



**APPENDIX**



Traffic impact assessment

# **Birriwa Solar and Battery Project**

## **Traffic Impact Assessment**

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Prepared for ACEN Australia Pty Ltd

July 2022

# Birriwa Solar and Battery Project

## Traffic Impact Assessment

ACEN Australia Pty Ltd

J210553 Birriwa Solar and Battery Project - TIA

July 2022

Version	Date	Prepared by	Approved by	Comments
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# Executive Summary

## ES1 Introduction

ACEN Australia Pty Ltd (ACEN), formerly known as UPC\AC Renewables Australia (UPC\AC) proposes to develop the Birriwa Solar and Battery Project; a large scale solar photovoltaic (PV) electricity generation facility along with battery storage and associated infrastructure (the project). The solar farm component of the project will have an indicative capacity of around 600 megawatts (MW) and will include a centralised battery energy storage system of up to 600 MW and 2 hour duration. The project will be developed within a study area of approximately 1,300 hectares and will connect to the proposed Central-West Orana Renewable Energy Zone Merotherie Hub.

The project is in the localities of Birriwa and Merotherie, approximately 15 kilometres south-west of the township of Dunedoo, in the Central West of New South Wales (NSW). The project is within Central-West Orana (CWO) Renewable Energy Zone (REZ), and is within the Mid-Western Regional Council local government area, with parts of its access route within Warrumbungle Shire Council LGA.

This traffic impact assessment report has been prepared to accompany a new State Significant Development (SSD) application and Environmental Impact Statement (EIS) for the project.

## ES2 Existing conditions

At a local scale, Birriwa Solar and Battery Project will be serviced by a network of roads namely Castlereagh Highway, Barneys Reef Road and Birriwa Bus Route South. Castlereagh Highway/Barneys Reef Road will be the intersection between the existing road network (where no upgrades are required) and the local network (where upgrades are required and assessed as part of this SSD). Intersection counts were undertaken on Castlereagh Highway/Barneys Reef Road and Castlereagh Highway/Birriwa Bus Route South intersections between Tuesday to Thursday, 7 to 9 December 2021 from 7.00 am–9.00 am and from 4.00 am–6.00 pm. The traffic data showed that the peak hourly traffic volumes in the locality were low (on average one vehicle movement per minute).

Between 2015 and 2019, there were three crashes in the vicinity of the site on Castlereagh Highway. There were no fatal incidents.

Public transport includes NSW TrainLink coaches operating along Castlereagh Highway. School bus services operated by Eastend bus Service travel along Castlereagh Highway and Hodgen's Bus Service operate along Barneys Reef Road, Birriwa Bus Route South and Birriwa Bus Route North.

The entire length of Birriwa Bus Route South between its intersection with the Castlereagh Highway to the west and Merotherie Road to the east forms part of the Central West Cycle Trail. There are no pedestrian facilities or formal parking facilities in the vicinity of the site due to rural nature of the area.

## ES3 Assessment of impacts

This report has assessed the project related traffic impacts for the construction traffic. The operational traffic generation will be significantly lower than during project construction and therefore operational traffic impacts have not been assessed with the same level of detail.



This impact assessment considered the impacts on affected roads and intersections within the site vicinity including the Castlereagh Highway and Barneys Reef Road. It also considered impacts on road safety and impacts of public transport, cyclists and pedestrians. Key findings are summarised as follows:

- Level of service (LOS) for the affected intersections for existing, existing + project and cumulative traffic scenario will be LOS A (average delay of less than 12 second per vehicle).
- Mid-block capacity of Castlereagh Highway is expected to operate at LOS C during cumulative scenario (highest traffic scenario) with two-way traffic volumes of approximately 600 vehicles per hour with 12% heavy vehicles in both AM and PM peaks. Castlereagh highway will be able to efficiently cater for the additional vehicular traffic generated by the proposed project and other nearby developments.
- Road safety is assessed based on available sight distance at the Castlereagh Highway/Barneys Reef Road intersection. The available sight distance at the intersection towards the left and right meets the minimum requirements.
- The need for additional intersection turn lanes (eg basic, auxiliary lane and channelised) was assessed for Castlereagh Highway/barneys Reef Road intersection. The assessment finds that under the peak hour traffic volumes during existing + project scenario, the existing left lane turn treatment (BAL) will be adequate for the left turning traffic from Castlereagh Highway, whereas a channelised right turn treatment (CHR) will be required for right turning traffic from Castlereagh Highway. As per the traffic volumes under the cumulative scenario, an auxiliary left lane turn treatment (AUL) will be required for left turning traffic from Castlereagh Highway. The channelised right turn lane (CHR) will continue to be adequate from the existing + project scenario.
- Due to narrow carriageway width of less than 6.5 m, Barneys Reef Road and Birriwa Bus Route South along the project access route will be widened up to a 9.2 m wide carriageway.
- Impacts to school bus services will be mitigated as part of the Driver Code of Conduct with the Construction Traffic Management Plan by informing drivers to not travel within 100 m of any school bus and to not overtake any school buses. Impacts to cyclists will be mitigated by providing an approximately 2 m dust lane in accordance with relevant cycling guidelines and standards and in consultation with community.

#### ES4 Consultation with relevant stakeholders

Mid-Western Regional Council and Warrumbungle Shire Council were consulted in access route selection and design consideration. Mid-Western Regional Council was further consulted regarding potential for road upgrades, treatment of roadside vegetation, road drainage, waterway crossings and intersection treatment. Mid-Western Regional Council and Warrumbungle Shire Council both preferred access route option 1 along Barneys Reef Road due to its reduced impacts. Further consultations are still being held at the time of finalisation of this report with Mid-Western Regional Council to reduce option 1 road corridor width design by implementing speed limit of 80 km/h for construction traffic along Barneys Reef Road.

Central West Cycle Trail committee were updated about the project and raised concerns about the potential impact of construction traffic on Central West Cycle Trail. Central West Cycle Trail committee accepted access route option 1 as the preferred option due to its fewer impacts on Central West Cycle Trail. Central West Cycle Trail committee's concerns regarding lack of accommodation for cyclists were addressed by outcomes of Social Impact Assessment and proposed mitigation measures. ACEN has committed to continuing its consultation with Central West Cycle Trail committee.

Gulgong and Dunedoo Community information sessions were held informing residents about the project and the access route options. Access route option 1 was generally accepted.

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# 1 Introduction

## 1.1 Overview

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The project is in the localities of Birriwa and Merotherie, approximately 15 kilometres (km) south-west of the township of Dunedoo, in the Central West of New South Wales (NSW) (Figure 1.1). The project is within the Central-West Orana (CWO) Renewable Energy Zone (REZ), and is within the Mid-Western Regional Council local government area (LGA), with part of the access route from the Castlereagh Highway being within Warrumbungle Shire Council LGA.

The project is State significant development (SSD) pursuant to Schedule 1 of the *State Environmental Planning Policy (Planning Systems) 2021* (Planning Systems SEPP). Therefore, a development application for the project is required to be submitted under Part 4, Division 4.1 of the *NSW Environmental Planning and Assessment Act 1979* (EP&A Act). This traffic impact assessment report forms part of the Environmental Impact Statement (EIS).

## 1.2 Assessment approach and requirements

This Traffic Impact Assessment (TIA) has been prepared generally in accordance with the requirements of the New South Wales Government's *Guide to Traffic Generating Developments* (RTA, 2002).

This report comprises of the following sections:

- a description of the project, local setting and surrounds;
- consideration of existing traffic volumes and results of traffic surveys;
- description of construction and operational activities and estimates of associated project traffic volumes;
- identification and consideration of nearby developments and cumulative traffic;
- Signalised Intersection Design and Research Aid (SIDRA, traffic engineering software) intersection analysis; and
- consideration of future intersection and road upgrade requirements and maintenance impacts.

This assessment has been prepared in accordance with requirements of the NSW Department of Planning and Environment (DPE) which were set out in the Planning Secretary's Environmental Assessment Requirements (SEARs) for the project, issued on 5 November 2021. The SEARs identify matters which must be addressed in the EIS and essentially form its terms of reference. Table 1.1 lists individual requirements relevant to this TIA and where they are addressed in this report.

**Table 1.1 Traffic related SEARs and EMM responses**

No.	SEARs requirements	EMM responses/section addressed
1	An assessment of the peak and average traffic generation, including over-dimensional vehicles and construction worker transportation.	Section 4.1.4 discusses construction traffic generation including over size over mass vehicles (OSOM) and construction worker transportation.
2	An assessment of the likely transport impacts to the site access route, site access point(s), any Crown land, particularly in relation to the capacity and condition of the roads, road safety and intersection performance.	Section 5 discusses transport impacts on key intersections and the road network in terms of performance and capacity. Crown land is discussed in Chapter 4 of the EIS.
3	A cumulative impact assessment of traffic from nearby developments.	Section 4.5 considers cumulative traffic estimates. Section 5 presents cumulative traffic impact assessment.
4	Provide details of measures to mitigate and/or manage potential impacts including a schedule of all required road upgrades (including resulting from heavy vehicle and over mass / over dimensional traffic haulage routes), road maintenance contributions, and any other traffic control measures, developed in consultation with the relevant road and rails authorities (if required).	Section 7 presents consultation undertaken with councils, Central West Cycle Trail committee and local residents in determining access route options, traffic impacts and proposed mitigation measures.

In addition to the above SEARs, TfNSW in its letter dated 28 October 2021 raised additional comments. TfNSW comments and EMM responses are provided in Table 1.2.

**Table 1.2 TfNSW comments and EMM responses**

No.	TfNSW comments	EMM responses/information location
1	Tallawang Solar Farm and Barneys Reef Wind Farm occurring within the vicinity and likely using similar transport routes. Consideration of the cumulative traffic generation and timing of projects.	Section 0 considers cumulative traffic generation. The impact assessment conducted and outlined in Section 5 is based on estimated cumulative traffic volumes including traffic generation from these two identified projects.
2	<p>Consideration should be given to projects that are occurring within the road network along the OSOM/heavy vehicle haulage routes from the scoping report it is likely that the following projects may be occurring along the preliminary OSOM/heavy vehicle haulage route. It is important to liaise with TfNSW as the TIA and the EIS progress.</p> <ul style="list-style-type: none"> <li>• Golden Highway – Mudies Creek and Whittingham project.</li> <li>• TfNSW New England Highway – Belford to Golden Highway.</li> </ul>	Section 4.4.2 considers Golden Highway and New England Highway projects.
3	The volume of OSOMs associated with the development of the Central West REZ and the other projects occurring across the state is likely to reduce the capacity of the as a result of the to the frequency and volume of OSOM movements. The TIA will need to identify overlapping projects utilising the same OSOM routes and consider scheduling outside of peak periods and key project traffic control periods.	<p>Two nearby renewable energy development projects and their associated transport routes have been identified for potential cumulative impacts as outlined in Section 4.4.</p> <p>It is proposed the cumulative traffic effects with other renewable energy projects be revisited as part of preparation of the project CTMP before construction commences, when more detailed information is available on the construction timelines of other surrounding projects. This will be undertaken in consultation with the proponents of these other developments and TfNSW.</p>
4	It is noted that there are a significant number of renewable energy projects occurring within the locality. The TIA should assess the implications in relation to the construction related traffic on the road network due to the coinciding timeframes for the construction of these projects.	Surrounding renewable energy development projects have been identified in the EIS. It is proposed the traffic assessment be revisited preferably before construction once detailed information is available on the construction timelines of surrounding projects.
5	An assessment of the need for improvements to the road network, in particular at the intersection of Barneys Reef Road/Castlereagh Highway and Birriwa Bus Route South/Castlereagh Highway.	<p>Section 5.5 discusses the upgrade requirements to the Castlereagh Highway/Barneys Reef Road intersection.</p> <p>Section 5.6 outlines proposed road widening upgrades to Barneys Reef Road and Birriwa Bus Route South.</p> <p>No upgrades are required at the Birriwa Bus Route South/Castlereagh Highway intersection.</p>

