Watercourse

0 100 Meters

The Site
Illustration 1.2 - Sheet 24 of 27



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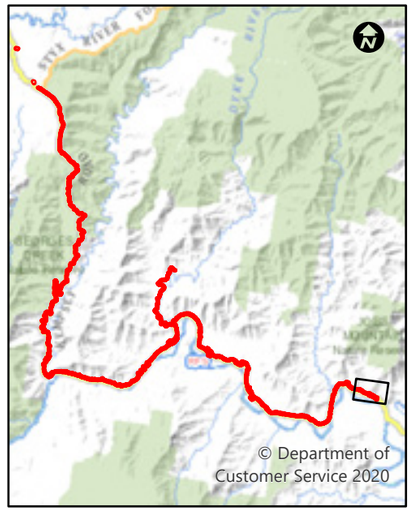
*Revision: E*


**Map Sheet Location**

**LEGEND**

- Activity boundary
- Cadastre
- Culvert
- Watercourse

0 100 Meters

GeoLINK
environment | engineering | planning | design

Review of Environmental Factors – ARC Kempsey Road Restoration
4055-1076

The Site
Illustration 1.2 - Sheet 25 of 27

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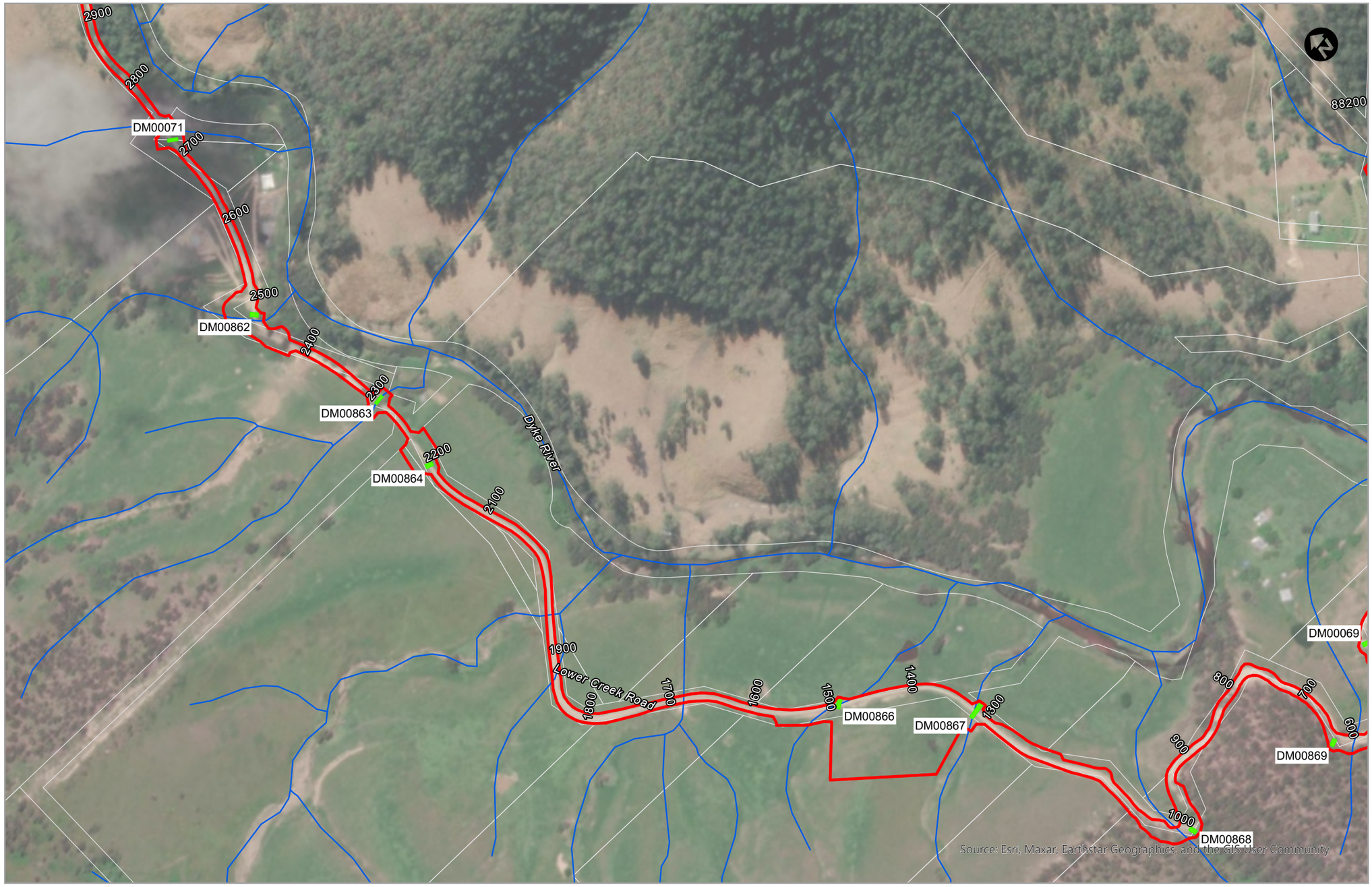


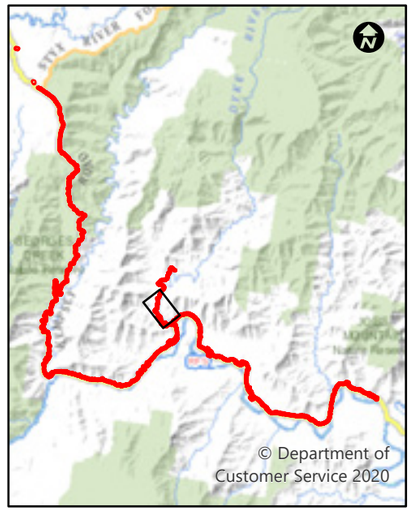


**Map Sheet Location**

**LEGEND**

- Activity boundary
- Cadastre
- Culvert
- Watercourse

0 100 Meters

The Site
Illustration 1.2 - Sheet 26 of 27



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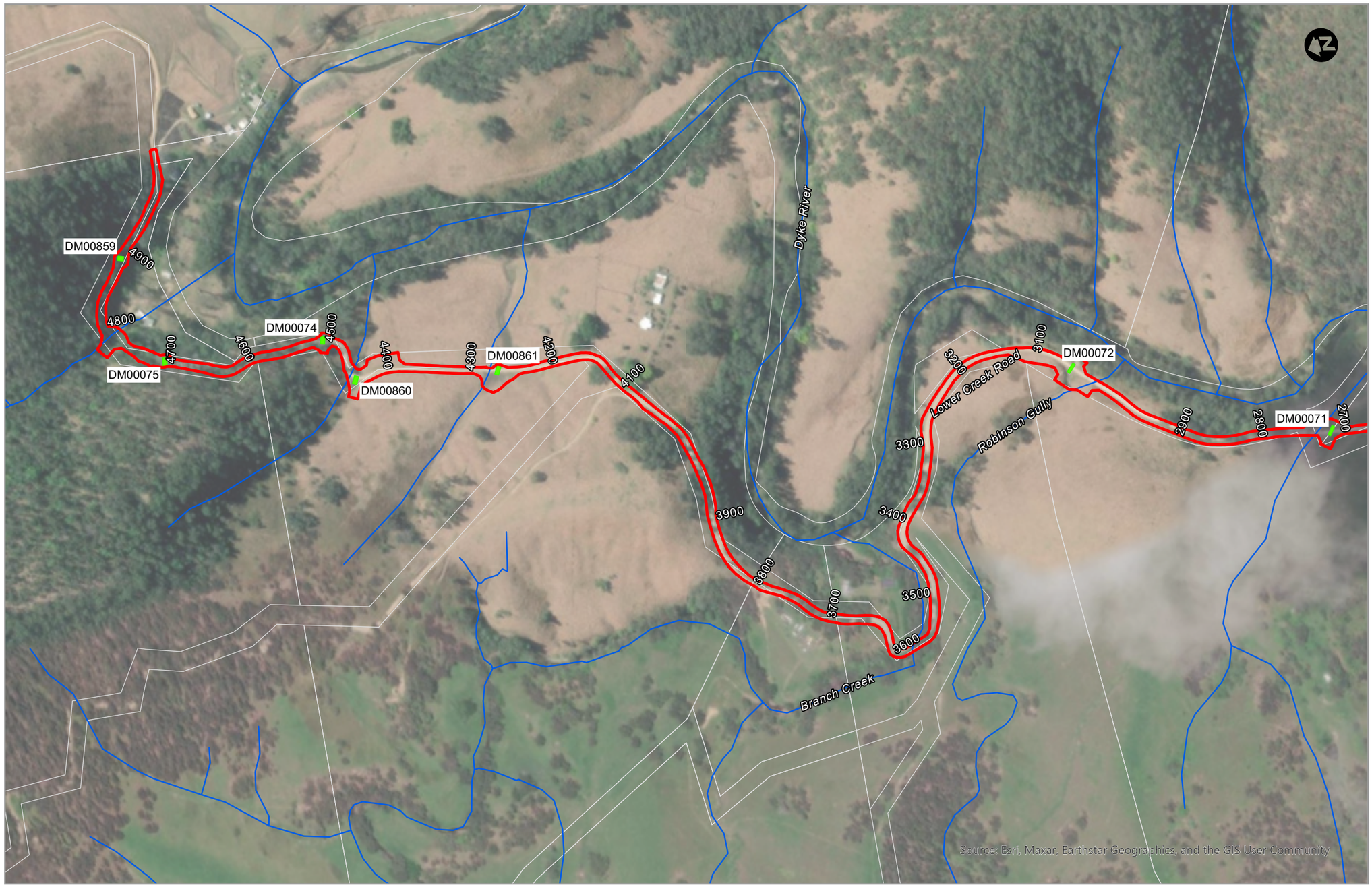


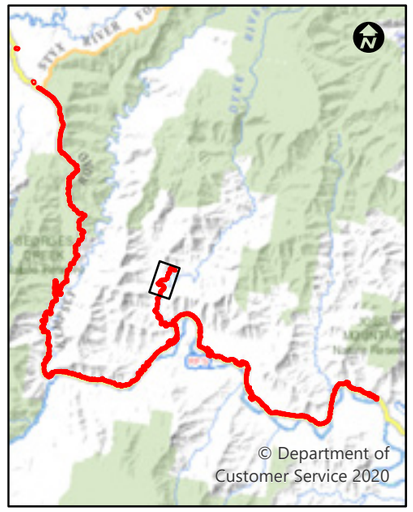


**Map Sheet Location**

**LEGEND**

- Activity boundary
- Cadastre
- Culvert
- Watercourse

0 100 Meters

The Site
Illustration 1.2 - Sheet 27 of 27



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*Revision: E*

### 1.1.3 Ancillary Works

As part of the proposed road works for Kempsey Road, there are several ancillary works that will need to occur in conjunction with the road repair works, these include:

- camp and office construction and operations for site workers;
- stockpile and laydown area construction;
- concrete batching plant construction and operations;
- quarry material acquisition and transportation; and
- water supply infrastructure for construction works and camp operations.

The location of the proposed ancillary facilities is shown in **Figure 1.1.**

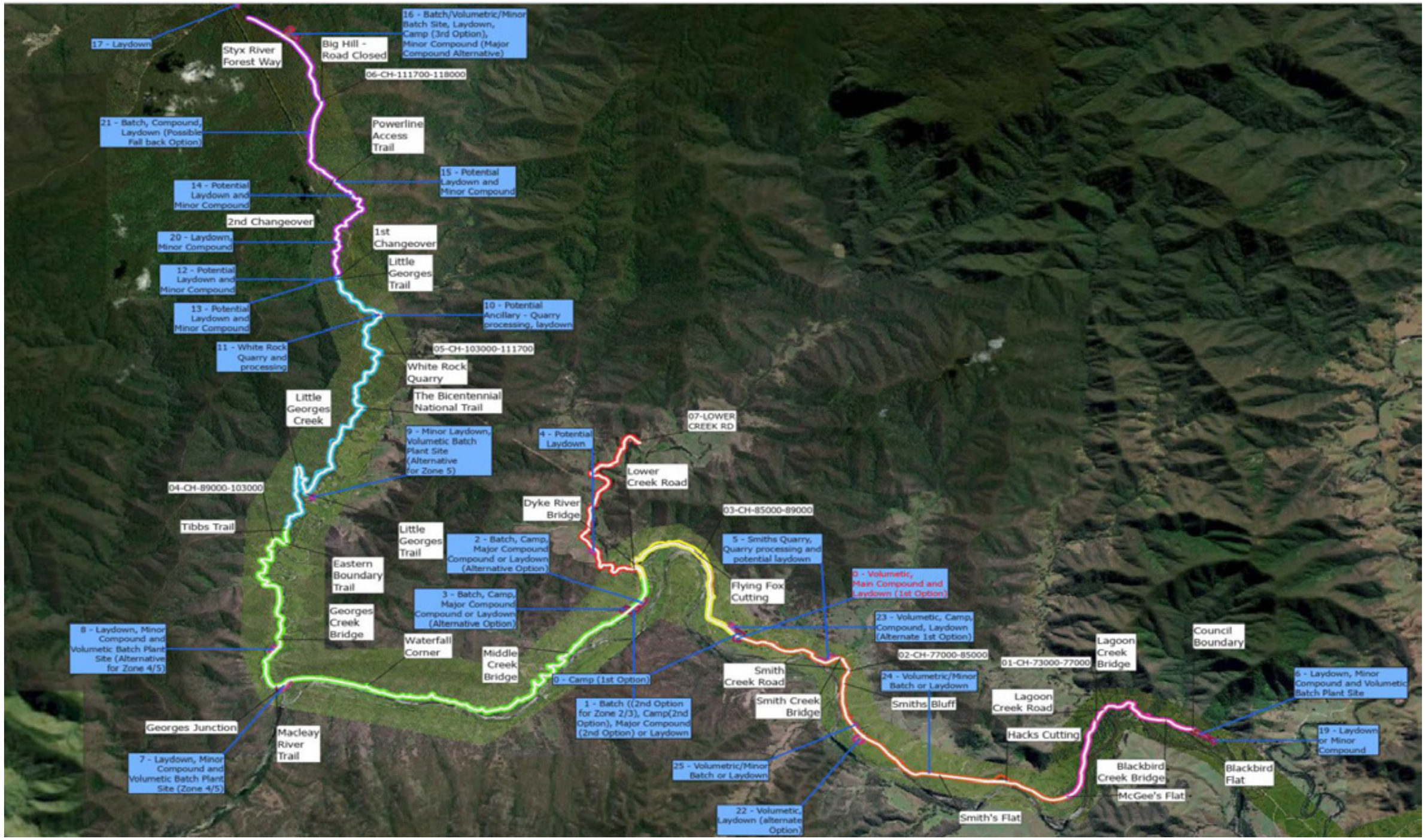



**Figure 1.1 Ancillary Facility Locations**

# 2. Existing Conditions

## 2.1 Kempsey Armidale Road Condition

The condition of Kempsey Armidale Road varies across its' extent, it consists of both sealed and unsealed sections with varying widths.