**Table 1.2 TfNSW comments and EMM responses**

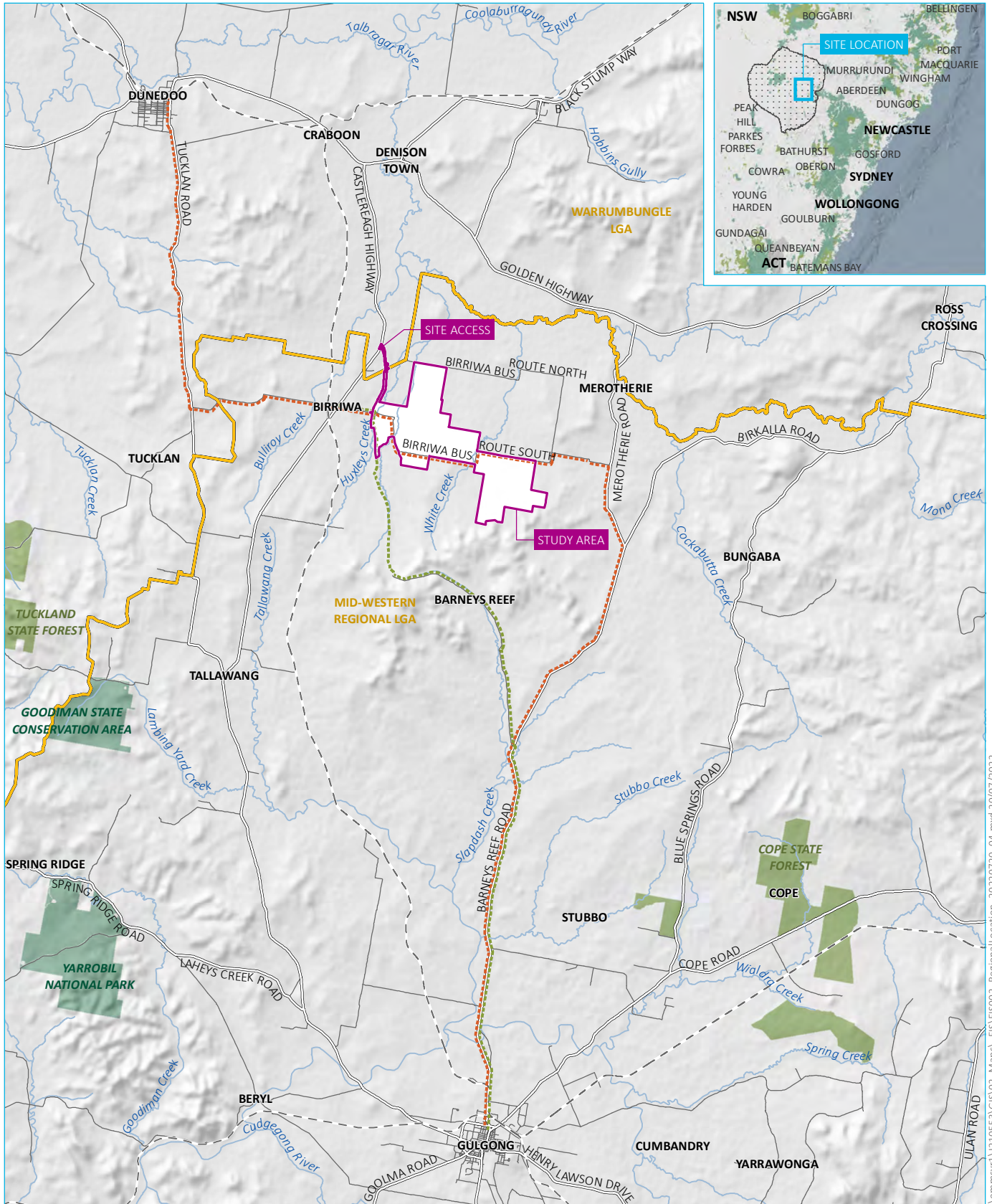
No.	TfNSW comments	EMM responses/information location
6	<p>TfNSW requests that the Environmental Impact Statement be supported by a Traffic Impact Assessment (TIA) prepared by a suitably qualified person in accordance with the Austroads Guide to Traffic Management Part 12, the Roads and Maritime Supplements to Austroads and the RTA Guide to Traffic Generating Developments. The TIA is to address the following.</p> <ul style="list-style-type: none"> <li>• Project schedule: <ul style="list-style-type: none"> <li>– hours and days of work, number of shifts and start and end times; and</li> <li>– phases and stages of the project, including construction, operation and decommissioning.</li> </ul> </li> <li>• Traffic volumes: <ul style="list-style-type: none"> <li>– existing background traffic;</li> <li>– project-related traffic for each phase or stage of the project; and</li> <li>– projected cumulative traffic at commencement of operation, and a 10-year horizon post commencement.</li> </ul> </li> <li>• Traffic characteristics: <ul style="list-style-type: none"> <li>– number and ratio of heavy vehicles to light vehicles;</li> <li>– peak times for existing traffic;</li> <li>– peak times for project-related traffic including commuter periods;</li> <li>– proposed hours for transportation and haulage; and</li> <li>– interactions between existing and project-related traffic.</li> </ul> </li> <li>• A description of all over size and over mass vehicles and the materials to be transported</li> <li>• The origins, destinations and routes for: <ul style="list-style-type: none"> <li>– commuter (employee and contractor) light vehicles and pool vehicles;</li> <li>– heavy (haulage) vehicles; and</li> <li>– over size and over mass vehicles.</li> </ul> </li> <li>• Road safety assessment of key haulage route/s.</li> <li>• The impact of traffic generation on the public road network and measures employed to ensure traffic efficiency and road safety during construction, operation and decommissioning of the project,</li> <li>• The need for improvements to the road network, and the improvements proposed such as road widening and intersection treatments, to cater for and mitigate the impact of project related traffic.</li> <li>• Proposed road facilities, access and intersection treatments are to be identified and be in accordance with Austroads Guide to Road Design including provision of Safe Intersection Sight Distance (SISD).</li> </ul>	<p>This TIA has been prepared in accordance with Austroads Guide to Traffic Management Part 12, the Roads and Maritime Supplements to Austroads and the RTA Guide to Traffic Generating Developments.</p> <p>Project schedule is presented in Section 4.1.1.</p> <p>Existing traffic volumes are presented in Section 3.3. Project traffic volumes are presented in Section 4.1.4. A 10 year horizon post commencement has not been considered given the insignificant traffic volumes associated with operation of the project.</p> <p>Traffic characteristics have been discussed in Section 3.3 and Section 4.</p> <p>Section 4.2 discusses construction traffic including OSOM vehicles.</p> <p>Section 4.4 discusses construction traffic distribution including light vehicles and heavy vehicles including OSOM vehicles.</p> <p>Section 0 and Section 5.4.</p> <p>Section 5.3 analyses road capacity of Castlereagh Highway.</p> <p>Section 5.5 discusses the upgrades requirements to Castlereagh Highway/Barneys Reef Road intersection. Section 5.6 presents upgrades to Barneys Reef Road and Birriwa Bus Route.</p> <p>SISD assessment has been conducted in Section 5.4.</p>



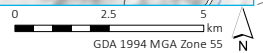
**Table 1.2 TfNSW comments and EMM responses**

No.	TfNSW comments	EMM responses/information location
	<ul style="list-style-type: none"> <li>• Local climate conditions that may affect road safety during the life of the project (eg fog, wet and dry weather, icy road conditions).</li> <li>• The layout of the internal road network, parking facilities and infrastructure.</li> <li>• Impact on rail corridors and level crossings detailing any proposed interface treatments.</li> <li>• Impact on public transport (public and school bus routes) and consideration for alternative transport modes such as walking and cycling.</li> <li>• Identification and assessment of potential impacts of the project, such as blasting, lighting, visual, noise, dust and drainage on the function and integrity of all affected public roads.</li> <li>• Controls for transport and use of any dangerous goods in accordance with <i>State Environmental Planning Policy No. 33 – Hazardous and Offensive Development, the Australian Dangerous Goods Code and Australian Standard 4452 Storage and Handling of Toxic Substances</i>.</li> </ul>	<p>Section 6.1 as part of CTMP.</p> <p>Figure 2.1; internal road network subject to detailed design.</p> <p>Section 5.7 discusses impact on rail corridor and rail crossings.</p> <p>Section 5.9 discusses impacts on public transport, cyclists and pedestrians.</p> <p>Refer to other specialist reports in support of the EIS.</p> <p>Refer to the Preliminary Hazards Assessment (Appendix I of the EIS) and Section 6.5 of the EIS.</p>

Consultation with Mid-Western Regional Council and Warrumbungle Shire Council has been presented in detail in Chapter 7 of this report.



Source: EMM (2022); DFSI (2017); DPIE (2022); GA (2011); ASGC (2006); ACEN (2022)



**KEY**

- Study area
- Existing environment
- Rail line
- Major road
- Minor road
- Named watercourse
- Local government area
- Central West Orana Renewable Energy Zone (see inset)
- NPWS reserve
- State forest
- Central West Cycle (CWC) Trail
- CWC main route - Gulgong to Dunedoo
- CWC alternate route - Slap Dash Creek side trail

**Regional context**

Birriwa Solar and Battery Project  
Traffic Impact Assessment  
Figure 1.1

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## 2 Project description and setting

### 2.1 Project overview

A full project description is provided in Chapter 3 of the EIS. In summary, the project will comprise the following key components:

- a network of approximately 1 million solar panels and associated mounting infrastructure;
- a BESS with a capacity of up to 600 MW and a storage duration of 2 hours;
- an onsite substation with a connection voltage of up to 500/330 kilovolt (kV);
- electrical collection and conversion systems, including inverter and transformer units, switchyard and control room;
- underground and aboveground cables;
- an operational infrastructure area, including demountable offices, amenities and equipment sheds;
- parking and internal access roads;
- a temporary construction compound (during construction and decommissioning only); and
- upgrade of the site access route from the Castlereagh Highway into the development footprint (Barneys Reef Road and part of Birriwa Bus Route).

In relation to the capacity of the BESS, it is noted that while approval is sought for a 600 MW capacity and 2 hour duration system, the project design initially included a BESS with a 1,000 MW capacity for one hour duration. The proposed capacity of the BESS is an input into the assumptions relating to the required construction workforce, and therefore associated traffic movements during construction of the project. This TIA assessed the traffic movements associated with a 1,000 MW BESS capacity, and therefore presents a conservative assessment of predicted traffic movements and associated impacts on the local road network.

The impact footprint (comprising the development footprint and road upgrade corridor) is shown on Figure 2.1.

The project will connect to the proposed CWO REZ Merotherie Energy Hub. Details of the connection to the proposed Energy Hub are still being discussed with EnergyCo and are described further in Chapter 1 of the EIS.

### 2.2 The study area

The project will be developed within a study area of approximately 1,300 hectares (ha) and is comprised of 18 freehold land parcels (Figure 2.1). The study area is the area of assessment for baseline surveys and studies conducted for the EIS. The study area comprises the maximum area considered for the project based on the extent of land where ACEN hold landholder agreements and the area of potential impact for road upgrades.

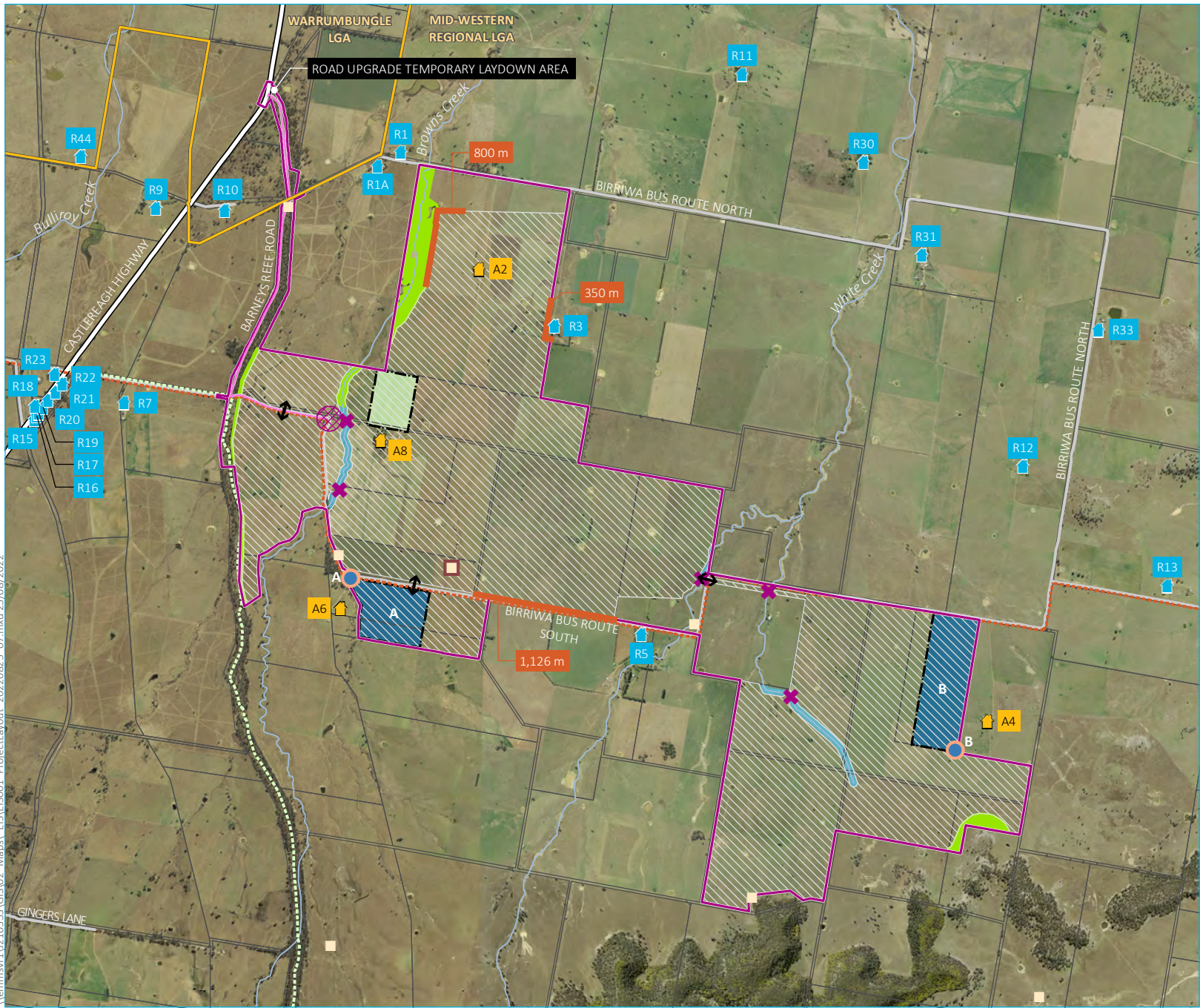
The properties within the study area are currently primarily used for sheep and cattle grazing as well as low intensity dry land cropping. There are four associated residences within close proximity to the study area (A2, A4, A6 and A8). There are 21 non-associated residences within 2 km of the study area, many of them in the township of Birriwa, and another 22 between 2 km and 5 km away (Figure 2.1).

The development footprint is the land within the study area that will be used for the operation of the project, which excludes certain areas of environmental value or social considerations (Figure 2.1). The development footprint has been refined through an iterative design process throughout the preparation of the EIS and has been informed by the outcomes of community and stakeholder engagement and environmental, social and economic assessments.

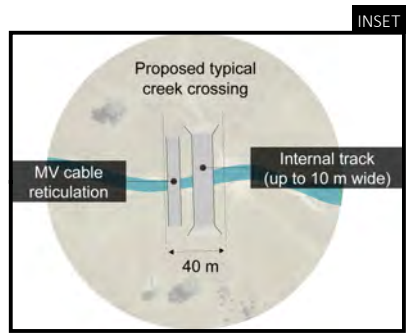
The road upgrade corridor is the area of direct impact for public road upgrade works along the access route, which comprises part of Barneys Reef Road and Birriwa Bus Route South (connecting the access point to the project with the Castlereagh Highway). It also includes three public road crossings along Birriwa Bus Route South, two of them being outside the road upgrade corridor. Public road crossings will allow construction and operation traffic to access different areas of the project with limited impacts on Birriwa Bus Route South.

The study area will be accessed via the Castlereagh Highway, Barneys Reef Road and Birriwa Bus Route (Figure 2.1). From the project access point, private internal roads will be used to traverse the development footprint. The different areas of the development footprint can be accessed via public road crossings located along Birriwa Bus Route South. A section of each of Barneys Reef Road and Birriwa Bus Route will require upgrade to provide safe access to the development footprint during construction of the project.





- KEY**
- Study area
  - Impact footprint
    - Development footprint
    - Road upgrade corridor
    - Restricted development area
  - Potential public road crossing location
  - Project layout
    - ✕ Potential creek crossing point (refer to inset below for indicative design)
    - Proposed access point to the project
    - Connection point (option A or B)
    - Proposed operational infrastructure area including substation, operational facility and BESS (option A or B)
    - Temporary construction compound
    - Landscape screen planting
  - Existing environment
    - ↑ Dwelling not associated with the project
    - ↑ Dwelling associated with the project
    - Aboriginal heritage site (to be salvaged)
    - Aboriginal heritage site (to be avoided)
    - Vegetation to be retained
    - Major road
    - Minor road
    - Watercourse
    - Cadastral boundary
    - Local government area boundary
    - Central West Cycle (CWC) Trail
      - CWC main route - Gulgong to Dunedoo
      - CWC alternate route - Slap Dash Creek side trail



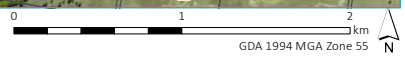
Project overview

Birriwa Solar and Battery Project  
Traffic Impact Assessment  
Figure 2.1



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Source: EMM (2022); DFSI (2017, 2022); GA (2011); ACEN (2022)



## 3 Existing conditions

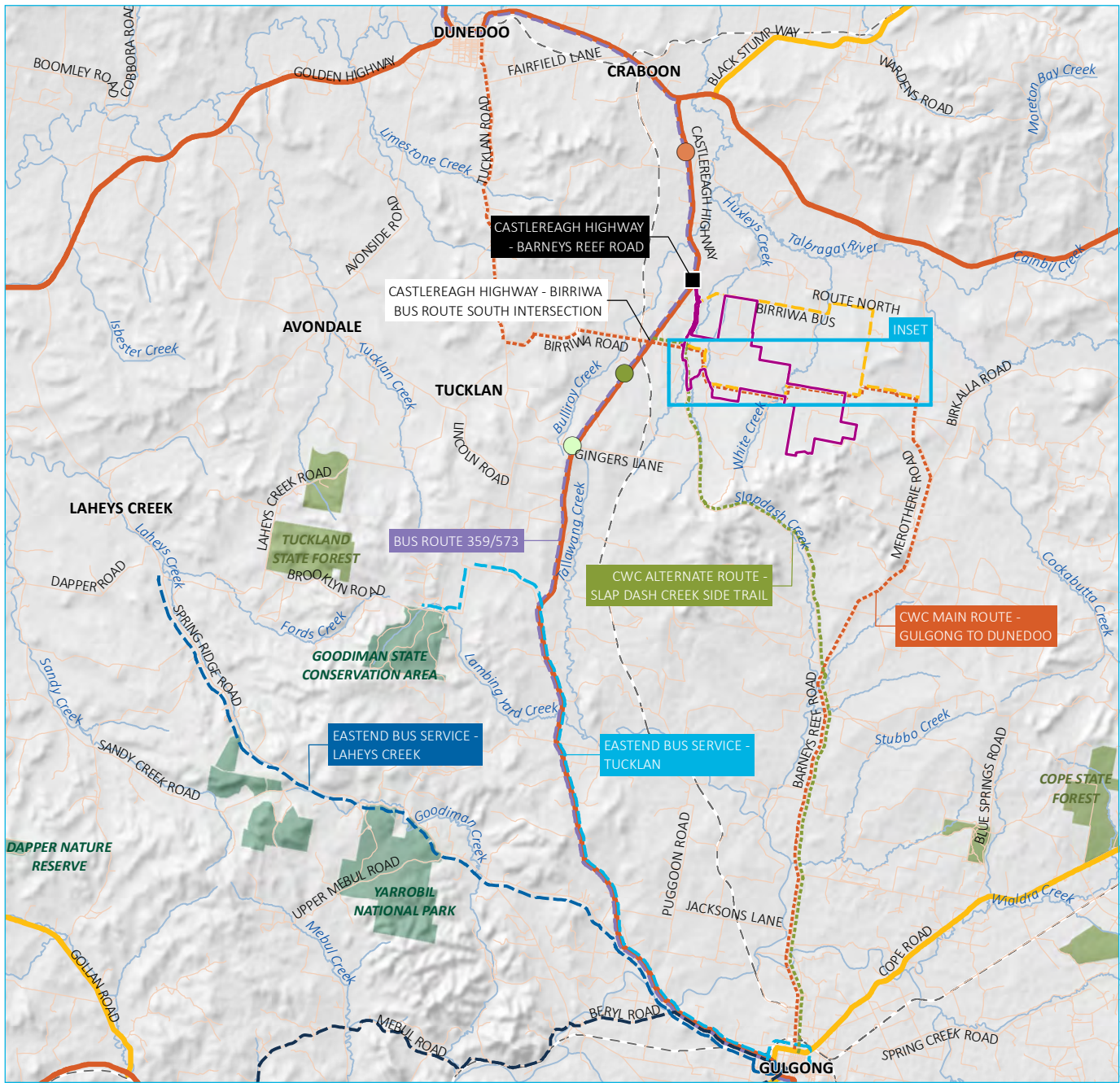
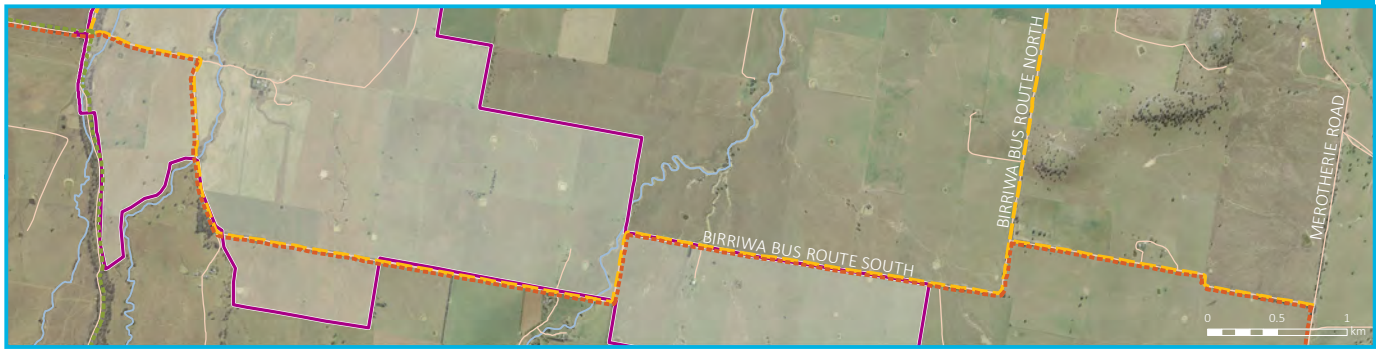
### 3.1 Road network

The NSW administrative road hierarchy comprises the following road classifications, which align with the generic road hierarchy as follows:

- state roads – freeways and primary arterials (TfNSW managed);
- regional roads – secondary or sub arterials (council managed and part funded by the State); and
- local roads – collector and local access roads (council managed).