There are numerous sections of Kempsey Armidale Road that are extremely narrow with cliff drop off on one side and cliff face on the other (refer to **Plate 2.1** and **Plate 2.2**).

Road width is restricted to 3.5 m in several sections with no opportunity for safe vehicle passing for extended periods (greater than 0.5 km).

The sealed sections of Kempsey Armidale Road are in relatively good condition in most sections; however, the seam between the seal and unsealed section is showing signs of deterioration (fretted edge on the seal and loss of aggregates in the unsealed pavement) and prone to heavy wear from vehicular traffic (refer to **Plate 2.3**).

The unsealed sections are generally slippery during wet conditions (refer to **Plate 2.5** and (Uddin et al., 2023) and then extensively dusty during dry conditions (refer to **Plate 2.4**).

The road speed limit varies along Kempsey Armidale Road from 50-60 km/h in town areas (40 km/h in school zone) and 100 km/h or unrestricted speed limits in other areas.

Debris from regular rock falls is evident along some sections of Kempsey Armidale Road, as well as extensively narrow and heavily vegetated bends where there is little to no sight distance of oncoming vehicles.

**Plate 2.1 Kempsey Road - Lower Creek - Narrow Access**

**Plate 2.2 Kempsey Armidale Road - Lower Creek - Narrow Access**

**Plate 2.3 Kempsey Road – South of Williams Rd – Seal to Unsealed connecting seam**


**Plate 2.4 Kempsey Armidale Road – Dust Generation on Unsealed Roads**

**Plate 2.5 Kempsey Armidale Road – Slippery Surfaces During Wet Conditions**
*source: (Uddin et al., 2023)

### 2.1.1 Bridge Crossings

There are six existing bridge crossings on Kempsey Armidale Road with most bridges in relatively good condition and with widths varying widths ranging from 6 m wide at Oaky River Crossing to 4 m wide at Styx River Crossing. Bridge crossings include:

- Dyke River Crossing.
- Five Day Creek Crossing.
- Pee Dee Creek Crossing.
- Oaky River Crossing.
- Styx River Crossing.
- Macleay River Crossing (near Pig Paddock Gully).

The bridges are load limited and consideration on load sizes will need to be considered during transit.

## 2.2 Land Use

The Kempsey Armidale Road area (within the works zone) is zoned for the following:

- RU1: Primary Production.
- RU2: Rural Landscape.
- RU3: Forestry.
- C1: National Parks and Nature Reserve.

Built up towns in the Kempsey Shire Council area have C3: Environmental Management and RU5: Village.

The Kempsey Armidale Road supports traffic from the following land uses:

- Rural residential dwellings.
- Agricultural industry (cropping and meat).
- Logging industry.
- Forestry maintenance.
- Tourism (fishing and accommodation, etc.).
- Other various recreational activities.

## 2.3 Surrounding Network Details

Roads, other than Kempsey Armidale Road, that may be impacted by construction traffic include (refer to **Illustration 2.1**):

- Waterfall Way.
- Macleay Valley Way.
- Belgrave Street.
- Elbow Street.
- River Street.
- North Street.
- Second Lane.

These roads are all sealed and heavily trafficked roads.

**Illustration 2.1 Surrounding Networks to Kempsey Armidale Road**

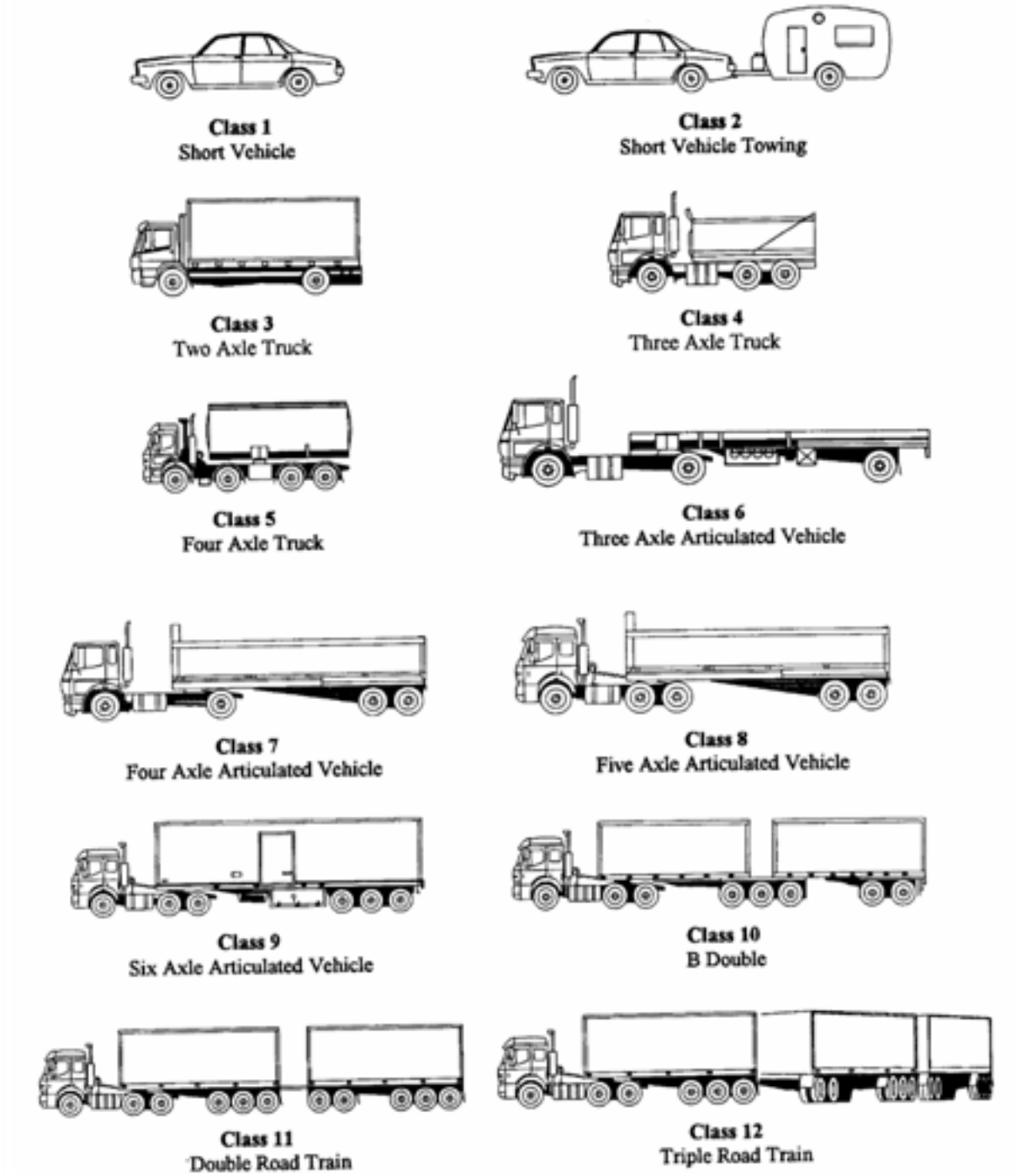
# 3. Volume Assessment

Kempsey Road (in Armidale Regional Council area) is currently closed to all traffic except local traffic and a small number of contractors performing works for Kempsey Road remediation purposes; as such the existing traffic volumes detailed in Section 3.1 are not reflective of current traffic numbers, but traffic numbers for volumes experienced prior to the road damage and closure.

Post construction volumes are expected to return to levels detailed in the 'existing traffic' component of this assessment, as such this will not be discussed further as part of this assessment.

All vehicles are classified under the Austroads Vehicle Classification (Patrick, 2019) as shown in **Figure 3.1**. Light vehicles (LVs) are categorised as Class 1 and Class 2 from the Austroads Vehicle Classification System, all other vehicles are heavy vehicles (HVs).

The overall project construction is anticipated to be completed in a 41-month period, this includes design and construct phase, site setup, construction works and demobilisation.




* source: Appendix B of (Patrick, 2019)

**Figure 3.1 Austroads Vehicle Classification**

## 3.1 Existing Traffic

### 3.1.1 Kempsey Armidale Road

Kempsey Armidale Road supports traffic from:

- Local rural dwellings.
- Agricultural industry (cropping and meat).
- Logging industry.
- Forestry maintenance.
- Tourism (fishing and accommodation).
- Other various recreational activities.

The eastern section has a higher density population residing in the area and as such has higher traffic generation. The western section has greater recreation and industry (logging) which is represented in the various sealed sections between Styx River Forest Way and Waterfall Way.

The available Annual Average Daily Traffic (AADT) data for some sections of Kempsey Armidale Road has been provided by Armidale Regional Council (ARC) (refer to **Appendix A**) and Kempsey Shire Council (KSC) and is shown in **Table 3.1.**

**Table 3.1 Kempsey Armidale Road – Existing Traffic Volumes**

| Road Section | Council Area | Data Period (month/ year) | AADT | % Heavy Vehicles |
|---|---|---|---|---|
| South of Tallowood Fire Road (Newells Culvert) | ARC | June 2021 | 20.65 | 7.99 |
| Lower Creek (40 m South of Lower Creek Road) | ARC | June 2021 | 46.5 | 20.75 |
| Blackbird Flat | ARC | June 2021 | 28.45 | 27.59 |
| West of Five Day Creek Road | KSC* | January 2018 | 76 | 1.36 |
| West of Thungutti Drive | KSC* | May 2018 | 244 | 3.14 |
| South of Tom Gully Road | KSC* | April 2021 | 397 | 3.43 |
| North of Mungay Creek Road | KSC* | January 2020 | 934 | 3.06 |
| South of Mooneba Road | KSC* | April 2021 | 1,934 | 5.91 |

* Data sourced from (Uddin et al., 2023)

### 3.1.2 Ancillary Roads

The surrounding network roads, as discussed in **Section 2.3**, have potential to be impacted by the Kempsey Road works as well; however, they have been constructed to manage higher traffic volumes and are unlikely to be substantially impacted by the proposed construction volumes.

The available AADT data for some of these roads has been obtained from Armidale Regional Council, Kempsey Shire Council or the Transport for NSW Traffic Volume Viewer (Transport for NSW, 2023) and is detailed in **Table 3.2**.

**Table 3.2 Ancillary Road – Existing Traffic Volumes**

| Road | Data Period (month/ year) | AADT | % Heavy Vehicles |
|---|---|---|---|
| Waterfall Way | March/ April 2022 | 625 | 23 |
| Macleay Valley Way (Station ID 6124) | 2022 | 7,422 | 14.39 |
| River Street | February/ March 2020 | 7,518 | 0.87 |

## 3.2 Construction Traffic

Most of the construction traffic will be generated from the eastern (Kempsey) section of the project as shown in **Table 3.3**.

Construction traffic has been segregated into three categories:

- Site Setup.
- Construction Operations.
- Demobilisation.

The key components of the work program include:

1. Establishment of major ancillary sites.
2. Temporary enabling works.
3. Upslope safety works (including tree removal works).
4. Small culvert works that cut off/limit access but can be built using accelerated methods.
5. Large culverts that have a longer duration but can be built in a staged manner using side tracks, or multiple stages.
6. Offline construction of Inlet and Outlet treatments for culverts.
7. Downslope slope stabilisation works including soil nail walls and gravity walls.
8. Pavement works.

These works are applicable across seven individual zones through the project site (refer to **Figure 3.2**):

- Zone 1 – Ch73000 To Ch77000 (Blackbird Flat to Mcgee's Flat).
- Zone 2 - Ch:77000 To Ch:85000 (Mcgee's Flat to Flying Fox).
- Zone 3 - Ch:85000 To Ch:89000 (Flying Fox to Lower Creek).
- Zone 4 - Ch-89000 To Ch:103000 (Lower Creek to Eastern Boundary Trail).
- Zone 5 - Ch-103000 To Ch:111700 (Eastern Boundary Trail to First Change Over).
- Zone 6 - Ch:111700 To Ch:118000 (First Change Over to Top Of Big Hill).
- Zone 7 - Lower Creek Road.

The traffic volumes presented in Sections 3.2.2, 3.2.3, and 3.2.4 below are the anticipated traffic volumes external to the project construction during the three phases of construction. For anticipated traffic volumes including internal and external traffic movements, Seymour Whyte Constructions (SWC) have provided information on this as part of their construction methodology (Seymour & Seymour Whyte Constructions, 2023) and this is detailed in Section 3.2.5 below.


**Figure 3.2 Kempsey Road Work Zones**

### 3.2.2 Site Establishment

Establishing the site is the first major component of the project works that will involve extensive traffic development. While there will be minor volumes of traffic, and predominantly light vehicles, during the detailed design phase, it is unlikely it will impact road users substantially.

SWC have indicated that the site establishment phase is to be completed within a 100-day period, an overview of site setup works will involve the following:

1. Preliminary works:

    a. Heavy machinery mobilisation to commence preliminary works for ancillary facilities (camps, offices, stockpile, and laydown areas).
    b. Fuel trucks regularly attending the site to service heavy machinery during these works.
    c. Temporary offices and amenities (e.g., caravans) to support workers completing preliminary works.
    d. Travel of staff to and from accommodation facilities for these preliminary works.
    e. Quarry material delivery for ancillary sites.