Key roads in the vicinity of the project include the Castlereagh Highway, Barneys Reef Road and Birriwa Bus Route South which are shown in Figure 3.1. Road geometry descriptions for each of the roads are provided in Table 3.1 to Table 3.3.





Source: EMM (2022); ACEN (2022); DFSI (2017); GA (2011); ASGC (2006)

KEY		
Study area	Degree of crash (site vicinity only)	Bus route - public
Rail line	Serious Injury	Bus route 359/573
Named watercourse	Minor/Other Injury	Eastend Bus Service - school
NPWS reserve	Non-casualty (towaway)	Goolma
State forest	NSW classified road	Laheys Creek
Intersection assessed in the TIA	State road	Tucklan
	Regional road	Hodgson's Bus Service - school
	Local road	Dunedoo (approximate route)
		Central West Cycle (CWC) trail
		CWC main route - Gulgong to Dunedoo
		CWC alternate route - Slap Dash Creek side trail

Road network and traffic characteristics

Birriwa Solar and Battery Project  
Traffic Impact Assessment  
Figure 3.1



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**Table 3.1**      **Castlereagh Highway**

Aspect	Description
Road classification and connectivity	State road starting from Great Western Highway in Lithgow to Carnarvon Highway in St George, Queensland
Alignment	Generally north-south
Number of lanes	One lane each way
Carriageway type	Sealed road
Carriageway width	Approximately 7 m at its intersection with Barneys Reef Road and 6.2 m at its intersection with Birriwa Bus Route South, with 1 m wide shoulders on both sides
Posted speed limit	80 km/h at intersection with Birriwa Bus Route South; 100 km/h at intersection with Barneys Reef Road
Heavy vehicle access	Approved for 26 m B-doubles
Traffic function	Provides connection between townships



**Plate 3.1**      **Castlereagh Highway looking north from Barneys Reef Road**



**Table 3.2 Barneys Reef Road**

Aspect	Description
Road classification and connectivity	Local road between the Castlereagh Highway in Birriwa and Tallawang Street in Gulgong
Alignment	Generally north-south
Number of lanes	One lane each way in its section between Castlereagh Highway and Birriwa Bus Route South
Carriageway type	Sealed road for the first 80 m from the Castlereagh Highway and south of Merotherie Road; unsealed for the rest of the route
Carriageway width	Approximately 6 m wide
Speed limit	Default speed limit of 100 km/h however drive to conditions
Heavy vehicle access	Approved for heavy vehicles up to 19 m long under 50 tonnes
Traffic function	Carries local traffic
Additional comments	Some localised drainage issues



**Plate 3.2 Barneys Reef Road looking east from Castlereagh Highway**

Barneys Reef Road will be the primary access road providing a link from Castlereagh Highway to the site. The road generally runs south from Castlereagh Highway. The first 80 m of Barneys Reef Road from Castlereagh Highway is bitumen, and the remainder of the route is dirt/rubble. Gradient of the road is flat and suitable for heavy vehicle access. There are three culverts along the route towards the study area. Surface overflow was observed during the site visit at approximately 1.6 km from Castlereagh Highway. There are two cross intersections along the route, one with Birriwa Bus Route North and one with Birriwa Bus Route South. Barneys Reef Road will be used by all vehicles during both the construction and operational phases of the project.

**Table 3.3** Birriwa Bus Route South

Aspect	Description
Road classification and connectivity	Local road between the Castlereagh Highway and Merotherie Road
Alignment	Generally east-west
Number of lanes	One lane each way
Carriageway type	Unsealed road
Carriageway width	Approximately 5 m wide
Speed limit	Default speed limit is currently 100 km/h
Heavy vehicle access	Approved for heavy vehicles up to 19 m long under 50 tonnes
Traffic function	Carries local traffic



**Plate 3.3** Birriwa Bus Route South looking east from Castlereagh Highway

### 3.2 Key intersections

Castlereagh Highway/Barneys Reef Road has been assessed as a key intersection for project related traffic impacts as this intersection will be used by all construction and operational traffic. Castlereagh Highway/Birriwa Bus Route South is the other intersection in the vicinity. The location of the intersections is shown in Figure 3.1. Intersection geometry details are presented in Table 3.4 and Table 3.5 and intersection aerial views in Plate 3.4 and Plate 3.5.

**Table 3.4**      **Castlereagh Highway/Barneys Reef Road intersection**

Aspect	Description
Location from the site	Approximately 2.5 km north of the site
Intersection control	Priority control (give-way) intersection
Major Road	Castlereagh Highway
North Approach	One lane on approach and one lane on departure
South Approach	One lane on approach and one lane on departure
East Approach	One lane on approach and one lane on departure
Pedestrian Connectivity	No pedestrian connectivity provided on any approach
Traffic function	Predominantly carries regional traffic
Speed limit	100 km/hour along Castlereagh Highway
Additional comments	The intersection has wide geometry and complies with current Basic Right Turn (BAR) and Basic Left Turn (BAL) standards



Source: Google maps

**Plate 3.4**      **Castlereagh Highway/Barneys Reef Road intersection**



**Table 3.5**      **Castlereagh Highway/Birriwa Bus Route South intersection**

Aspect	Description
Location from the site	Approximately 1.3 km west of the site
Intersection control	Priority control (give-way) intersection
Major Road	Castlereagh Highway
North Approach	One lane on approach and one lane on departure
South Approach	One lane on approach and one lane on departure
East Approach	One lane on approach and one lane on departure
Pedestrian Connectivity	No pedestrian connectivity provided on any approach
Traffic function	Predominantly carries regional traffic
Speed limit	100 km/hour along Castlereagh Highway
Additional comments	The intersection has narrow geometry and does not comply with current BAR and BAL standards



Source: Google maps

**Plate 3.5**      **Castlereagh Highway/Birriwa Bus Route South intersection**

### 3.3 Existing traffic volumes

The Castlereagh Highway/Barneys Reef Road and Castlereagh Highway/Birriwa Bus Route South intersections have been surveyed between 7.00 am and 9.00 am, as well as between 4.00 pm and 6.00 pm, from 7 to 9 December 2021. The count data is provided in Appendix A.

The survey results indicate that the peak hours are:

- Castlereagh Highway/Barneys Reef Road;
  - AM peak hour: 8.00 am to 9.00 am; and
  - PM peak hour: 4.00 pm to 5.00 pm;
- Castlereagh Highway/Birriwa Bus Route South;
  - AM peak hour: 8.00 am to 9.00 am; and
  - PM peak hour: 4.15 pm to 5.15 pm.

The surveyed traffic volumes during the AM and PM peak hours are summarised in Figure 3.2.

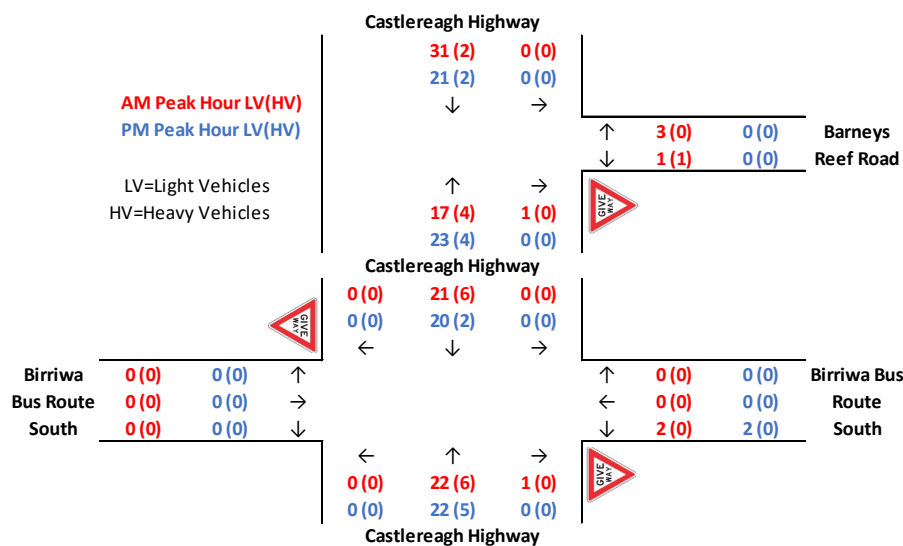


Figure 3.2 Existing AM and PM peak hourly traffic volumes

## 3.4 Crash analysis

Crash data from TfNSW Centre for Road Safety interactive history database for the last five years between 2016 and 2020 (<https://roadsafety.transport.nsw.gov.au/statistics/interactivecrashstats/index.html>) has been studied in the vicinity of the site and is presented in Figure 3.1.

The crashes are categorised based on the severity of the crashes as follows:

- fatal;
- serious injury;
- moderate injury;
- minor/other injury; or
- non-casualty (eg towaway).

There were three crashes in the vicinity of the site on Castlereagh Highway. The nearest crash occurred in 2016 on Castlereagh Highway 1.5 km south of Birriwa Bus Route South. The crash resulted in minor/other injury and involved trucks.

There were no fatal incidents. This overall crash rate is considered low over the 5 year period, which indicates there are no current road safety issues affecting the identified access roads for the project.

## 3.5 Public transport

### 3.5.1 Buses

There are NSW TrainLink coach services which travel along Castlereagh Highway. The coach services operate between Lithgow to Coonabarabran and vice versa and between Lithgow to Baradine and vice versa.

Several school bus routes operate along Castlereagh Highway which are operated by Eastend Bus Service. School bus routes for Goolma, Laheys Creek and Tucklan travel along the southern part of Castlereagh Highway originating from Gulgong.

Hodgen's Bus Service (Dunedoo) operates a service along Barneys Reef Road, Birriwa Bus Route South and Birriwa Bus Route North providing student transport to local schools in Dunedoo.

Public transport and school bus routes are presented in Figure 3.1.