2. Camp establishment:

    a. Donga delivery (220).
    b. Sewage Treatment Plant (STP) components.

c. Walkway and other ancillary infrastructure.
d. 6 x workshop containers.
e. 4 x generators.
f. Water tanks.
g. Fencing materials.

3. Main office compounds setup:

a. 50 x office dongas.
b. 4 x workshop facility containers.
c. 8 x storage containers.
d. Concrete batch plant facilities.
e. Fuel storage infrastructure.
f. 2 x generators.
g. Facility blocks.
h. Soils lab (5 x containers).

4. Plant and Equipment mobilisation:

a. Heavy machinery.
b. Minor equipment (erosion and sediment controls, roadside furniture, wacker packers, etc.).
c. Infrastructure (prefab culverts, etc.).
d. Fuel Tankers.
e. Concrete trucks.
f. Water trucks.

5. Laydown Area Equipment:

a. 8 x Storage containers.
b. 4 x Caravan offices.
c. Portaloos.

Due to road design constraints the modular units (dongas) will be delivered from the Kempsey end to Bellbrook in semi-trailers and then loaded on to flatbed trucks to transport them to the Lower Creek area.

ARC have provided approximate traffic volume numbers and direction of travel are shown in **Table 3.3**.

**Table 3.3 Construction Traffic Volumes**

| Stage | Direction of Travel to Site | Max Vehicle Class | Number of Vehicle Trips for this Phase* |
|---|---|---|---|
| **Preliminary Works** | | | |
| Heavy Machinery | E | 10 | 60 |
| Fuel Trucks | E | 4 | 100 |
| Worker Temporary Accommodation | W | 2 | 200 |
| Quarry Materials | W | 10 | 300 |
| **Camp Setup** | | | |
| Donga Delivery | E | 10 | 600 |

| Stage | Direction of Travel to Site | Max Vehicle Class | Number of Vehicle Trips for this Phase* |
|---|---|---|---|
| STP | E | 10 | 40 |
| Ancillary Infrastructure | E | 10 | 100 |
| Workshop Containers | E | 10 | 6 |
| Generators | E | 10 | 8 |
| Water Tanks | E | 10 | 12 |
| Fencing | W | | 16 |
| **Compound Setup** | | | |
| Donga Delivery | E | 10 | 100 |
| Workshop Containers | E | 10 | 8 |
| Storage Containers | E | 10 | 16 |
| Batch Plant and Facilities | E | 10 | 60 |
| Amenities | E | 10 | 8 |
| Fuel Storage Infrastructure | E | 10 | 12 |
| Fencing | W | 10 | 16 |
| Soils Lab and Equipment | E | 10 | 10 |
| **Laydown Area Setup** | | | |
| Storage Containers | E | 10 | 16 |
| Caravan Offices | E | 2 | 8 |
| Amenities | E | 8 | 6 |
| Fencing | W | 10 | 20 |
| **Plant and Equipment Mobilisation** | | | |
| Heavy Machinery | E | 10 | 60 |
| | W | 10 | 60 |
| Equipment | E | 10 | 30 |
| Infrastructure | E | 10 | 400 |
| Fuel Tankers | E | 4 | 4 |
| Concrete Trucks | E | 4 | 12 |
| Water Trucks | W | 4 | 4 |

* A trip is determined to be one way, i.e., in only; therefore, vehicle access in and out is 2 trips

### 3.2.3 Site Construction Operations

Site construction operations will result in increased traffic volumes on Kempsey Armidale Road; vehicle traffic is not just inclusive of actual construction works, but also the ancillary facilities that operate to support the construction works (i.e., the camp).

Construction workers will typically work a 10 on, 4 days off roster with all workers being accommodated in the camp during the 10-day work period.

The SWC construction methodology indicates that approximately 12,000L of fuel will be required per day. A fuel storage area will be established in the main site compound; this fuel will be transported from the Kempsey Depot to site by rigid tankers that have a capacity of 10,000L. Re-topping of the storage tanks is anticipated to occur on the first 2 days of the 4 days off cycle.

One large mobile batch plant will be set up at a designated point (most likely west side of the project) and supplemented by Volumetric Mixers that will be established as static batching units at designated laydown areas near Ch. 102,000, 84,000 and 73,000. Concrete batch materials will most likely be sourced from the west to reduce traffic through the site.

Two quarries are proposed around the works footprint, White Rock Quarry and Smiths Quarry, it is unlikely that these quarries will produce materials compliant with TfNSW specification R71 – Construction of Unbound and Modified Pavement Course requirements (required for sealed pavements); however, they should be adequate for gravel pavements. A substantial amount of material will be sourced from these quarries, where possible, with the rest of material being imported to the site from nearby quarries on either the western or eastern side of the project.

During construction, the road will only be opened to residents. Road openings during the 10 days on would be between 5pm and 7am, with a potential midday opening. Travel between the Armidale end and the Kempsey end would not be permitted during the midday opening. Travel would be from either end to Lower Creek. Community consultation has occurred on the frequency of these midday escorts and consensus on initially having two days during the 10 days. Ongoing consultation with the community about the two midday openings would occur for the duration of the Activity and the number of days would be increased based on feedback and/ or time of year as required.

SWC have indicated that the construction operations phase is expected to take 39 months, it includes the following aspects:

1. Camp Operations:

    a. Food deliveries.
    b. Fuel deliveries.
    c. Laundry.
    d. Water deliveries.
    e. Wastewater removal.
    f. Waste removal.

2. Site Compound Operations:

    a. Concrete batch plant materials.
    b. Waste removal.
    c. Wastewater removal.
    d. Water deliveries.
    e. Fuel deliveries.

3. Stormwater Infrastructure Construction:

    a. Erosion and sediment controls.
    b. Spoil and other material removal.
    c. Equipment and material transport.
    d. Site stabilisation materials.

4. Road Construction:

    a. Quarry material deliveries.
    b. Spoil and other material removal.
    c. Formwork, reo, soil and equipment for wall stabilisation.
    d. Bitumen application equipment and materials.
    e. Erosion and sediment controls.
    f. Site stabilisation materials.

5. Staff and Contractors:

    a. Construction staff movements (roster work and other daily trips).
    b. Camp staff movements.
    c. Short term consultants.

ARC have provided approximate traffic volume numbers and direction of travel are shown in **Table 3.4**.

**Table 3.4 Construction Operations Traffic Volumes**

| Stage | Direction of Travel to Site | Max Vehicle Class | Number of Vehicle Trips for this Phase* |
|---|---|---|---|
| Camp Operations | E | 6 | 7,600 |
| Site Compound Operations | E | 9 | 5,600 |
| Concrete Batch Plant Materials | W | 20 | 3,300 |
| Stormwater Infrastructure Construction | E | 9 | 5,608 |
| Road Construction | E | 6 | 5,122 |
| Quarry Material Delivery | E | 10 | 3,125 |
| | W | 10 | 3,125 |
| Staff and Contractor Movements | E | 3 | 81,400 |
| | W | 3 | 81,400 |

* A trip is determined to be one way, i.e., in only; therefore, vehicle access in and out is 2 trips

### 3.2.4 Site Demobilisation

Site demobilisation phase will include most aspects associated with site mobilisation; however, with all materials being removed that were established during the site setup phase.

ARC have provided approximate traffic volume numbers and direction of travel are shown in **Table 3.5.**

**Table 3.5 Demobilisation Traffic Volumes**

| Stage | Direction of Travel to Site | Max Vehicle Class | Number of Vehicle Trips for this Phase* |
|---|---|---|---|
| **Preliminary Works** | | | |
| Heavy Machinery | E | 10 | 60 |
| Fuel Trucks | E | 4 | 100 |
| Worker Temporary Accommodation | W | 2 | 200 |
| Quarry Materials | W | 10 | 300 |
| **Camp Setup** | | | |
| Donga Delivery | E | 10 | 600 |
| STP | E | 10 | 40 |
| Ancillary Infrastructure | E | 10 | 100 |
| Workshop Containers | E | 10 | 6 |
| Generators | E | 10 | 8 |
| Water Tanks | E | 10 | 12 |
| Fencing | W | | 16 |
| **Compound Setup** | | | |
| Donga Delivery | E | 10 | 100 |
| Workshop Containers | E | 10 | 8 |
| Storage Containers | E | 10 | 16 |
| Batch Plant and Facilities | E | 10 | 60 |
| Amenities | E | 10 | 8 |
| Fuel Storage Infrastructure | E | 10 | 12 |
| Fencing | W | 10 | 16 |
| Soils Lab and Equipment | E | 10 | 10 |
| **Laydown Area Setup** | | | |
| Storage Containers | E | 10 | 16 |
| Caravan Offices | E | 2 | 8 |
| Amenities | E | 8 | 6 |
| Fencing | W | 10 | 20 |

| Stage | Direction of Travel to Site | Max Vehicle Class | Number of Vehicle Trips for this Phase* |
|---|---|---|---|
| **Plant and Equipment Mobilisation** | | | |
| Heavy Machinery | E | 10 | 60 |
| | W | 10 | 60 |
| Equipment | E | 10 | 30 |
| Infrastructure | E | 10 | 400 |
| Fuel Tankers | E | 4 | 4 |
| Concrete Trucks | E | 4 | 12 |
| Water Trucks | W | 4 | 4 |

* A trip is determined to be one way, i.e. in only; therefore, vehicle access in and out is 2 trips

### 3.2.5 Contractor Provided Information

As part of the construction planning process SWC provided a detailed construction methodology which outlined vehicle movements during the three phases of the construction project. The SWC proposed traffic figures include external and internal traffic movements. **Figure 3.3** illustrates the SWC determined vehicle movements across the construction project timeline.

SWC have indicated that it is expected that an average of 70 heavy vehicle movements per day, with an approximate peak of 200 heavy vehicle movements per day. Light vehicle movements are anticipated to be an average of 250 movements per day, with a peak around 400 movements per day.

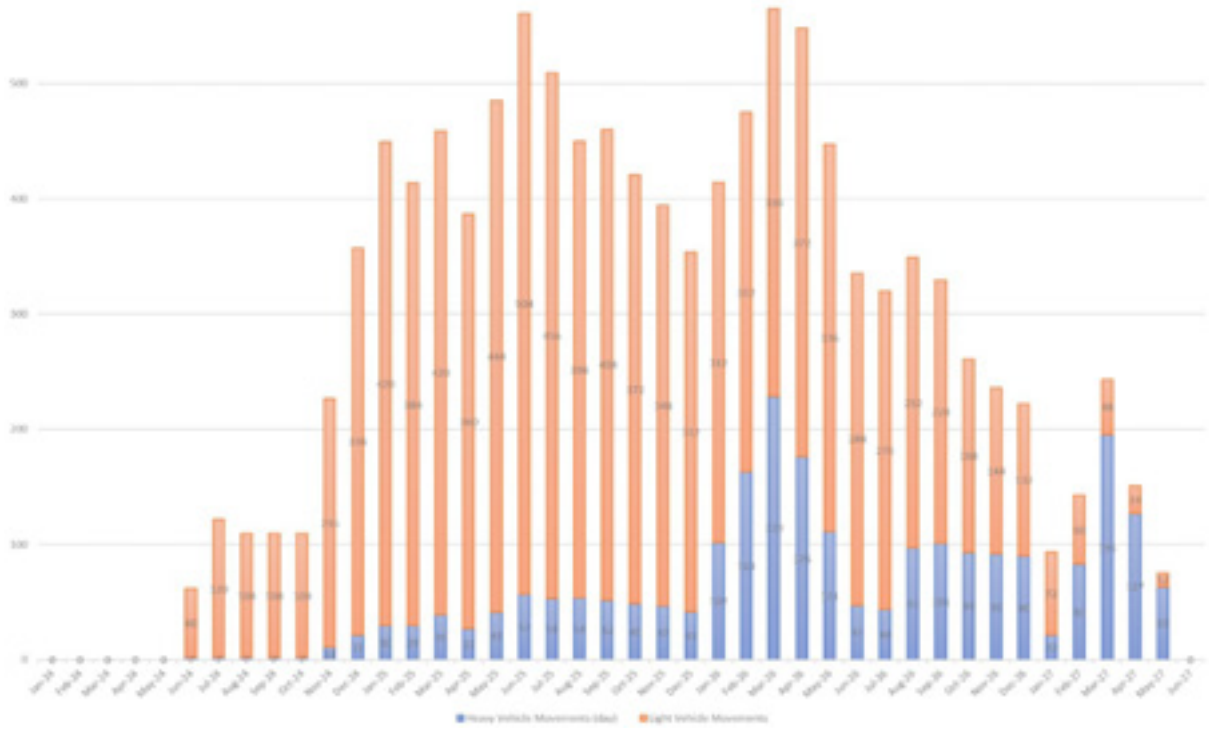


**Figure 3.3 Construction Project Daily Vehicle Movements**

* source: (Seymour & Seymour Whyte Constructions, 2023)

## 3.3 Volume Impact Assessment

The existing road traffic volumes are detailed in **Section 3.1** of this report. The proposed construction volumes (external to the construction site) are detailed in **Section 3.2** of this report. This section of this report reviews the traffic increase that will result from the construction operations over the proposed 41-month construction period.

**Table 3.6** shows the anticipated traffic volume increase on Kempsey Armidale Road during the construction period compared to existing traffic. The 'existing' traffic volumes would be less during this construction period due to the road closures and heavily restricted access for residents only.

Light vehicles are not expected to generate extensive impacts during construction; however, travel to and from the east may present some minor traffic impacts through built up areas between Five Day Creek Crossing and the Kempsey township.

Heavy vehicles will have significant impacts for both east and west travel directions along Kempsey Armidale Road. Given the state of Kempsey Armidale Road, i.e., poorly constructed, and narrow pavements, on each side of the works area there will need to be appropriate planning and management measures established prior to works commencing to ensure the safety of local road users is not compromised.

**Table 3.6 Traffic Volume Increase Assessment**

| Direction of Travel to Site | Existing Traffic Volumes | | Construction Traffic Volumes | | Traffic Volume Increase During Construction (%) | |
|---|---|---|---|---|---|---|
| | LV | HV | LV | HV | LV | HV |
| **Site Establishment** | | | | | | |
| East | 45.4 | 12.5 | 2.1 | 16.8 | 4.6 | 134.1 |
| West | 30.8 | 9.5 | 3.0 | 4.2 | 0.001 | 43.8 |
| **Construction Works** | | | | | | |
| East | 45.4 | 12.5 | 16.3 | 115.2 | 36.0 | 921.9 |
| West | 30.8 | 9.5 | 3.7 | 55.8 | 0.001 | 587.5 |
| **Demobilisation** | | | | | | |
| East | 45.4 | 12.5 | 1.6 | 16.8 | 3.5 | 134.1 |
| West | 30.8 | 9.5 | 2.5 | 4.2 | 0.001 | 43.8 |

Notes:

- LV is a light vehicle and consists of Class 1 and Class 2 vehicles under the Austroads Vehicle Classification (Patrick, 2019).
- HV is a heavy vehicle and consists Class 3 to Class 12 vehicles under the Austroads Vehicle Classification (Patrick, 2019).

# 4. Pavement Assessment

A site visit to observe current pavement condition along Kempsey Armidale Road was completed on the 21 September 2023 by GeoLINK. The findings of this site assessment are detailed in **Sections 4.1.1** and **4.1.2** below.

## 4.1 Pavement Condition

### 4.1.1 Western Side

The western approach to the Kempsey Road works includes the area between Waterfall Way intersection and Mill Fire Road intersection.

The pavement for this section varies between sealed and unsealed sections and includes two bridges for Oaky Creek crossing and Styx River crossing.

The road width varies between 5.5 m and 8 m. The sealed pavement width varies between 4.5 m and 7 m with 1 m of unsealed shoulder width.

This road services forestry with logging trucks moving north towards Waterfall Way regularly.

Sealed pavement condition is relatively good with only minor impacts observed during the site inspection (refer to **Plate 4.1**, **Plate 4.2** and **Plate 4.3** Ravelling **observed on edges of seal – South of Styx River Crossing**

The seam between sealed and unsealed pavements is at high risk from additional heavy vehicle movements at each site where there is a seam between the two types of surfaces it is in poor condition and prone to wear and tear (refer to **Plate 4.4** Pavement connection seam with signs of deterioration – North of Williams Road

Edge break and edge drop-off were observed in all areas where pavement seams occurred along the western section of Kempsey Road.

Unsealed roads in the western section of Kempsey Road were observed to have the following issues in most sections:

- Coarse texture where the aggregates/rock are protruding from the pavement surface and noticeably loose (refer to **Plate 4.7**).
- Corrugations.
- Loose powdery materials (refer to **Plate 4.7** and **Plate 4.9**).
- Rutting (refer to **Plate 4.8**).
- Channel erosion (refer to **Plate 4.10**).
- Potholes (refer to **Plate 4.10**).
- Shoving.

The unsealed surfaces are already worn from heavy vehicle tracking associated with agricultural uses and logging uses. Additional heavy vehicle movements on this road will deteriorate the unsealed pavements substantially.

**Plate 4.1 Good Condition Sealed Surface – South of Styx River Crossing**

**Plate 4.2 Rutting and depressions observed across seal – South of Styx River Crossing**

**Plate 4.3 Ravelling observed on edges of seal – South of Styx River Crossing**

**Plate 4.4 Pavement connection seam with signs of deterioration – North of Williams Road**

**Plate 4.5 Pavement connection seam with signs of deterioration – South of Williams Road**

**Plate 4.6 Pavement seam with signs of deterioration – South of Styx River Crossing**

**Plate 4.7 Protruding aggregates/rocks and loose materials – North of Falls Road**

**Plate 4.8 Rutting and protruding aggregates/rocks – North of Falls Road**

**Plate 4.9 Very loose powdery material – North of Falls Road**

**Plate 4.10 Channel erosion and potholes – North of Williams Road**

### 4.1.2 Eastern Side

The eastern side extends from Five Day Creek right through to the Kempsey township. The road supports a few small rural towns and is unsealed from Five Day Creek through to approximately 8.2 km west of Bellbrook (just west of Pee Dee Creek), from this point and east into Kempsey the road is sealed.

The road is extensively winding, and the unsealed pavement condition is in similar condition to that of the western side with the following issues being observed:

- Coarse texture where the aggregates/ rock are protruding from the pavement surface and noticeably loose (refer to **Plate 4.11** and **Plate 4.13**).
- Corrugations (refer to **Plate 4.13**).
- Loose powdery materials (refer to **Plate 4.14**).
- Shoving (refer to **Plate 4.15**).

**Plate 4.11 Corrugations, protruding aggregates, and loose materials – East of Five Day Creek**

**Plate 4.12 Channel erosion and loose materials – East of Five Day Creek**

**Plate 4.13 Corrugations and protruding aggregates – East of Five Day Creek**

**Plate 4.14 Loose material, shoving and rutting – East of Five Day Creek**

**Plate 4.15 Loose material and shoving – East of Five Day Creek**

## 4.2 Pavement Impact Calculations

A road pavement must be strong enough to cater for both the heaviest of these vehicles and the cumulative effects of the passage of all vehicles. Light vehicles (Austroads Vehicle Classes 1 and 2) contribute very little to structural deterioration; therefore, only heavy vehicles are considered in pavement design (Austroads Ltd, 2017).

The damage caused to a pavement by the passage of a heavy vehicle depends not only on its gross weight but also on how this weight is distributed to the pavement. In particular, it depends on:

- the number of axles on the vehicle;
- the manner in which these axles are grouped together – into axle groups; and
- the loading applied to the pavement through each of these axle groups – the axle group load.

Kempsey Armidale Road is not an approved B double route under the NSW Combined Higher Mass Limits and Restricted Access Vehicle Map (NSW Government, 2023a).

Trucks utilised in this construction project will be limited to Class 9, long (11.5 m to 19 m) up to six axles articulated (Moffatt, 2019).

### 4.2.1 Sealed Pavement Assessment

The cumulative loading on a pavement over a period of time is, in essence, an account of every axle group traversing the pavement during this time period, together with its type and its load. This cumulative loading is specified by:

- the cumulative number of axle groups traversing the pavement during the period;
- the proportions of each axle group type in this total; and
- for each axle group type, the frequency distribution of the axle group loads.

The traffic load distribution (TLD) for the road is required to calculate the design traffic loading. The TLD provides information necessary to evaluate the pavement damage caused by the heavy vehicle axle groups (HVAG), specifically:

- the proportions of all axle groups that are a particular axle group type; and
- for each axle group type, the proportion of axles applied at each load magnitude.

Design traffic loading is commonly described in terms of the number of Equivalent Standard Axles (ESA). The design traffic used in the empirical design of unbound granular pavements with thin bituminous surfaces is expressed in terms of ESAs. Additionally, when considering rutting and loss of surface shape in the mechanistic-empirical design of pavements the design traffic is considered also in units of ESAs.

The Standard Axle is defined as a single axle with dual tyres (SADT) applying a load of 80 kN to the pavement. To determine ESAs the loads on axle configurations that are considered to cause the same damage (i.e. overall pavement damage when using the empirical procedure, and rutting and loss of surface shape in the mechanistic-empirical design procedure) are given in **Table 4.1** and **Table 4.2**.

Denoting this axle group load (which causes the same damage as a Standard Axle) as the axle group's Standard Load ($SSLLii$), ESAs of damage is calculated using Equation 1. The calculation of the ESAs of damage due to the design traffic requires the estimation of the average number of ESAs per heavy vehicle axle group (ESA/ HVAG) from the TLD.

The average ESA/ HVAG is then calculated by multiplying the ESA values for each axle group and of each axle group type (Table I 3 of Austroads Guide (Moffatt, 2019) by its frequency of occurrence

(Table I 2 of Austroads Guide (Moffatt, 2019), Table I 4 of Austroads Guide (Moffatt, 2019) outlines the average ESA/ HVAG which is the sum of the weighted ESA values, this value is 0.8.

**Table 4.1 Loads on Axle Groups With Dual Tyres Which Cause Damage as a Standard Axle**

| Axle Group Type | Load (kN) |
|---|---|
| Single axle with dual tyres (SADT) | 80 |
| Tandem axle with dual tyres (TADT) | 135 |
| Triaxle with dual tyres (TRDT) | 182 |
| Quad-axle with dual tyres (QADT) | 226 |

*source: (Moffatt, 2019)

**Table 4.2 Loads on Axle Groups With Single Tyres Which Cause Same Damage as a Standard Axle**

| Axle Group Type | Nominal Tyre Section Width | Load (kN) |
|---|---|---|
| Single axle with single tyres (SAST) | Less than 375 mm | 53 |
| | At least 375 mm but less than 450 mm | 58 |
| | 450 mm or more | 71 |
| Tandem axle with single tyres (TAST) | Less than 375 mm | 89 |
| | At least 375 mm but less than 450 mm | 98 |
| | 450 mm or more | 119 |
| Triaxle with single tyres (TRST) | Less than 375 mm | 121 |
| | At least 375 mm but less than 450 mm | 132 |
| | 450 mm or more | 162 |
| Quad-axle with single tyres (QAST) | Less than 375 mm | 150 |
| | At least 375 mm but less than 450 mm | 164 |
| | 450 mm or more | 201 |

*source: (Moffatt, 2019)

**Equation 1 ESA Determination**

$$ESA_{ij} = \left(\frac{L_{ij}}{SL_i}\right)^4$$

where

$ESA_{ij}$ = number of repetitions of a Standard Axle which causes the same amount of damage as a single passage of axle group type $i$ with load $L_{ij}$

$SL_i$ = Standard Load for axle group type $i$ (from Table 7.7 and Table 7.8)

$L_{ij}$ = $j^{th}$ load magnitude on the axle group type $i$

The design traffic calculated in terms of ESA of loading is converted to SAR of loading using the average SAR/ESA value for each damage type. These factors are determined from the Traffic Load Distributions (TLDs) that characterise actual or presumptive traffic data.

The determined SARs for this project are detailed in **Table 4.3**.

**Table 4.3 SAR Determination**

| Austroads Vehicle Class | Unloaded SAR | Loaded SAR |
|---|---|---|
| 3 | 0.54 | 2.98 |
| 4 | 0.50 | 3.57 |
| 5 | 0.46 | 4.09 |
| 6 | 0.60 | 4.43 |
| 7 | 0.56 | 5.02 |
| 8 | 0.52 | 5.61 |
| 9 | 0.51 | 4.93 |

Existing traffic loads provided in **Table 4.4** below have been acquired from the site traffic data provided by ARC and discussed in Section 3.1.1 of this report.

The Queensland Department of Transport and Main Roads outlines that road impacts are identified where development generated SARs (ESAs) exceed 5% of background SARs (ESAs) on the road network (Department of Transport and Main Roads, 2018b).

**Table 4.5**, **Table 4.6,** and **Table 4.7** detail the SAR impact for the Kempsey Armidale Road construction period (including early works and demobilisation). As can be seen by this data the proposed construction project is anticipated to have extensive impacts on the road pavements of Kempsey Armidale Road.

Even though the construction project is for a short period (41 months) the impacts to the road pavement from heavy vehicle traffic is expected to be significant and remediation programs of these roads should be considered in the planning process of this construction project.

**Table 4.4 Existing Background Traffic Loadings**

| Road Section | Existing HV Volumes | ESA | Daily Background ESA | Yearly Background ESA |
|---|---|---|---|---|
| South of Tallowood Fire Road (Newells Culvert) | 9.5 | 0.8 | 7.6 | 2773.7 |
| Blackbird Flat | 12.5 | 0.8 | 10 | 3650 |

**Table 4.5 Construction SAR (ESAs) - East**

| Vehicle Class | Loaded | | | | | Unloaded | | | | | Daily Total | Yearly Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Daily Demand | Yearly Demand | SAR/ Vehicle | SAR/ Day | SAR/ Year | Daily Demand | Yearly Demand | SAR /Vehicle | SAR/ Day | SAR/ Year | | |
| 3 | 37.5 | 13698.5 | 2.98 | 111.8 | 40821.5 | 37.5 | 13698.5 | 0.54 | 20.3 | 7397.2 | 132.1 | 48218.6 |
| 4 | 0.08 | 30.4 | 3.57 | 0.3 | 108.7 | 0.08 | 30.4 | 0.50 | 0.042 | 15.2 | 0.3 | 123.9 |
| 5 | - | - | 4.09 | - | - | - | - | 0.46 | - | - | - | - |
| 6 | 5.1 | 1861.9 | 4.43 | 22.6 | 8248.1 | 5.1 | 1861.9 | 0.60 | 3.06 | 1117.1 | 25.7 | 9365.3 |
| 7 | - | - | 5.02 | - | - | - | - | 0.56 | - | - | - | - |
| 8 | 0.005 | 1.8 | 5.61 | 0.027 | 9.9 | 0.005 | 1.8 | 0.52 | 0.003 | 0.91 | 0.03 | 10.8 |
| 9 | 4.8 | 1762.2 | 4.93 | 23.8 | 8687.7 | 4.83 | 1762.2 | 0.51 | 2.5 | 898.7 | 26.3 | 9586.5 |

Note: cells identified with a '-' symbol indicate that these types of vehicles were not recorded on the road during the recording period.