### 3.5.2 Trains

There are no train stations in close proximity of the study area. The Gwabegar railway line which has a level crossing on Castlereagh Highway near Birriwa is not in use by passenger trains but is occasionally used by freight trains.

## 3.6 Active transport

The site passes through<sup>1</sup> Central West Cycling Trail (CWCT). This cycling trail is 400 km long which generally follows quiet tracks, away from the traffic. Birriwa forms part of the Gulgong to Dunedoo track which is approximately 50 km to 60 km long.

<sup>1</sup> <https://centralwestcycletrail.com.au/>

The cycle trail overlaps Castlereagh Highway for a short section between Birriwa Bus Route South and Birriwa Road. There are two routes at the vicinity of the site. The main and alternative cycle trail routes are shown in Figure 3.1.

The entire length of Birriwa Bus Route South between its intersection with the Castlereagh Highway to the west and Merotherie Road to the east forms part of this cycling trail. The main cycle trail route is via Birriwa Bus Route South, east of Barneys Reef Road which traverse through study area, predominantly along the periphery.

The alternative route of the cycle trail intersects with the project access route only at the Barneys Reef Road and Birriwa Bus Route South intersection which predominantly follows Slapdash Creek to the south.

As the haulage route intersects with this cycling trail, consultation is ongoing with CWCT. Appropriate mitigation measures and driver awareness eg appropriate signposting is discussed in Chapter 6 to ensure safety of recreational cyclists.

There are no pedestrian facilities in the vicinity of the study area due to the rural nature of the area.

### 3.7 Parking

There are no formal parking facilities in the vicinity of the study area given the rural nature of the area.



## 4 Assessment method and assumptions

### 4.1 Construction

#### 4.1.1 Duration and hours

The construction phase of the project is expected to take up to 28 months from the commencement of site establishment works, including completion of the substation and BESS.

The construction of the project will generally include the following overlapping stages:

- road upgrades;
- site establishment;
- construction (including temporary construction ancillary facilities);
- BESS and substation installation; and
- commissioning and testing.

Construction activities will be undertaken during construction hours as follows:

- 7.00 am to 6.00 pm Monday to Friday;
- 8.00 am to 6.00 pm on Saturdays; and
- no works on Sundays or public holidays.

Out of hours work and extended construction hours may be required on limited occasions such as for special deliveries to minimise road traffic disruption, or in the case of emergencies. The Secretary, Mid-Western Regional Council and surrounding landholders will be notified of any foreseeable exceptions.

#### 4.1.2 Workforce

The construction workforce will comprise of up to 600 full time equivalent staff increasing to a maximum of 800 if the BESS construction occurs at the same time. Out of the peak construction workforce of 800, it is expected that approximately 200 will be unskilled labour and 600 will be skilled labour.

### 4.1.3 Vehicles and equipment

Construction vehicles and equipment required for the construction of the project will include:

- cranes;
- rollers;
- dump truck;
- concrete truck;
- excavators;
- forklifts;
- grader;
- compactor;
- pile driver;
- water truck; and
- cable trencher and layer.

### 4.1.4 Traffic generation

Construction traffic for the project will consist of light vehicles transporting construction staff, heavy vehicles for various construction activities and over size over mass (OSOM) vehicles for deliveries of transformers and other major equipment.

Construction staff are usually expected to arrive at the site before commencement of any construction activities hence there would be minimal overlap during peak hours between construction light and heavy vehicles. It is anticipated that construction workers will be sourced from Mudgee, Gulgong, Dunedoo, Dubbo, other areas of NSW and outside of NSW. It is also expected that construction workers from other areas of NSW and outside of NSW will be residing in temporary accommodation in Mudgee and Gulgong, or any other town in the region. Existing or proposed accommodation villages, such as the Ulan Village Green at Ulan Mine or the Valley of the Winds Wind Farm workers facility (if approved) may be used if capacity is available at the time of construction of the project.

Construction staff will be arriving to the site in a combination of light vehicles and shuttle buses. Shuttle buses will be provided for construction workers from Mudgee and Gulgong. It is expected that there will be a 50/50 split between light vehicles and shuttle buses for construction staff arriving from Mudgee and Gulgong (which is likely to include construction staff from other areas of NSW temporarily accommodated in Mudgee and Gulgong or other regional towns). Construction staff from Dunedoo and Dubbo are expected to arrive via light vehicles only. It is assumed that shuttle buses would have a seating capacity for 20 staff and there will be 1.5 persons travelling per light vehicle. Details of construction staff source locations and light vehicle and shuttle bus splits are presented in Table 4.1. Details of daily and peak hourly construction vehicle trips are presented in Table 4.2. Shuttle buses are not considered in the daily heavy vehicle movements.

During the peak stages of construction, there will be up to 135 heavy vehicle trips per day. Heavy vehicle trips will be spread throughout the construction hours during the day. It is assumed that up to 10% of heavy vehicle trips will occur during the peak hour.

A total of 40 OSOM<sup>2</sup> vehicle trips are expected to take place during the 28 month construction period. There will be a maximum of 1 OSOM vehicle delivery (round trip) per day.

**Table 4.1** Estimated construction staff source locations and light vehicle and shuttle bus splits

Workforce Sourcing Assumptions	Workforce	% Total workforce	Travelling by Light vehicles	Travelling by Shuttle buses
MWRC LGA (Gulgong/Mudgee)	160	20%	80	80
Warrumbungle LGA (Dunedoo)	80	10%	80	-
Dubbo Regional Council LGA (Dubbo)	200	25%	200	-
Other areas of NSW	280	35%	140	140
Outside of NSW	80	10%	40	40
<b>Total workforce</b>	<b>800</b>	<b>100%</b>	<b>540</b>	<b>260</b>

**Table 4.2** Daily and peak hourly construction trips

Peak construction stage	Daily		Peak hour	
	Trips <sup>1</sup>	Movements	Trips	Movements
Light vehicles	360	720	360	360 <sup>2</sup>
Shuttle buses	13	26	13	13 <sup>2</sup>
Heavy vehicles	120	240	14	28
<b>Total</b>	<b>493</b>	<b>986</b>	<b>387</b>	<b>401</b>

Note:

<sup>1</sup> A 'trip' is defined as a vehicle entering the site once (1 movement) and a vehicle exiting the site once (1 movement).

<sup>2</sup> Light vehicle and shuttle bus movements will be incoming during morning and outgoing during evening peak hours.

## 4.2 Operation

The project will operate 24 hours per day, 7 days per week, 365 days per year. The operational lifespan of the project will be at least 30 years. Throughout operations a workforce of up to 20 people will be required. It is anticipated that the facility will require regular maintenance throughout its operational life. Regular light vehicle access will be required throughout operations, however, is not anticipated to exceed approximately 20 light vehicles per day. Heavy vehicles may be required occasionally for replacing larger components of project infrastructure including inverters, transformers or components of the BESS.

Based on the above, the operational traffic generation will be significantly lower than during project construction. Hence operational traffic impacts have not been considered as part of this TIA report.

<sup>2</sup> Exempt OSOM vehicles as defined by Heavy Vehicle National Law 'Multi-State Class 1 Load Carrying Vehicle Dimension Exemption Notice 2020 (No.1)', Special Vehicles and Restricted Access Vehicles are excluded from the definition of OSOM for the purpose of the quantity of OSOM approved. These will be considered as heavy vehicle movements.

### 4.3 Traffic distribution

As per Table 4.1, it is expected that 65% of the light vehicle traffic will be coming from the south (Mudgee and Gulgong) and the remaining 35% from the north (Dunedoo and Dubbo). All shuttle buses will be coming from the south (Mudgee and Gulgong). Heavy vehicle component deliveries will come from the ports of Newcastle and Sydney. From Newcastle they will come via the Golden Highway and from Sydney via Castlereagh Highway. It is also expected that around 75% of all heavy vehicle movements will be to/from Newcastle and the remaining 25% to/from Sydney.

The expected project traffic volumes during the AM and PM peak hours are summarised in Figure 4.1.

The combined existing + project traffic volumes are presented in Figure 4.2.

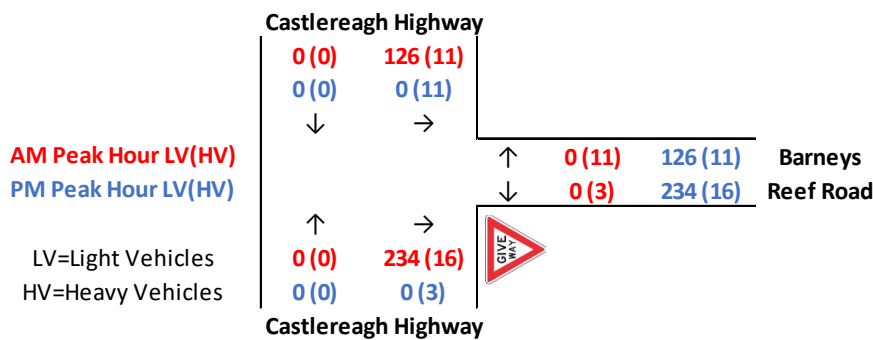


Figure 4.1 Project AM and PM peak hourly traffic volumes

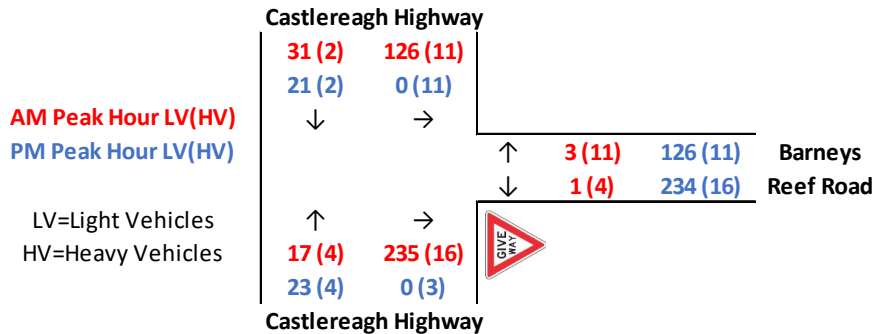


Figure 4.2 Existing + project AM & PM peak hourly traffic volumes

### 4.4 Nearby development traffic

Development in vicinity of the project has the potential to generate cumulative traffic impacts with the project. The greatest potential for cumulative impacts of future projects and the project in relation to traffic are associated with construction of the Tallawang Solar Farm (SSD-23700028) and Barneys Reef Wind (SSD-24106966) which have the potential to have construction periods that overlap with the project.

Detailed construction traffic forecasts for the two projects were not publicly available at the time of writing of this report. Preliminary forecasts for their likely peak construction traffic movements have been estimated by EMM from the publicly available scoping reports for Tallawang Solar Farm (Umwelt Australia Pty Ltd, 2021) and Barneys Reef Wind Farm (Umwelt Australia Pty Ltd, 2021) available from NSW Planning Portal (<https://www.planningportal.nsw.gov.au/>) as summarised below.

#### 4.4.1 EnergyCo CWO REZ infrastructure and Candidate Foundation Generators

Timing and location of the CWO REZ infrastructure such as transmission line and the Merotherie Energy Hub are likely to generate cumulative impacts with the project.