**Table 4.6 Construction SAR (ESAs) - West**

| Vehicle Class | Loaded | | | | | Unloaded | | | | | Daily Total | Yearly Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Daily Demand | Yearly Demand | SAR/ Vehicle | SAR/ Day | SAR/ Year | Daily Demand | Yearly Demand | SAR /Vehicle | SAR/ Day | SAR/ Year | | |
| 3 | 20.9 | 7610.3 | 2.98 | 62.1 | 22678.6 | 20.9 | 7610.3 | 0.54 | 11.3 | 4109.5 | 73.4 | 26788.1 |
| 4 | 0.0032 | 1.2 | 3.57 | 0.011 | 4.18 | 0.0032 | 1.2 | 0.50 | 0.0016 | 0.59 | 0.013 | 4.77 |
| 5 | - | - | 4.09 | - | - | - | - | 0.46 | - | - | - | - |
| 6 | - | - | 4.43 | - | - | - | - | 0.60 | - | - | - | - |
| 7 | - | - | 5.02 | - | - | - | - | 0.56 | - | - | - | - |
| 8 | - | - | 5.61 | - | - | - | - | 0.52 | - | - | - | - |
| 9 | 2.9 | 1060.9 | 4.93 | 14.3 | 5230.2 | 2.91 | 1060.9 | 0.51 | 1.5 | 541.1 | 15.8 | 5771.3 |

Note: cells identified with a '-' symbol indicate that these types of vehicles are not expected to be utilised during the construction works from this travel direction.

**Table 4.7 Proposed Construction Traffic Impact Assessment**

| Road Direction* | Existing HR Volume SAR/ Year | Load | Construction HR Volume SAR/ Year | Total Increase (%) |
|---|---|---|---|---|
| East | 3650 | Loaded | 57875.8 | 1486% |
| | | Unloaded | 9429.2 | 158% |
| West | 2773.7 | Loaded | 27913.0 | 906% |
| | | Unloaded | 4651.2 | 68% |

* Refers to the directional side of the construction works area (i.e., east side is roads heading towards Kempsey, west side is roads heading towards Armidale).

### 4.2.2 Unsealed Pavement Assessment

The methodology for calculating impacts to unsealed roads:

- adopts the Australian Local Road Deterioration Study (LRDS) gravel loss model to calculate;
- marginal cost estimates per pair of axle passes (termed Loading Units (LU)) for various;
- combinations of network, comprising surface material performance, regional location (represented in annual rainfall), treatment costs (represented by district) and traffic parameters, and by applying an estimated optimum grading frequency in relation to the anticipated (total) traffic use;
- ensures that the level of service experienced by all road users is consistent with the anticipated;
- level of traffic during the period of additional loading; and
- involves the same steps as for sealed roads except that SAR and SAR-km is replaced by the LU, and the marginal cost is expressed in 'cents per LU-km'.

LU is calculated as a function of the number of axles, using Equation 2 (Department of Transport and Main Roads, 2018b).

**Equation 2 Loading Units Equation**

$$Loading\ Units = \frac{Number\ of\ Axles}{2}$$

**Table 4.8** provides a summary of LU by Austroads heavy vehicle classification. For vehicles operating on unsealed public roads, the damaging effect of a loaded and unloaded vehicle is the same; therefore, the LU is constant per vehicle class.

**Table 4.8 LU by Austroads Heavy Vehicle Classification**

| Austroads Vehicle Class | Number of Axles | LU |
|---|---|---|
| 3 | 2 | 1.0 |
| 4 | 3 | 1.5 |
| 5 | 4 | 2.0 |
| 6 | 3 | 1.5 |
| 7 | 4 | 2.0 |
| 8 | 5 | 2.5 |
| 9 | 6 | 3.0 |

* source: (Department of Transport and Main Roads, 2018b)

**Table 4.9** and **Table 4.10** show the determined LUs for existing heavy vehicle traffic and proposed construction heavy vehicle traffic. **Table 4.11** illustrates the impact that heavy vehicle traffic will have on the existing unsealed roads, the determined total impact is 1293% for eastern sections and 2366% for western sections; these impacts are significant and appropriate measures should be considered by ARC for repairing the expected damage to these roads that will occur as part of this construction project.

**Table 4.9 Background Lus**

| Austroads Vehicle Class | LU Per Day | | LU Per Year | |
|---|---|---|---|---|
| | East | West | East | West |
| 3 | 5.4 | 2.75 | 1,952.8 | 1,003.8 |
| 4 | 3.2 | 1.8 | 1,177.1 | 657.0 |
| 5 | 0 | 0.2 | 0.0 | 73.0 |
| 6 | 0.4 | 0.075 | 136.9 | 27.4 |
| 7 | 0 | 0 | 0.0 | 0.0 |
| 8 | 0 | 0.125 | 0.0 | 45.6 |
| 9 | 0.3 | 0.3 | 109.5 | 109.5 |
| **Total** | **9.3** | **2.5** | **3,376.3** | **912.5** |

**Table 4.10 Construction LUs**

| Austroads Vehicle Class | LU Per Day | | LU Per Year | |
|---|---|---|---|---|
| | East | West | East | West |
| 3 | 75.1 | 41.7 | 27,397.0 | 15,220.5 |
| 4 | 0.3 | 0.010 | 91.3 | 3.5 |
| 5 | - | - | 0.0 | 0.0 |
| 6 | 15.3 | - | 5,585.6 | 0.0 |
| 7 | - | - | 0.0 | 0.0 |
| 8 | 0.02 | - | 8.8 | 0.0 |
| 9 | 29.0 | 17.4 | 10,573.3 | 6,365.4 |
| **Total** | **119.6** | **59.1** | **43,656.0** | **21,589.4** |

**Table 4.11 Construction LU Impacts – Per Class**

| Austroads Vehicle Class | Background LU Per Year | | Construction LU Per Year | | Combined LU Per Year | | % Impact | |
|---|---|---|---|---|---|---|---|---|
| | East | West | East | West | East | West | East | West |
| 3 | 1952.8 | 1003.8 | 27397.0 | 15220.5 | 29349.7 | 16224.3 | 1403% | 1516% |
| 4 | 1177.1 | 657.0 | 91.3 | 3.5 | 1268.4 | 660.5 | 8% | 1% |
| 5 | 0.0 | 73.0 | 0.0 | 0.0 | 0.0 | 73.0 | 0% | 0% |
| 6 | 136.9 | 27.4 | 5585.6 | 0.0 | 5722.5 | 27.4 | 4080% | 0% |
| 7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0% | 0% |
| 8 | 0.0 | 45.6 | 8.8 | 0.0 | 8.8 | 45.6 | 0% | 0% |
| 9 | 109.5 | 109.5 | 10573.3 | 6365.4 | 10682.8 | 6474.9 | 9656% | 5813% |
| Total | 3376.3 | 912.5 | 43656.0 | 21589.4 | 47032.2 | 22501.9 | 1293% | 2366% |

# 5. Road Safety Assessment

To determine the level of road safety that currently exists for Kempsey Armidale Road, interactive crash reports were obtained from NSW Centre for Road Safety (NSW Government, 2023b).

Road accidents are recorded in the NSW database and covers vehicle accidents that have occurred on NSW roads between 2018 and 2022. The number of road accidents for the western side of Kempsey Armidale Road is quite minimal (refer to **Table 5.1** and **Figure 5.1**). The eastern side of Kempsey Armidale Road has substantially more traffic accidents (refer to **Table 5.2** and **Figure 5.2)**; however, this would largely be due to the higher volumes of traffic that traverse this section of the road.

The majority of accidents recorded along Kempsey Armidale Road over the reporting period were associated with light vehicles that had left the road by overshooting a bend, which would indicate that there is potentially issues with the road design layout and the allocated speed limit for this road.

There is a fatality recorded in this data in 2018 (refer to item 7 in **Table 5.2**) and over 50% of the accidents recorded during this period were serious injuries, this indicates that road safety is a complex issue for Kempsey Road and appropriate measures will need to be considered and implemented as part of this construction project given the significant increase in vehicle traffic to traverse this road.

Kempsey Armidale Road is extremely narrow in many sections with large cliff faces on one side and steep drop-offs on the other side, there is frequently no capacity for two way traffic movements (refer **Plate 5.1** and **Plate 5.2**).

The project construction works are likely to increase travel times for local road users and restrict access periods, as such road safety matters are escalated under these conditions due to the stress of changed conditions on the road users. These factors will need to be considered when developing the traffic management plan for the construction works.

**Plate 5.1 Narrow Road Section – Armidale Road (Comara)**

**Plate 5.2 Warning Signs for Narrow Road Section – Armidale Road (Comara)**

**Table 5.1 Crash Data – Kempsey Road – Western Side**

| Map ID* | Reporting Year | Crash ID | Vehicle Type | Degree of Crash | Crash Description |
|---|---|---|---|---|---|
| 1 | 2020 | 1234082 | Light Vehicle | Serious Injury | Vehicle off road on left side, hit object |
| 2 | 2018 | 1181314 | Light Vehicle | Serious Injury | Out of control on bend |
| 3 | 2022 | 1291057 | Light Vehicle | Minor Injury | Vehicle off road on left side on bend |
| 4 | 2020 | 1245650 | Light Vehicle | Moderate Injury | Vehicle off road on left side, hit object |
| 5 | 2018 | 1184548 | Light Vehicle | Serious Injury | Vehicle out of control, hit object |

* refer to **Figure 5.1** for Map ID locations.

**Table 5.2 Crash Data – Armidale Road – Eastern Side**

| Map ID* | Reporting Year | Crash ID | Vehicle Type | Degree of Crash | Crash Description |
|---|---|---|---|---|---|
| 1 | 2018 | 1188833 | Light Vehicle | Serious Injury | Out of control on bend |
| 2 | 2018 | 1164140 | Light Vehicle | Moderate Injury | Vehicle off road on left side, hit object |
| 3 | 2020 | 1253062 | Light Vehicle | Serious Injury | Vehicle off road on left side, hit object |
| 4 | 2022 | 1301038 | Light Vehicle | Serious Injury | Vehicle off road on left side, hit object |
| 5 | 2021 | 1267159 | Light Vehicle | Non-casualty (towaway) | Vehicle off road on left side, hit object |
| 6 | 2020 | 1223272 | Light Vehicle | Moderate Injury | Vehicle off road on right side, hit object |
| 7 | 2018 | 1179388 | Light Vehicle | Fatal | Vehicle off road on right side, hit object |
| 8 | 2022 | 1300811 | Light Vehicle | Moderate Injury | Vehicle off road on left side, hit object |

| Map ID* | Reporting Year | Crash ID | Vehicle Type | Degree of Crash | Crash Description |
|---|---|---|---|---|---|
| 9 | 2021 | 1269599 | Light Vehicle | Non-casualty (towaway) | Struck Animal |
| | 2022 | 1284890 | Light Vehicle | Serious Injury | Vehicle off road on right side, hit object |
| | 2019 | 1210189 | Light Vehicle | Serious Injury | Head on |
| | 2019 | 1220178 | Light Vehicle | Serious Injury | Head on |
| 10 | 2018 | 1185582 | Heavy Vehicle | Moderate Injury | Vehicle off road on left side, hit object |
| 11 | 2019 | 1200293 | Light Vehicle | Moderate Injury | Vehicle off road on left side, hit object |
| 12 | 2018 | 1191720 | Light Vehicle | Serious Injury | Vehicle off end of road |
| 13 | 2018 | 1171639 | Light Vehicle | Serious Injury | Vehicle off road on left side, hit object |
| 14 | 2019 | 1213775 | Light Vehicle | Serious Injury | Vehicle out of control during over taking |
| 15 | 2022 | 1299332 | Light Vehicle | Serious Injury | Vehicle off road on left side, hit object |
| 16 | 2019 | 1216492 | Light Vehicle | Serious Injury | Vehicle off road on left side, hit object |
| 17 | 2018 | 1183544 | Light Vehicle | Serious Injury | Vehicle off road on left side, hit object |
| 18 | 2020 | 1238751 | Light Vehicle | Moderate Injury | Vehicle off road on left side, hit object |
| 19 | 2018 | 1184310 | Light Vehicle | Non-casualty (towaway) | Struck animal |
| 20 | 2019 | 1191625 | Light Vehicle | Moderate Injury | Vehicle off road on left side, hit object |
| 21 | 2021 | 1272745 | Heavy Vehicle | Moderate Injury | Lane change left |
| 22 | 2020 | 1230236 | Light Vehicle | Serious Injury | Vehicle off road on left side, hit object |
| 23 | 2018 | 1184458 | Light Vehicle | Serious Injury | Head on |
| 24 | 2019 | 1204909 | Light Vehicle | Moderate Injury | Vehicle off road on left side, hit object |

| Map ID* | Reporting Year | Crash ID | Vehicle Type | Degree of Crash | Crash Description |
|---|---|---|---|---|---|
| 25 | 2019 | 1221555 | Light Vehicle | Moderate Injury | Vehicle off road on right side, hit object |
| 26 | 2019 | 1219724 | Light Vehicle | Serious Injury | Vehicle off road on left side, hit object |
| 27 | 2021 | 1275286 | Light Vehicle | Serious Injury | Vehicle off road on right side, hit object |
| 28 | 2018 | 1163597 | Heavy Vehicle | Moderate Injury | Vehicle on footpath |
| 29 | 2019 | 1213360 | Light Vehicle | Non-casualty (towaway) | Rear end |
| 30 | 2021 | 1269597 | Light Vehicle | Minor Injury | Rear end |

* refer to

**Figure** 5.2 for Map ID locations.

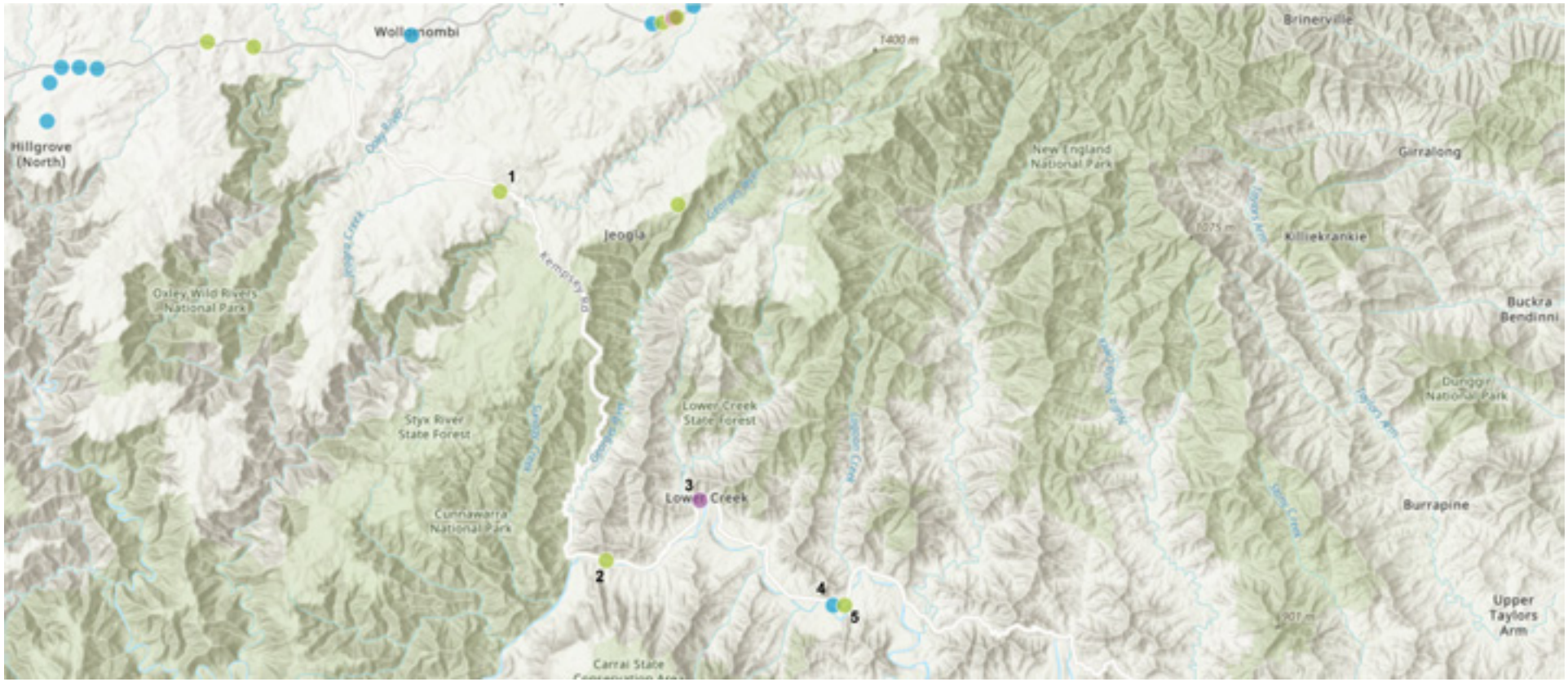



**Figure 5.1 Kempsey Road – Western Side (Armidale Regional Council area) – Crash Data**

* source: (NSW Government, 2023b)

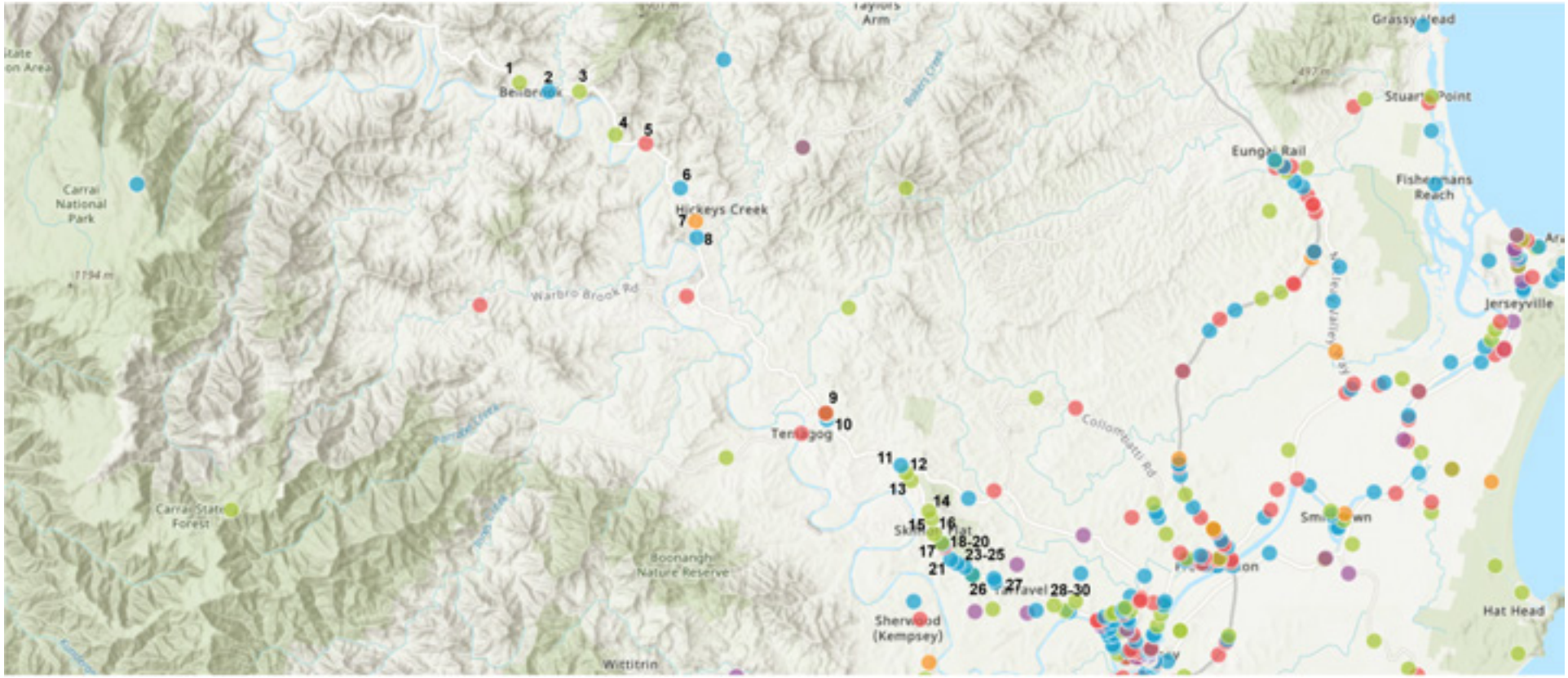



**Figure 5.2 Armidale Road – Eastern Side (Kempsey Shire Council area) – Crash Data**

* source: (NSW Government, 2023b)

Infrastructure Risk Rating (IRR) is a road assessment methodology designed by Austroads Ltd to assess road safety risk at a network level (Zia et al., 2019).

The IRR is calculated by coding the following road and roadside features:

- land use;
- road stereotype;
- lane and shoulder width;
- horizontal alignment;
- roadside hazards;
- intersection density;
- access density;
- traffic volume – rural roads only; and
- speed limit – rural roads only.

The IRR has been calculated for various sections of Kempsey Armidale Road (refer to **Table 5.3**) in accordance with the IRR Manual (Zia et al., 2019) overall the road is classified as High risk.

**Table 5.3 Infrastructure Risk Rating**

| Aspect | Rating | | | |
|---|---|---|---|---|
| Homogenous Sections | Rural Towns | Unsealed Rural Road | Sealed Rural Roads | Winding Sections |
| Land Use | 2.5 | 1 | 1 | 1 |
| Road Stereotype | 3.7 | 10 | 3.7 | 10 |
| Lane and shoulder width | 2.01 | 2.01 | 2.01 | 2.01 |
| Horizontal alignment | 1.8 | 1.8 | 1.8 | 3.5 |
| Roadside hazards | 0.4 | 2.8 | 2.8 | 2.8 |
| Intersection density | 1.15 | 1 | 1 | 1 |
| Access density | 1.03 | 1 | 1 | 1 |
| Traffic volume | 1 | 1 | 1 | 1 |
| Speed limit | 0.81 | 3.24 | 3.24 | 1.52 |
| IRR | 1.11 | 2.52 | 2.08 | 2.48 |
| | Low | High | Medium High | High |

Utilising the Queensland Department of Transport and Main Roads safety risk score matrix (refer to **Figure 5.3**) (Department of Transport and Main Roads, 2018a) the following risk assessment will identify the likelihood of potential incidents occurring and the resulting consequence of those incidents.

| | | Potential consequence | | | | |
|---|---|---|---|---|---|---|
| | | Property only (1) | Minor injury (2) | Medical treatment (3) | Hospitalisation (4) | Fatality (5) |
| Potential likelihood | Almost certain (5) | M | M | H | H | H |
| | Likely (4) | M | M | M | H | H |
| | Moderate (3) | L | M | M | M | H |
| | Unlikely (2) | L | L | M | M | M |
| | Rare (1) | L | L | L | M | M |

L: Low risk
M: Medium risk
H: High risk

**Figure 5.3 Safety Risk Score Matrix**

**Table 5.4** below outlines some of the safety hazards associated with the potential construction traffic from the Kempsey Armidale Road project on existing road users and possible management measures that could be implemented to alleviate risk levels to these road users.

**Table 5.4 Road Safety Risk Assessment**

| Risk Item | With Construction Traffic | | | Possible Management Measures | With Construction and Management Measures | | |
|---|---|---|---|---|---|---|---|
| | L | C | R | | L | C | R |
| Additional traffic (heavy and light vehicles) on Kempsey Armidale Road resulting in increased head on collision or vehicles swerving off the side of the road. | 4 | 5 | H | ▪ Reduce Kempsey Armidale Road speed limit.<br>▪ Install temporary traffic lights on narrow bends that don't have two-way traffic capacity or good visibility.<br>▪ Install give way signage on narrow stretches of road with visibility of oncoming traffic.<br>▪ Restrict traffic movements for construction to allocated periods during the day when regular traffic is lowest.<br>▪ Convoy heavy vehicle movements and restrict all other vehicle movements during their transit to and from the construction site (i.e. use traffic controllers at designated locations to hold other traffic). | 1 | 5 | M |
| Increased number of vehicles off the side of roads due to unstable road conditions or animal strikes. | 4 | 5 | H | ▪ Reduce Kempsey Armidale Road speed limit. | 3 | 4 | M |
| Increased vehicle collisions on unsealed roads due to poor visibility from excess dust generation. | 3 | 5 | H | ▪ Reduce Kempsey Armidale Road speed limit.<br>▪ Regular dust suppression on unsealed sections.<br>▪ Restrict traffic movements for construction to allocated periods | 3 | 4 | M |

| Risk Item | With Construction Traffic | | | Possible Management Measures | With Construction and Management Measures | | |
|---|---|---|---|---|---|---|---|
| | | | | during the day when regular traffic is lowest.<br>■ Convoy heavy vehicle movements and restrict all other vehicle movements during their transit to and from the construction site (i.e. use traffic controllers at designated locations to hold other traffic). | | | |
| Increased opportunity for rear end collisions for any turning vehicles on Kempsey Armidale Road due to increased traffic volumes. | 4 | 4 | H | ■ Reduce Kempsey Armidale Road speed limit.<br>■ Restrict traffic movements for construction to allocated periods during the day when regular traffic is lowest. | 3 | 4 | M |
| Traffic impacting an existing road defect or a road defect that is created during construction (e.g. rutting, corrugations, edge break, damaged seam, loose aggregate, and dust). | 5 | 3 | H | ■ Establish an inspection regime with intervention levels for maintenance of substantial defects occurring during construction. | 1 | 3 | L |

# 6. Conclusion and Recommendations

This traffic impact assessment for the Kempsey Road Restoration Works project has identified that the number of vehicles associated with the construction works will result in a significant increase in vehicular traffic on the entirety of Kempsey Armidale Road, thus impacting the existing road users.

The increased traffic will impact the existing pavements which will have detrimental impacts to the already poor condition unsealed pavements on both the east and western side of the proposed works area.

Managing road safety during the construction works will be essential. Implementing engineering controls along all concerning areas of Kempsey Armidale Road, such as road widening or sealed surfaces, is not a viable option at this stage for this project. As such, appropriate traffic management measures will need to be implemented to ensure safety of all road users during the period of construction; management measures may include:

- Reducing the speed limit of Kempsey Armidale Road in sections that are narrow, winding, unsealed, or have obstructed sight distances to a maximum of 60 km/h.
- Installing give way signage and road markings on sections of road that are narrow but have good sight distance of oncoming traffic (e.g., Styx River Crossing bridge).
- Installing automated temporary traffic lights on sections that are narrow and have poor sight distance of oncoming traffic.
- Restricting construction traffic to designated periods of the day when existing traffic volumes are low.
- Pre-planning heavy vehicle movements and implementing convoy tactics with manned traffic control at appropriate locations to manage normal traffic movements.
- Regular dust management of unsealed roads.

It is recommended that Council consider:

- repairing existing defects (e.g., rutting, corrugations, etc.) along the subject roads prior to construction; and
- establishing a maintenance regime throughout construction to assess the condition on regular intervals with intervention levels for repair of defects created during construction.

The pavement of Kempsey Armidale Road will deteriorate with the additional traffic movements over the construction period, pre-planning by ARC and KSC to ensure road maintenance works are planned strategically after the Kempsey Road Restoration Works project has concluded would be advantageous and reduce future vehicle hazards.