At the time of finalisation of this EIS, ACEN's Birriwa Solar and Battery project, as well as other generation projects in the region, had recently been shortlisted as Candidate Foundation Generators (CFG). Other third-party projects mentioned in this report below were also shortlisted as CFGs. EnergyCo has offered to work collaboratively with CFGs to provide certainty around assumptions and manage whole-of-REZ issues such as cumulative impacts on roads and traffic. On-going discussions commenced between EnergyCo and CFGs at the end of June 2022 and are expected to continue following lodgement of this EIS. Should any relevant information affect the assessment of this report, ACEN will revise its assessment prior to determination of the Birriwa Solar and Battery project.

#### 4.4.2 Golden Highway and New England Highway upgrade projects

It is understood that there will be upgrades along the Golden Highway and New England Highway. The Golden Highway will be upgraded between Mudies Creek at Whittingham and Putty Road at Mount Thorley to improve safety, freight efficiency and flood immunity. New England Highway will be upgraded between Belford and the Golden Highway to provide two travel lanes in each direction and a flyover for vehicles turning right from the Golden Highway towards Maitland and Newcastle.

Consultation with TfNSW regarding OSOM and heavy vehicle movements will be undertaken before construction by the OSOM vehicle operators and construction contractor. Where the project traffic accessibility is affected by major road works in progress on the Golden Highway and New England Highway, TfNSW will be consulted regarding changes to the project traffic accessibility along the route.

#### 4.4.3 Tallawang Solar Farm

According to publicly available information at the time of lodgement of the EIS, the construction period for Tallawang Solar Farm is expected to be 34 months with estimated construction employment of 430 personnel. Trucks to Tallawang Solar Farm will be travelling from the port of Newcastle along the Golden Highway to the Castlereagh Highway before turning onto Gingers Lane. Other deliveries will take place along the same route via the Golden Highway and Castlereagh Highway, using the southern access point to the solar farm site near Laheys Creek Road, directly off the Castlereagh Highway. Three alternative access points to the proposed solar farm site are proposed from Puggoon Road.

Construction traffic for Tallawang Solar Farm have been estimated by EMM based on similar solar farm developments in the region presented in Table 4.3. Construction traffic estimates for Tallawang Solar Farm are presented in Table 4.5. Should significantly higher traffic estimates be released for Tallawang Solar Farm prior to determination of the Birriwa Solar and Battery project, ACEN will revise its assessment accordingly.

**Table 4.3** Similar solar farm developments

Solar Development	Capacity	Workforce	Light vehicle trips per day	Heavy vehicle trips per day	Light vehicle trips per hour	Heavy vehicle trips per hour	% Heavy vehicle trips during peak hour
Wellington North Solar Farm	300 MW	400	66	68	66	19	28%
Sundown Solar Farm	360 MW	500	200	112	160	20	18%
Stubbo Solar Farm	400 MW	400	230	60	230	6	10%
Birriwa Solar Farm	600 MW	800	360	133	360	25	19%

#### 4.4.4 Barneys Reef Wind Farm

The construction period for Barneys Reef Wind Farm is expected to be 28 months with peak construction period expected in months 7–14. The wind farm will have an estimated construction employment of 340 personnel. Access to Barneys Reef Wind farm will be provided via two potential access points on Merotherie Road from the Golden Highway and via Gingers Lane from the Castlereagh Highway. Gingers Lane is expected to provide access for the delivery of the battery storage system and substations with both the access points providing access for turbine component delivery.

Construction traffic estimates for Barneys Reef Wind Farm have been made based on similar wind farm developments in the region presented in Table 4.4. Construction traffic is assumed to be split 50/50 between the Merotherie Road and Gingers Lane access points. Construction traffic estimates for Barneys Reef Wind Farm are presented in Table 4.5.

**Table 4.4** Similar wind farm developments

Wind Development	Capacity	Workforce	Light vehicle trips per day	Heavy vehicle trips per day	Light vehicle trips per hour	Heavy vehicle trips per hour	% Heavy vehicle trips during peak hour
Uungula Wind Farm	97 wind turbines	250	400	96	200	21	22%
White Rock Wind Farm	119 wind turbines	100	60	182	-	-	-
Sapphire Wind Farm	159 wind turbines	150	50	200	50	30	15%

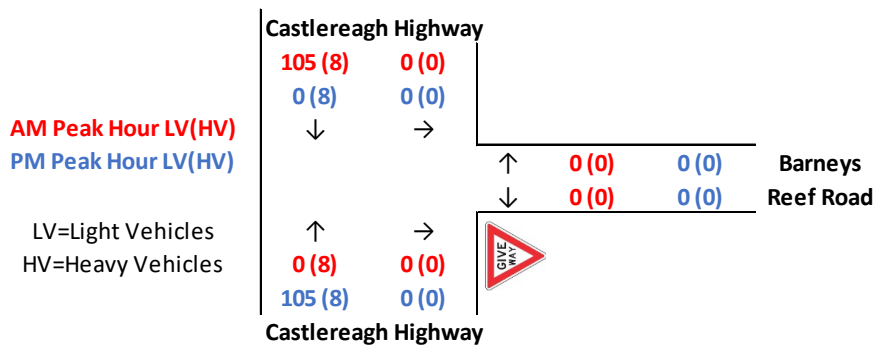
**Table 4.5** Nearby development traffic

Construction traffic	Tallawang Solar Farm	Barneys Reef Wind Farm
Light vehicle trips per day	300	30
Heavy vehicle trips per day	65	80
Light vehicle trips peak hour	300	30
Heavy vehicle trips peak hour	10	12

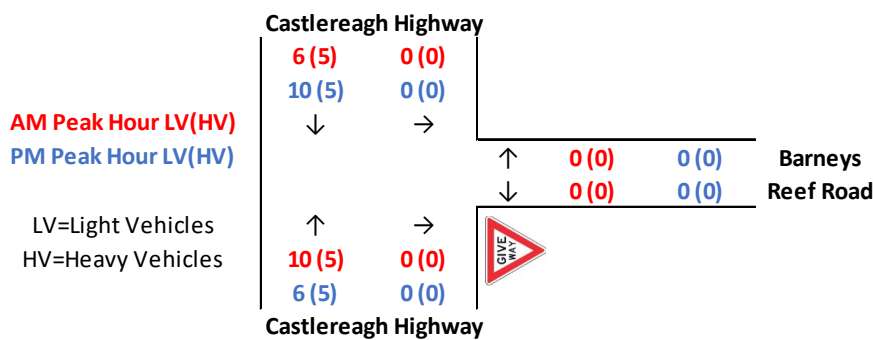
Traffic distributions for each of these projects is assumed to be the same as for the project. This means a 35/65 north/south split for light vehicle traffic and a 75/25 north/south split for heavy vehicles.

The forecast proportion of OSOM vehicle movements in comparison to other heavy vehicle movements for these two projects is not known but is likely to be low in terms of peak hourly traffic movements.

The estimated traffic volumes during the AM and PM peak hours for Tallawang Solar Farm and Barneys Reef Wind Farm are summarised in Figure 4.3 and Figure 4.4 respectively.



**Figure 4.3** Tallawang Solar Farm AM and PM peak hourly traffic volumes



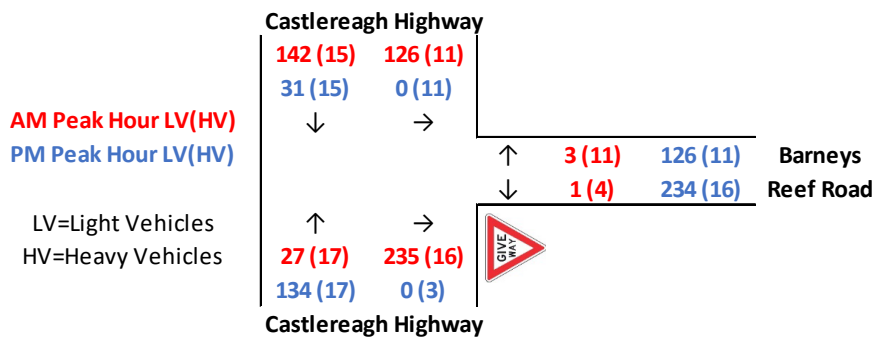
**Figure 4.4** Barneys Reef Wind Farm AM and PM peak hourly traffic volumes



## 4.5 Cumulative traffic

Tallawang Solar Farm and Barneys Reef Wind Farm projects are expected to require increased heavy vehicle movements during construction. In particular it is expected that heavy and light vehicle movements will use the Castlereagh Highway, and the intersection between Castlereagh Highway and Barneys Reef Road, therefore there is potential for cumulative traffic impacts at this intersection.

The cumulative traffic volume estimates, which are the summation of: existing traffic volumes (Figure 3.2); project traffic volumes (Figure 4.1); Tallawang Solar Farm traffic volumes (Figure 4.3); and Barneys Reef Wind Farm traffic volumes (Figure 4.4) are presented in Figure 4.5, at the key assessed intersection, which is Castlereagh Highway/ Barneys Reef Road.



**Figure 4.5 Cumulative AM and PM peak hourly traffic volumes**

The cumulative traffic volumes in this section present a worst-case scenario where the peak construction stages of the two other identified developments are assumed to overlap with peak construction period of the project.

The scoping reports for Tallawang Solar Farm and Barneys Reef Wind Farm do not specify the construction start and end months/year of their respective developments. Currently, there is no publicly available information regarding their construction schedules.

The assessment conducted and outlined in Section 5 of this report, particularly the warrants for intersection upgrade, have been based on project traffic volumes and cumulative traffic volumes. Any upgrade requirements based on cumulative traffic volumes should be revisited once detailed information is available on the construction timelines of Tallawang Solar Farm and Barneys Reef Wind Farm projects.

## 4.6 Parking requirements

During construction, worker vehicles will park at the temporary laydown area (where a construction compound will be located). No cars will park along Barneys Reef Road, Birriwa Bus Route South or Castlereagh Highway.

## 5 Impact assessment

### 5.1 Access route options assessment

Three options which were considered for the access route into the development footprint are shown in Figure 5.1. The three options, key inputs into the assessment process, the selected option and reasons for the selection are outlined in Table 5.1.