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# Copyright and Usage

# Appendix A

# ARC Traffic Data

# Armidale Regional Council
# Traffic Report

## Kempsey Rd. Blackbird Flat 20m West of Boundary - Westbound

**Profile:**

| | |
|---|---|
| **Filter time:** | **12:00 Wednesday, 9 June 2021 => 12:00 Monday, 28 June 2021 (19)** |
| **Included classes:** | 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 |
| **Speed range:** | 10 - 160 km/h. |
| **Direction:** | West (bound), P = East, Lane = 0-16 |
| **In profile:** | Vehicles = 589 / 1174 (50.17%) |

*** Virtual Day - Total=31, 15 minute drops**

| 0000 | 0100 | 0200 | 0300 | 0400 | 0500 | 0600 | 0700 | 0800 | 0900 | 1000 | 1100 | 1200 | 1300 | 1400 | 1500 | 1600 | 1700 | 1800 | 1900 | 2000 | 2100 | 2200 | 2300 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **0** | **0** | **0** | **0** | **0** | **0** | **1** | **1** | **2** | **2** | **2** | **3** | **3** | **3** | **2** | **4** | **3** | **3** | **1** | **1** | **0** | **0** | **0** | **0** |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | **1** | 1 | 0 | 1 | **1** | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | **1** | 1 | 1 | 1 | **1** | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | **1** | 1 | 1 | 1 | **1** | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | **1** | 1 | 1 | 0 | **1** | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

**AM Peak 1115 - 1215 (3), AM PHF=0.75 PM Peak 1515 - 1615 (4), PM PHF=0.84**

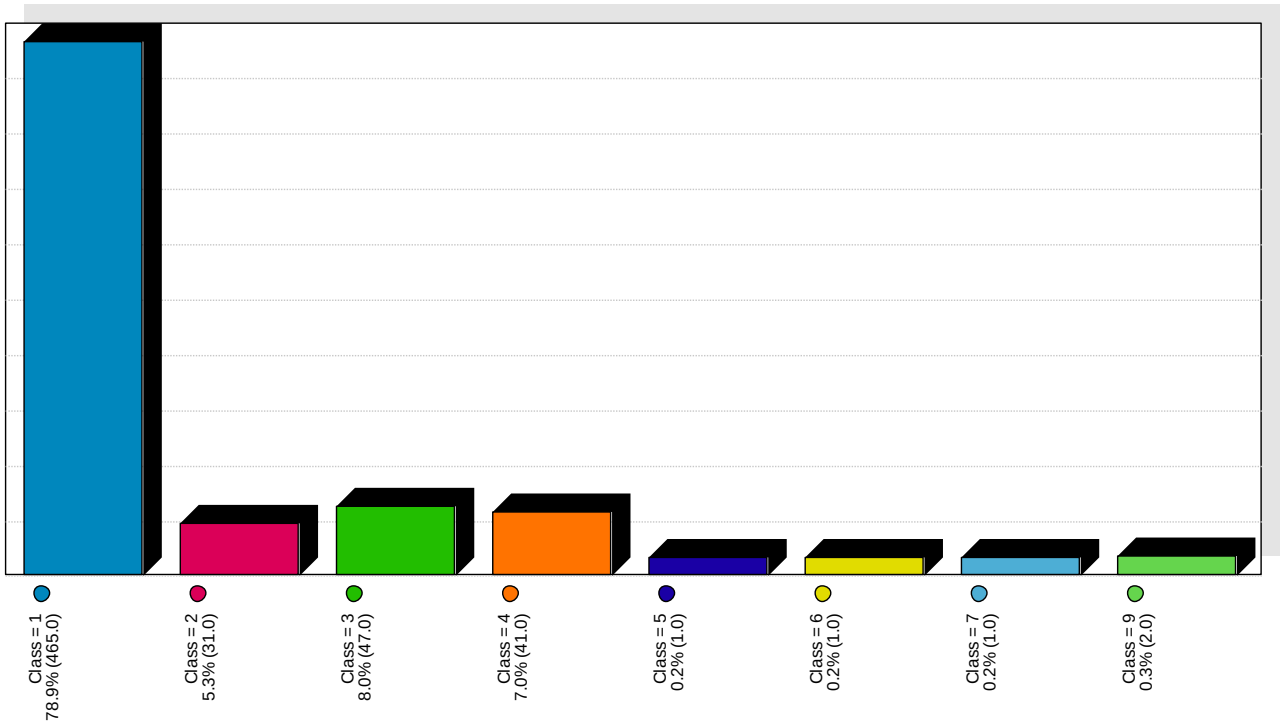
**Numbers have been rounded to the nearest integer.**

## Class Bins

Class 1 - 465 (78.95%)
Class 2 - 31 (5.26%)
Class 3 - 47 (7.98%)
Class 4 - 41 (6.96%)
Class 5 - 1 (0.17%)
Class 6 - 1 (0.17%)
Class 7 - 1 (0.17%)
Class 8 - 0 (0.00%)
Class 9 - 2 (0.34%)

### Class Bin Chart

**ClassBin-20** (Metric) **Site:** 1075056.0.1WE
**Description:** Kempsey Rd.@Blackbird Flat 20m West of Boundary
**Filter time:** 12:00 Wednesday, 9 June 2021 => 12:00 Monday, 28 June 2021
**Filter:** Cls(1-12) Dir(W) Sp(10,160) GapX(>0) Span(0 - 100) Lane(0-16)
**Scheme:** Vehicle classification (AustRoads94)
Total=589



# Armidale Regional Council
# Traffic Report

## Kempsey Rd. Blackbird Flat 20m West of Boundary - Eastbound

**Profile:**

| | |
|---|---|
| **Filter time:** | **12:00 Wednesday, 9 June 2021 => 12:00 Monday, 28 June 2021 (19)** |
| **Included classes:** | 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 |
| **Speed range:** | 10 - 160 km/h. |
| **Direction:** | East (bound), P = East, Lane = 0-16 |
| **In profile:** | Vehicles = 569 / 1174 (48.47%) |

*** Virtual Day - Total=30, 15 minute drops**

| 0000 | 0100 | 0200 | 0300 | 0400 | 0500 | 0600 | 0700 | 0800 | 0900 | 1000 | 1100 | 1200 | 1300 | 1400 | 1500 | 1600 | 1700 | 1800 | 1900 | 2000 | 2100 | 2200 | 2300 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **0** | **0** | **0** | **0** | **0** | **0** | **1** | **2** | **1** | **2** | **3** | **4** | **3** | **3** | **2** | **4** | **2** | **1** | **1** | **0** | **0** | **0** | **0** | **0** |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | **1** | 1 | 1 | 0 | **1** | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | **1** | 1 | 1 | 0 | **1** | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | **1** | 0 | 0 | 1 | **1** | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | **1** | 1 | 1 | 1 | **1** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

**AM Peak 1100 - 1200 (4), AM PHF=0.81  PM Peak 1500 - 1600 (4), PM PHF=0.85**

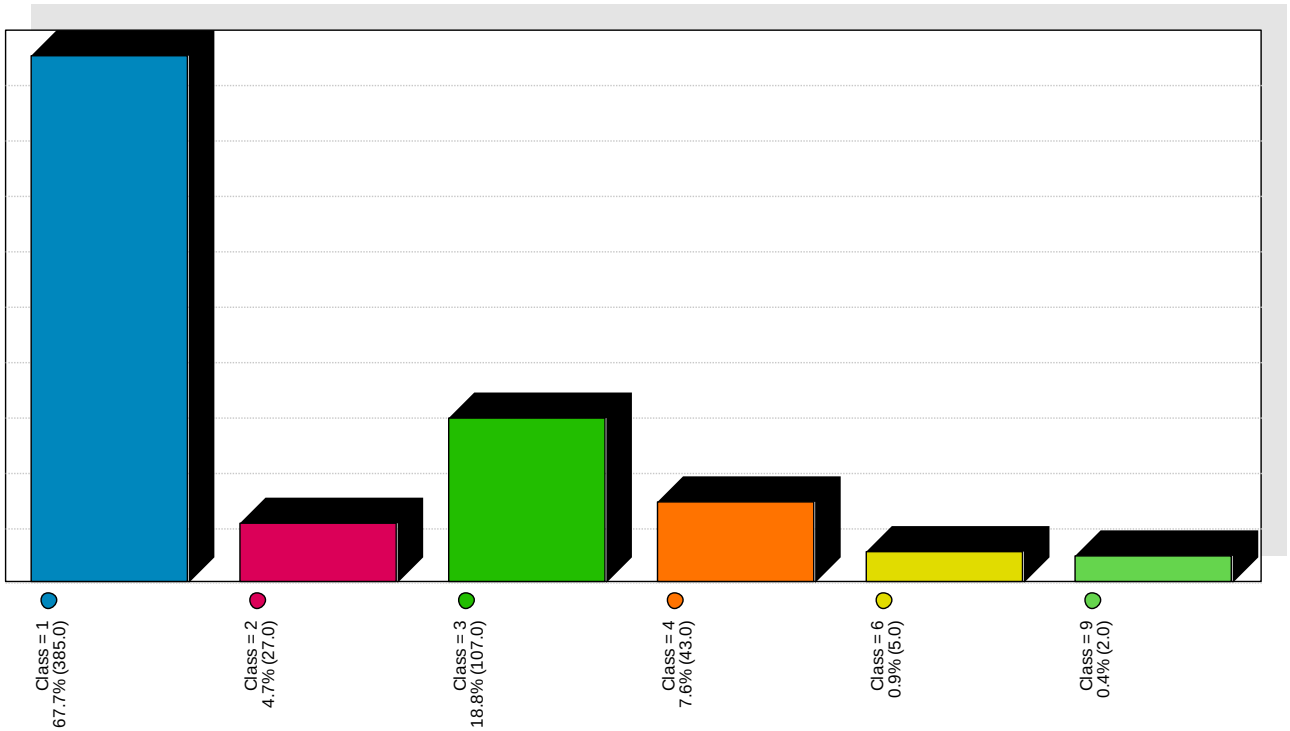
**Numbers have been rounded to the nearest integer.**

## Class Bins

Class 1 - 385 (67.66%)
Class 2 - 27 (4.75%)
Class 3 - 107 (18.80%)
Class 4 - 43 (7.56%)
Class 5 - 0 (0.00%)
Class 6 - 5 (0.88%)
Class 7 - 0 (0.00%)
Class 8 - 0 (0.00%)
Class 9 - 2 (0.35%)

### Class Bin Chart

**ClassBin-20** (Metric) **Site:** 1075056.0.1WE
**Description:** Kempsey Rd.@Blackbird Flat 20m West of Boundary
**Filter time:** 12:00 Wednesday, 9 June 2021 => 12:00 Monday, 28 June 2021
**Filter:** Cls(1-12) Dir(E) Sp(10,160) GapX(>0) Span(0 - 100) Lane(0-16)
**Scheme:** Vehicle classification (AustRoads94)
Total=569



# Armidale Regional Council
# Traffic Report

## Kempsey Rd. Lower Creek 40m Sth of Lower Creek Rd - Southbound

**Profile:**

| | |
|---|---|
| **Filter time:** | **11:00 Wednesday, 9 June 2021 => 11:00 Monday, 28 June 2021 (19)** |
| **Included classes:** | 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 |
| **Speed range:** | 10 - 160 km/h. |
| **Direction:** | South (bound), P = North, Lane = 0-16 |
| **In profile:** | Vehicles = 473 / 946 (50.00%) |

*** Virtual Day - Total=25, 15 minute drops**

| 0000 | 0100 | 0200 | 0300 | 0400 | 0500 | 0600 | 0700 | 0800 | 0900 | 1000 | 1100 | 1200 | 1300 | 1400 | 1500 | 1600 | 1700 | 1800 | 1900 | 2000 | 2100 | 2200 | 2300 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **0** | **0** | **0** | **0** | **0** | **0** | **1** | **1** | **1** | **2** | **2** | **3** | **2** | **3** | **3** | **2** | **2** | **1** | **1** | **0** | **0** | **0** | **0** | **0** |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | **1** | 1 | **1** | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | **0** | **1** | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** | **1** | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | **1** | 0 | **1** | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

**AM Peak 1145 - 1245 (3), AM PHF=0.75  PM Peak 1315 - 1415 (3), PM PHF=0.72**

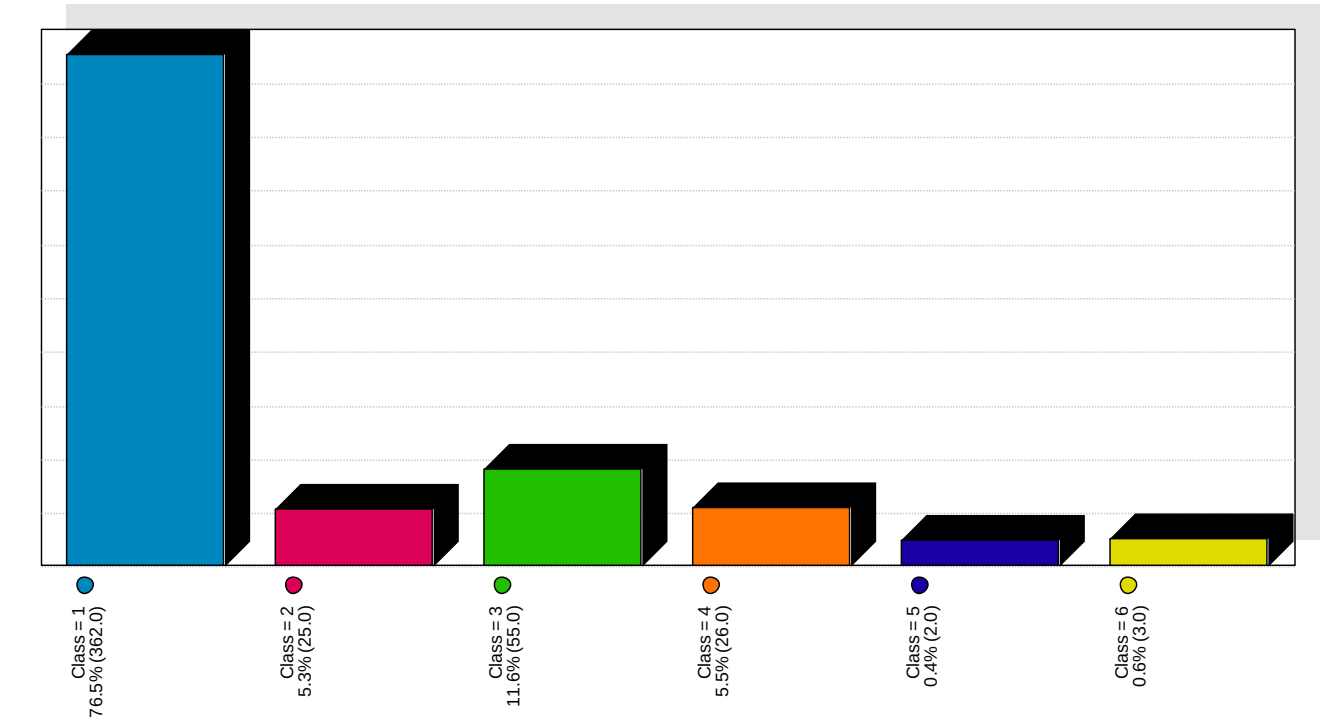
**Numbers have been rounded to the nearest integer.**

## Class Bins

Class 1 - 362 (76.53%)
Class 2 - 25 (5.29%)
Class 3 - 55 (11.63%)
Class 4 - 26 (5.50%)
Class 5 - 2 (0.42%)
Class 6 - 3 (0.63%)

### Class Bin Chart

**ClassBin-20** (Metric) **Site:** 1075039.0.1NS
**Description:** Kempsey Rd.@Lower Creek 40m Sth of Lower Creek Rd
**Filter time:** 11:00 Wednesday, 9 June 2021 => 11:00 Monday, 28 June 2021
**Filter:** Cls(1-12) Dir(S) Sp(10,160) GapX(>0) Span(0 - 100) Lane(0-16)
**Scheme:** Vehicle classification (AustRoads94)
Total=473



# Armidale Regional Council
# Traffic Report

## Kempsey Rd. Lower Creek 40m Sth of Lower Creek Rd - Northbound

**Profile:**

| | |
|---|---|
| **Filter time:** | **11:00 Wednesday, 9 June 2021 => 11:00 Monday, 28 June 2021 (19)** |
| **Included classes:** | 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 |
| **Speed range:** | 10 - 160 km/h. |
| **Direction:** | North (bound), P = North, Lane = 0-16 |
| **In profile:** | Vehicles = 457 / 946 (48.31%) |

*** Virtual Day - Total=24, 15 minute drops**

| 0000 | 0100 | 0200 | 0300 | 0400 | 0500 | 0600 | 0700 | 0800 | 0900 | 1000 | 1100 | 1200 | 1300 | 1400 | 1500 | 1600 | 1700 | 1800 | 1900 | 2000 | 2100 | 2200 | 2300 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **0** | **0** | **0** | **0** | **0** | **0** | **1** | **1** | **1** | **1** | **2** | **3** | **2** | **2** | **2** | **2** | **1** | **1** | **1** | **0** | **0** | **0** | **0** | **0** |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | **1** | 1 | 1 | 0 | **1** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | **1** | 1 | 1 | **1** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** | 0 | 0 | 0 | **0** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** | 1 | 1 | 1 | **1** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

**AM Peak 1030 - 1130 (3), AM PHF=0.82  PM Peak 1415 - 1515 (3), PM PHF=0.72**

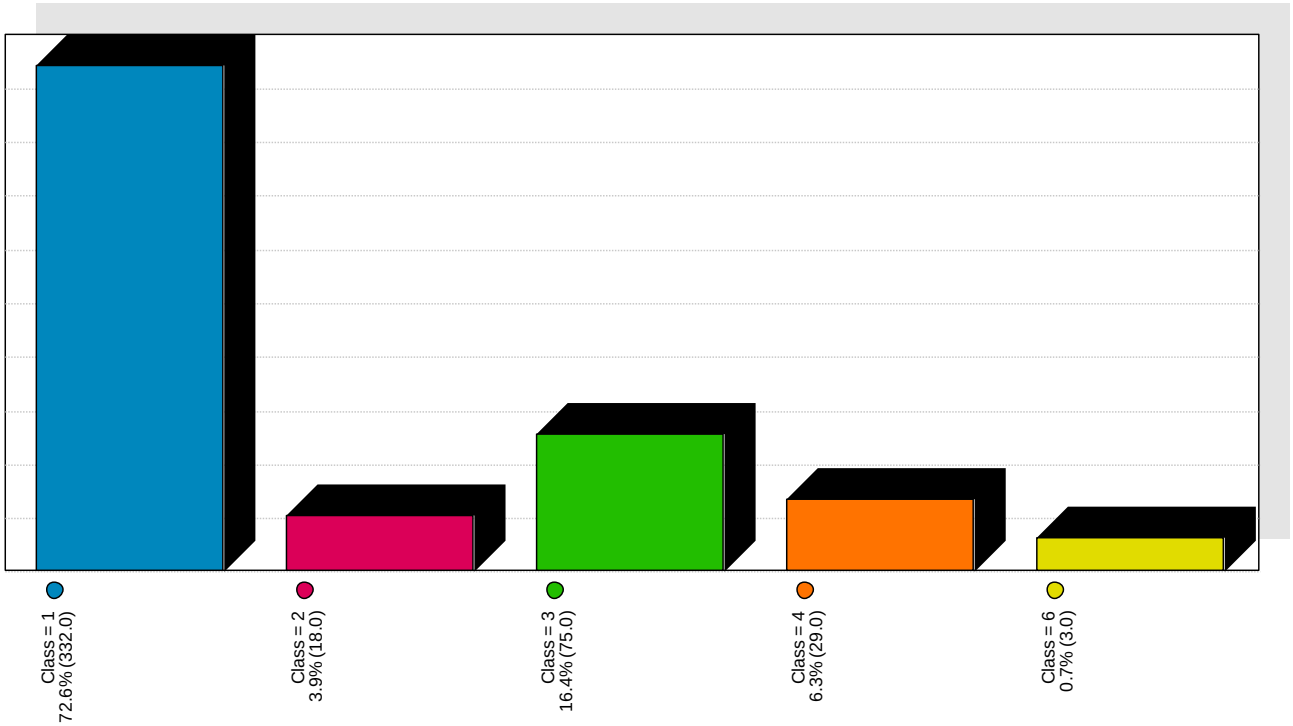
**Numbers have been rounded to the nearest integer.**

## Class Bins

Class 1 - 332 (72.65%)
Class 2 - 18 (3.94%)
Class 3 - 75 (16.41%)
Class 4 - 29 (6.35%)
Class 5 - 0 (0.00%)
Class 6 - 3 (0.66%)

### Class Bin Chart

**ClassBin-20** (Metric) **Site:** 1075039.0.1NS
**Description:** Kempsey Rd.@Lower Creek 40m Sth of Lower Creek Rd
**Filter time:** 11:00 Wednesday, 9 June 2021 => 11:00 Monday, 28 June 2021
**Filter:** Cls(1-12) Dir(N) Sp(10,160) GapX(>0) Span(0 - 100) Lane(0-16)
**Scheme:** Vehicle classification (AustRoads94)
Total=457



# Armidale Regional Council
# Traffic Report

## Kempsey Rd. At Newells Culvert - Northbound

**Profile:**

| | |
|---|---|
| **Filter time:** | **10:00 Wednesday, 9 June 2021 => 10:00 Monday, 28 June 2021 (19)** |
| **Included classes:** | 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 |
| **Speed range:** | 10 - 160 km/h. |
| **Direction:** | North (bound), P = North, Lane = 0-16 |
| **In profile:** | Vehicles = 414 / 805 (51.43%) |

*** Virtual Day - Total=22, 15 minute drops**

| 0000 | 0100 | 0200 | 0300 | 0400 | 0500 | 0600 | 0700 | 0800 | 0900 | 1000 | 1100 | 1200 | 1300 | 1400 | 1500 | 1600 | 1700 | 1800 | 1900 | 2000 | 2100 | 2200 | 2300 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **0** | **0** | **0** | **0** | **0** | **0** | **0** | **1** | **1** | **1** | **2** | **2** | **2** | **2** | **2** | **3** | **2** | **3** | **0** | **0** | **0** | **0** | **0** | **0** |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0** | 0 | 1 | 1 | 1 | 0 | **1** | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** | 1 | 0 | 0 | 1 | 1 | 0 | **1** | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0** | 0 | 1 | 1 | 0 | 1 | **1** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0** | 0 | 1 | 0 | 0 | 1 | **1** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

**AM Peak 1015 - 1115 (2), AM PHF=0.66  PM Peak 1630 - 1730 (3), PM PHF=0.72**

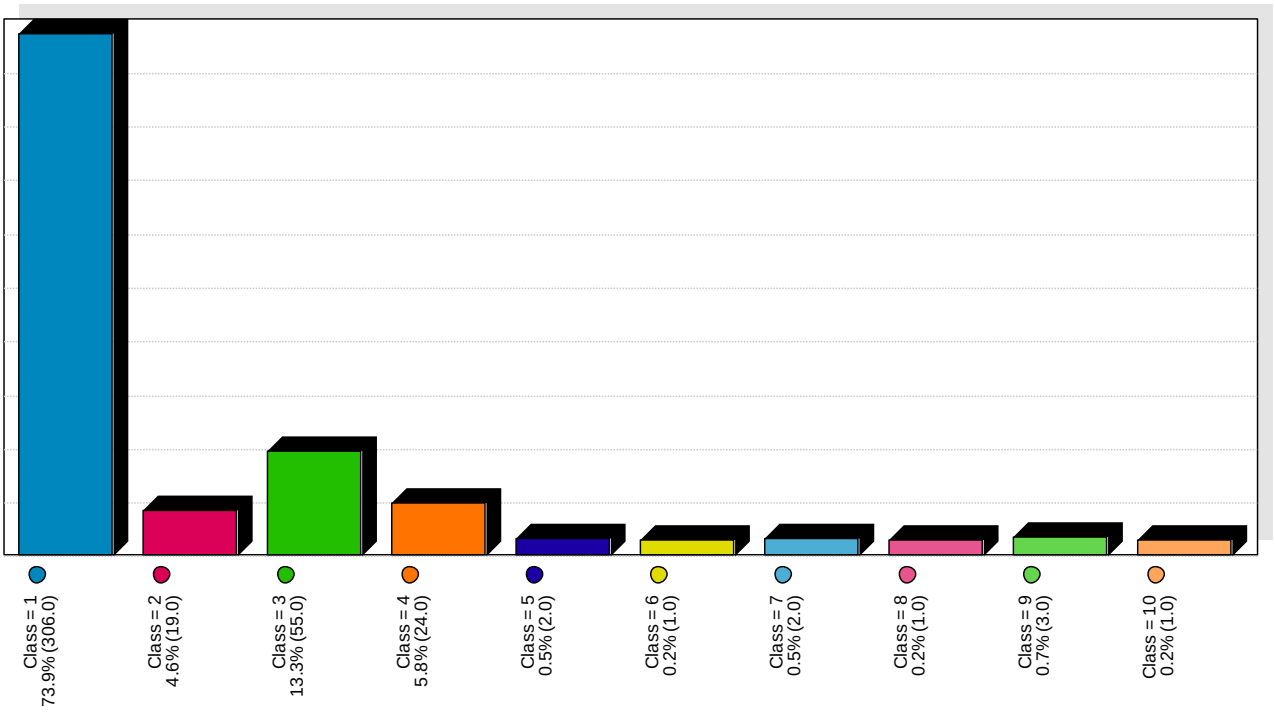
**Numbers have been rounded to the nearest integer.**

## Class Bins

Class 1 - 306 (73.91%)
Class 2 - 19 (4.59%)
Class 3 - 55 (13.29%)
Class 4 - 24 (5.80%)
Class 5 - 2 (0.48%)
Class 6 - 1 (0.24%)
Class 7 - 2 (0.48%)
Class 8 - 1 (0.24%)
Class 9 - 3 (0.72%)
Class 10 - 1 (0.24%)

### Class Bin Chart

**ClassBin-20** (Metric) **Site:** 1075017.0.1NS
**Description:** Kempsey Rd.@Newells Culvert
**Filter time:** 10:00 Wednesday, 9 June 2021 => 10:00 Monday, 28 June 2021
**Filter:** Cls(1-12) Dir(N) Sp(10,160) GapX(>0) Span(0 - 100) Lane(0-16)
**Scheme:** Vehicle classification (AustRoads94)
Total=414



# rmidale Regional Council
# Traffic Report

## Kempsey Rd. At Newells Culvert - Southbound

**Profile:**

| | |
|---|---|
| **Filter time:** | **10:00 Wednesday, 9 June 2021 => 10:00 Monday, 28 June 2021 (19)** |
| **Included classes:** | 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 |
| **Speed range:** | 10 - 160 km/h. |
| **Direction:** | South (bound), P = North, Lane = 0-16 |
| **In profile:** | Vehicles = 391 / 805 (48.57%) |

*** Virtual Day - Total=21, 15 minute drops**

| 0000 | 0100 | 0200 | 0300 | 0400 | 0500 | 0600 | 0700 | 0800 | 0900 | 1000 | 1100 | 1200 | 1300 | 1400 | 1500 | 1600 | 1700 | 1800 | 1900 | 2000 | 2100 | 2200 | 2300 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **0** | **0** | **0** | **0** | **0** | **1** | **2** | **1** | **1** | **2** | **2** | **1** | **1** | **1** | **2** | **1** | **1** | **1** | **1** | **0** | **0** | **0** | **0** | **0** |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** | 0 | 0 | 0 | 0 | 1 | 0 | **1** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | **1** | 0 | 0 | 1 | 1 | 0 | 0 | 0 | **0** | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | **1** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0** | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | **1** | 0 | 0 | 1 | 0 | 0 | 0 | **1** | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

**AM Peak 0615 - 0715 (2), AM PHF=0.77  PM Peak 1345 - 1445 (2), PM PHF=0.67**

**Numbers have been rounded to the nearest integer.**

## Class Bins

Class 1 - 268 (68.54%)
Class 2 - 22 (5.63%)
Class 3 - 65 (16.62%)
Class 4 - 22 (5.63%)
Class 5 - 0 (0.00%)
Class 6 - 5 (1.28%)
Class 7 - 3 (0.77%)
Class 8 - 0 (0.00%)
Class 9 - 5 (1.28%)
Class 10 - 1 (0.26%)

### Class Bin Chart

**ClassBin-20** (Metric) **Site:** 1075017.0.1NS
**Description:** Kempsey Rd.@Newells Culvert
**Filter time:** 10:00 Wednesday, 9 June 2021 => 10:00 Monday, 28 June 2021
**Filter:** Cls(1-12) Dir(S) Sp(10,160) GapX(>0) Span(0 - 100) Lane(0-16)
**Scheme:** Vehicle classification (AustRoads94)
Total=391