**Table 5.1 Project access route selection**

Options considered:	<ul style="list-style-type: none"> <li>Option 1: via Barneys Reef Road (two-way)</li> <li>Option 2: via Birriwa Bus Route South (two-way)</li> <li>Option 3: entry via Barneys Reef Road and exit via Birriwa Bus Route South (one-way clockwise circulation)</li> </ul>
Key inputs:	<ul style="list-style-type: none"> <li>Review of land use and land ownership</li> <li>Traffic survey and inspection of existing road infrastructure</li> <li>Biodiversity field survey</li> <li>Consultation with Mid-Western Regional Council and Warrumbungle Shire Council</li> <li>Consultation with the Central West Cycle Trail committee</li> <li>Consultation with the community, especially residents of the Birriwa and Merotherie localities</li> </ul>
<b>Selected option:</b>	<b>Option 1: via Barneys Reef Road (two-way)</b>
Key reasons for selection:	<p>Option 1 was selected for a range of reasons, notably:</p> <ul style="list-style-type: none"> <li>it was the preferred route for Mid-Western Regional Council and there was no objection from Warrumbungle Shire Council – the owner/operators of the roads;</li> <li>the alignment of Barneys Reef Road (Option 1) provides good sight distance and the grade is relatively flat;</li> <li>there are vertical alignment issues on Birriwa Bus Route South (Option 2 and Option 3), which would be a concern for sight distances and heavy vehicle use;</li> <li>the road widening and upgrades required are significantly lower for Barneys Reef Road (Option 1) compared with Birriwa Bus Route South (Option 2);</li> <li>a major intersection upgrade would be required for Option 2 at the Castlereagh Highway, with associated short-term disruption of a major road during construction;</li> <li>there are social impact concerns associated with Option 3, including potential increased travel time and safety concerns associated with a one-way system; and</li> <li>there are greater impacts on the Central West Cycle Trail associated with Option 2 and Option 3.</li> </ul>

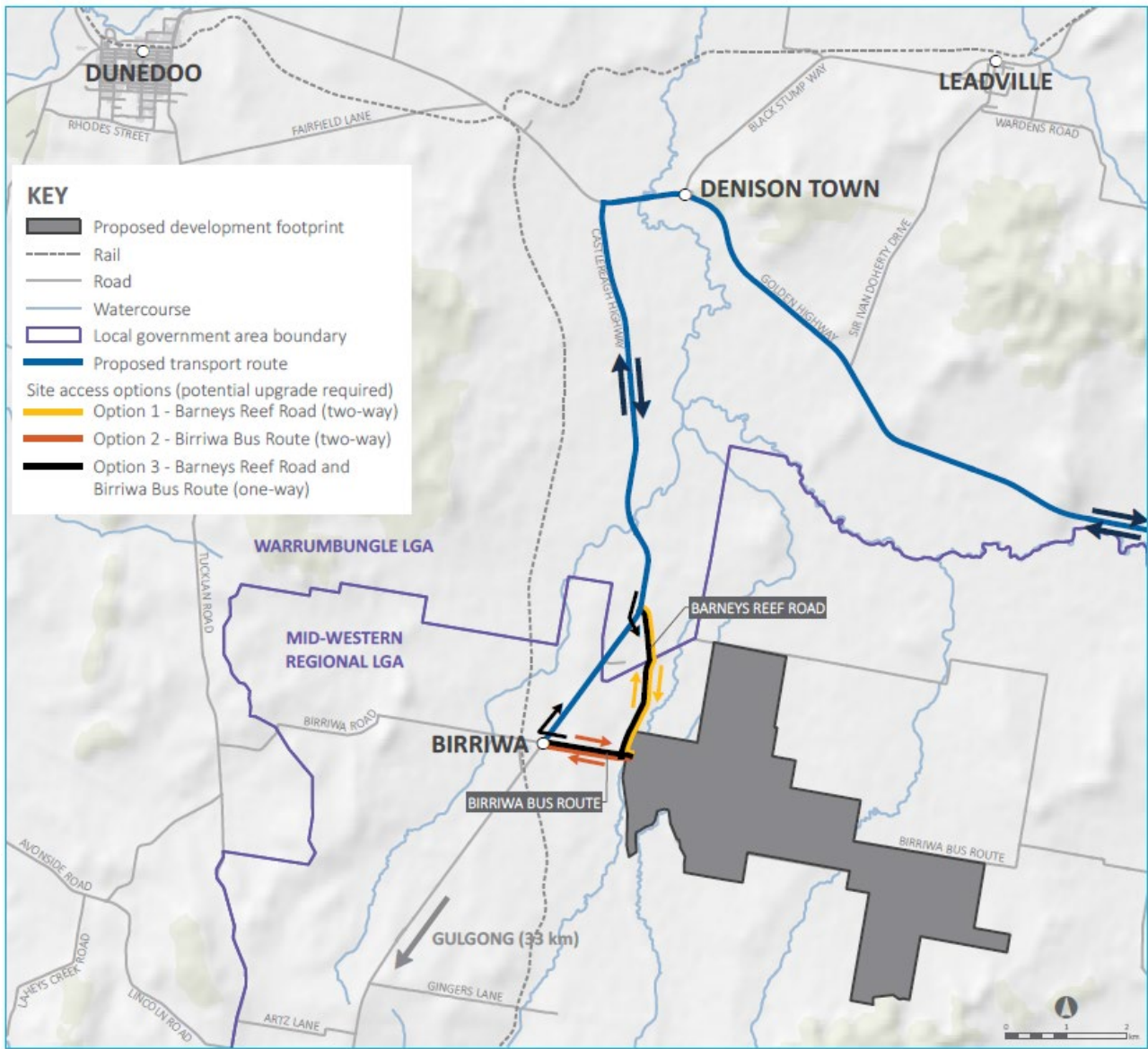


Figure 5.1 Access route options assessment

## 5.2 Intersection performance

The key intersection has been modelled with the SIDRA Intersection 9.0 software; a micro-analytical tool for individual intersections and linked intersection-network modelling. The modelling is based on the cumulative traffic volumes presented in Figure 4.5. SIDRA provides the following performance indicators:

- Degree of saturation (DOS) – the total usage of the intersection expressed as a factor of 1 with 1 representing 100% use/saturation (eg 0.8 = 80% saturation). In practice the target degrees of saturation of 0.90 for signals, 0.85 for roundabouts and 0.80 for unsignalised intersections are generally agreed to. These are usually called ‘practical degrees of saturation’.
- Average delay (DEL) – the average delay in seconds encountered by all vehicles passing through the intersection. It is often important to review the average delay of each approach as a side road could have a long delay time, while the large free flowing major traffic will provide an overall low average delay.
- Level of service (LOS) – this is a categorisation of average delay, intended for simple reference.
- 95% queue lengths (Q95) – is defined to be the queue length in metres that has only a 5% probability of being exceeded during the analysed time period. It transforms the average delay into measurable distance units.

The LOS is a good indicator of overall performance for individual intersections, with each level summarised in Table 5.2.

**Table 5.2** Intersection LOS standards

Level of service	Average delay (seconds per vehicle)	Traffic signals, roundabout	Priority intersection (‘Stop’ and ‘Give Way’)
A	<14	Good operation	Good operations
B	15 to 28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operating near capacity	Near capacity and accident study required
E	57 to 70	At capacity. At traffic signals, incidents will cause extensive delays. Roundabouts require other control mode.	At capacity; required other control mode
F	>71	Unsatisfactory with excessive queuing	Unsatisfactory with excessive queuing; required other control mode

Source: RTA Guide to Traffic Generating Development (RTA 2002)

SIDRA modelling for the key intersection has been conducted for the following scenarios:

- Existing – surveyed traffic volumes only.
- Existing + project – combined surveyed and project traffic volumes.
- Cumulative – includes combined existing, project and nearby development traffic.

SIDRA results are provided in Table 5.3.

**Table 5.3 SIDRA modelling result for Castlereagh Highway/Barneys Reef Road intersection**

Control/ scenarios	AM peak					PM Peak				
	Intersection volume	DEL(s)	LOS	DOS	Q95 in m (approach)	Intersection volume	DEL(s)	LOS	DOS	Q95 in m (approach)
Existing	61	5.9	A	0.018	0.11 (east approach)	54	5.6	A	0.016	0.0
Existing + project	461	9.6	A	0.181	6.8 (south approach)	451	6.9	A	0.278	9.7 east approach)
Cumulative	608	11.5	A	0.219	8.6 (south approach)	598	7.1	A	0.301	10.4 (east approach)

Key findings:

- in AM and PM, the intersection performs satisfactorily within capacity with LOS A and DoS < 0.3 for all scenarios; and
- in the highest traffic (cumulative impacts) scenario, the intersection still has approximately 70% additional capacity after accommodating the additional traffic generated by all the proposed project development considered herein.

The details of the intersection results are attached in Appendix B.

### 5.3 Mid-block capacity analysis

The mid-block level of service on rural and urban roads is assessed based on a vehicle’s average travel speed. At low traffic volumes and under ideal conditions, drivers are able to travel at their desired speed without interference. As traffic volumes increase, and as roadway, terrain and traffic conditions become less than ideal, drivers are affected by the presence of other vehicles on the road and bunches form in the traffic stream.

For this project, the Castlereagh Highway has been assessed as part of the major road network. The posted speed limit along the Castlereagh Highway is 100 km/h near Barneys Reef Road.

Table 4.5 of the *Guide to Traffic Generating Developments* (RTA 2002) provides the two-way hourly traffic capacities (ie number of vehicles per hour) for two-lane roads for different LOS with a design speed of 100 km/h based on different terrain types. The capacities assume 60% of traffic is travelling in one direction and 40% is travelling in the other direction.

The capacities for each LOS transition (ie the combined number of vehicles travelling in both directions at which the LOS decreases) are provided in Table 5.4.

**Table 5.4 Roadway hourly capacity for a two-lane two-way rural road (100 km/h speed limit) (RTA 2002)**

Terrain	Level of service transition	Effect of percentage of heavy vehicles (in traffic flow)			
		0%	5%	10%	15%
Level	A or B	630	590	560	530
	C	1,030	970	920	870
	D	1,630	1,550	1,480	1,410
	E	2,630	2,500	2,390	2,290

In the existing scenario (Figure 3.2) two-way traffic volumes for the Castlereagh Highway are less than 100 vehicles per hour in both the AM and PM peaks. Hence, the Castlereagh Highway is expected to operate at LOS B or better during existing scenario.

In the existing + project scenario (Figure 4.2) two-way traffic volumes for the Castlereagh Highway are approximately 450 vehicles per hour with 10% heavy vehicles in both the AM and PM peaks. Hence, the Castlereagh Highway is expected to operate at LOS B generally during the existing + project traffic scenario.

In the cumulative scenario (Figure 4.5) two-way traffic volumes for the Castlereagh Highway are approximately 600 vehicles per hour with 12% heavy vehicles in both the AM and PM peaks. Hence, the Castlereagh Highway is expected to operate at LOS C during the cumulative construction traffic scenario.

Overall, the Castlereagh Highway as part of the major road network will still be able to efficiently cater for the additional vehicular traffic generated by the proposed project and other nearby developments.

## 5.4 Road safety assessment for Castlereagh Highway and Barneys Reef Road

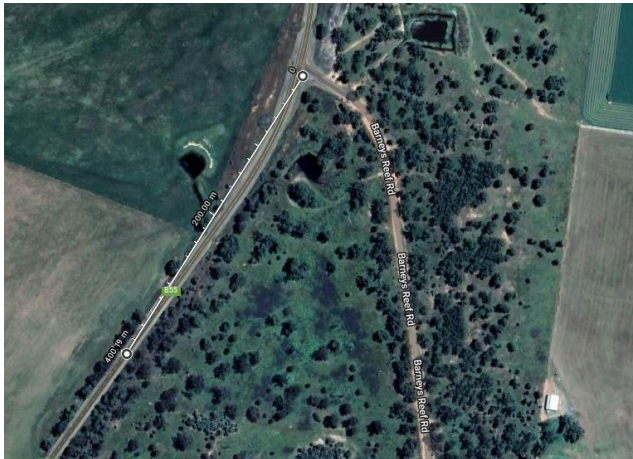
In accordance with *Austrroads Guide to Road Design Part 4A (Unsignalised and Signalised Intersections)* (Austrroads, 2017), all unsignalized T-intersections need to have clear visibility between the through traffic travelling on the major road and the turning traffic exiting from the minor road, so that the turning traffic can observe gaps to turn safely to merge with the major road traffic. This visibility measurement is called sight distance.

This is assessed in further detail below, in terms of the safe intersection sight distance (SISD) at the intersection, which varies according to the design speed of the road. Normally a design speed 10 km/h higher than the posted speed limit is used to calculate the SISD.

The Castlereagh Highway has a speed limit of 100km/h near the Barneys Reef Road intersection and therefore a presumed design speed of 110 km/hr is considered. In accordance with Austrroads (2017), for a road with a design speed of 110 km/h, the minimum SISD required for a general minimum 2 second driver reaction time is 285 m.

The sight distances on Barneys Reef Road at Castlereagh Highway have been estimated based on the line of sight, as shown in Plate 5.1. Based on the sight distance analysis, the sight distances to the left (400 m) and to the right (850 m) meet the minimum requirement (285 m) as stipulated in Austrroads (2017).





Sight distance to the left (400 m)

Sight distance to the right (850 m)

**Plate 5.1 Sight distance from Barney's Reef Road**

**5.5 Warrants for basic, auxiliary and channelised turn treatments**

Intersection operations are assessed from a combination of the peak hourly through and turning traffic movements that occur at each intersection. There are several types of turning lanes/turn treatments at an intersection such as basic, auxiliary lane and channelised which are described as follows:

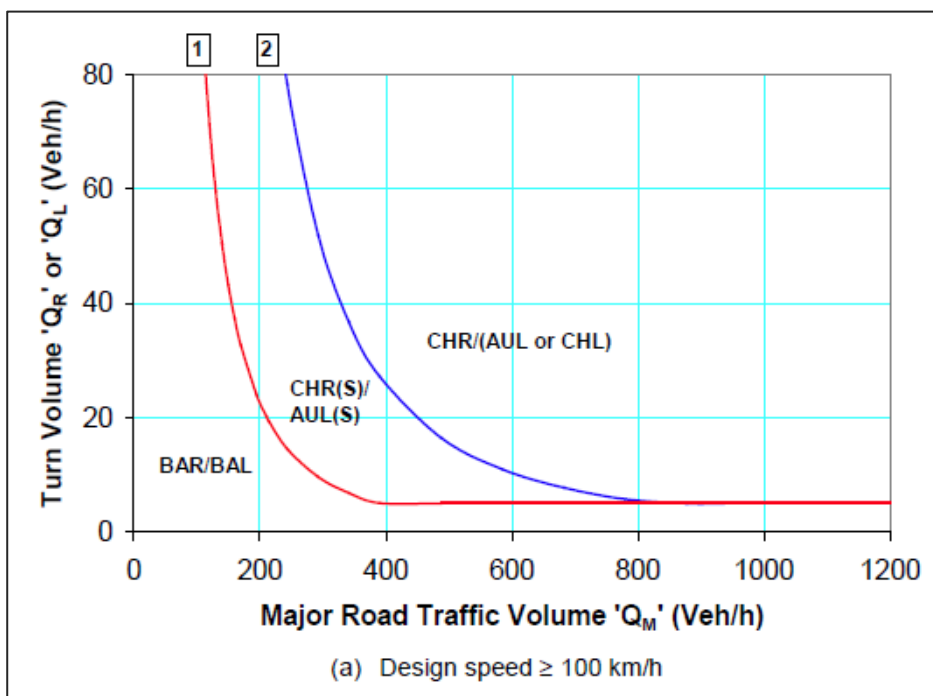
- a basic turn treatment (BAL/BAR) where turning vehicles may share the lane with through traffic movements;
- an auxiliary lane turn treatment (AUL/CHR(S)) where a separate lane is provided to enable the turn to be performed in an additional lane; and
- a channelised turn treatment (CHL/CHR) which provides a traffic island to enhance the safety of right-turning or left-turning vehicles.

The need for additional intersection turning lanes is determined in accordance with the current intersection design standards (Austroads, 2017) *Guide to Road Design Part 4, Intersections and Crossings General* (Figure A.10, Figure 5.2), where:

- curve 1 (red line) represents the boundary between a basic right turn (BAR) and a channelised short right turn (CHR(S)) treatment and between a basic left turn (BAL) and an auxiliary short left turn (AUL(S)) treatment; and
- curve 2 (blue line) represents the boundary between a CHR(S) and a full length CHR treatment and between an AUL(S) and a full length AUL or CHL treatment. The choice of CHL over an AUL will depend on factors such as the need to change the give way rule in favour of other manoeuvres at the intersection and the need to define more appropriately the driving path by reducing the area of bitumen surfacing.

TfNSW recommends that intersections should be designed for a travel speed 10 km/h greater than the posted speed limit. As the Castlereagh Highway has posted speed limit of 100 km/h, the intersection (including any requirements for turning bays) should be designed for 110 km/h.

Figure 5.2 below contains the graphs for the selection of turn treatments on roads with a design speed greater than or equal to 100 km/h which is appropriate for the Castlereagh Highway.



**Figure 5.2 Austroads warrant design charts for rural intersection turning lanes**

For a design speed greater than or equal to 100 km/h, the requirements for additional left or right turn traffic lanes are measured from Figure 5.2. The current configuration of the Castlereagh Highway/Barneys Reef Road intersection (shown in Plate 3.1) is a T-junction with BAR and BAL intersection turn treatment.

The intersection peak hourly turning traffic volumes for the warrant assessment for the existing, existing + project and cumulative traffic scenarios are summarised in Table 5.5 to Table 5.7 respectively. The existing scenario, existing + project scenario and cumulative scenario traffic volumes for the Castlereagh Highway/Barneys Reef Road intersection are also summarised graphically (Figure 5.3 to Figure 5.5).

Due to minimal existing turning traffic, no change is required for the existing intersection traffic left and right turning movements (Figure 5.3). However, in accordance with current design standards (Austrroads, 2017) the following turn treatments will be required for the project construction traffic access:

- the existing left lane turn treatment (BAL) (Figure 5.4) will continue to be adequate during existing and existing + project scenario for left turning traffic from the Castlereagh Highway southbound to Barneys Reef Road; and
- a channelised right turn treatment (CHR) (Figure 5.4) will be required for existing + project scenario for the right turning traffic from the Castlereagh Highway northbound to Barneys Reef Road.

**Table 5.5** Intersection turn treatment warrant for the Castlereagh Highway/Barneys Reef Road intersection for existing scenario

Movement	Peak hour	Major road traffic volume	Turning traffic volume	Turn treatment required
Left turn from major road	AM	33	0	BAL
	PM	23	0	BAL
Right turn from major road	AM	54	1	BAR
	PM	50	0	BAR

**Table 5.6** Intersection turn treatment warrant for the Castlereagh Highway/Barneys Reef Road intersection for existing + project scenario

Movement	Peak hour	Major road traffic volume	Turning traffic volume	Turn treatment required
Left turn from major road	AM	33	137	BAL
	PM	23	11	BAL
Right turn from major road	AM	191	251	CHR
	PM	61	3	BAR

**Table 5.7** Intersection turn treatment warrant for Castlereagh Highway/Barneys Reef Road intersection for cumulative scenario

Movement	Peak hour	Major road traffic volume	Turning traffic volume	Turn treatment required
Left turn from major road	AM	157	137	AUL
	PM	46	11	BAL
Right turn from major road	AM	338	251	CHR
	PM	208	3	BAR

From the cumulative traffic volumes assessment including the three projects considered herein, an auxiliary left lane turn treatment (AUL) (Figure 5.5) will also be required for left turning traffic from the Castlereagh Highway southbound to Barneys Reef Road.

However for the cumulative traffic (Figure 5.5) there will be no further change to the channelised right turn treatment (CHR) (Figure 5.5) that will be required for the existing + project traffic.

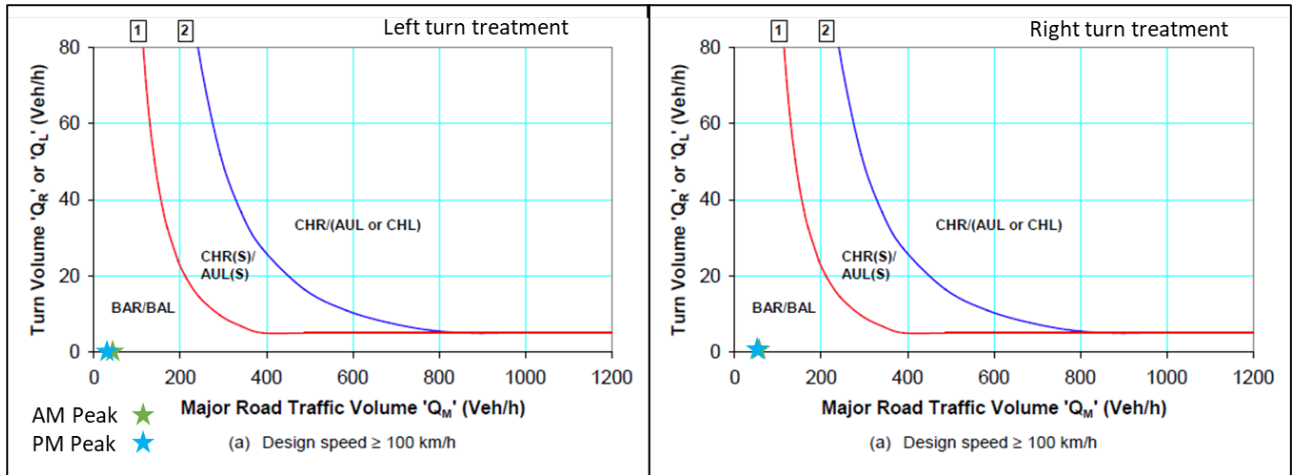


Figure 5.3 Austroads turn treatment warrant assessment for existing scenario

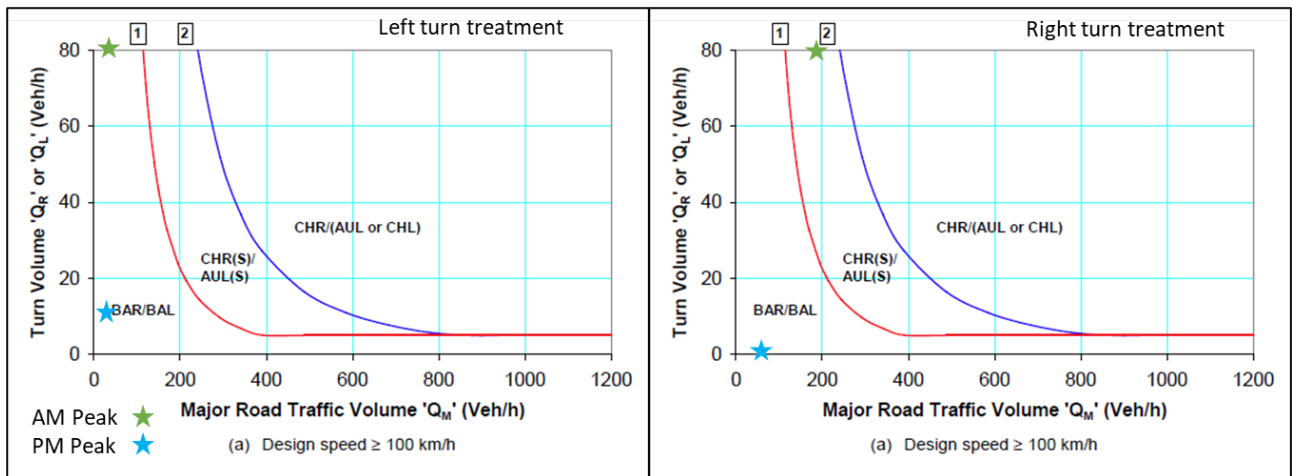


Figure 5.4 Austroads turn treatment warrant assessment for existing + project scenario



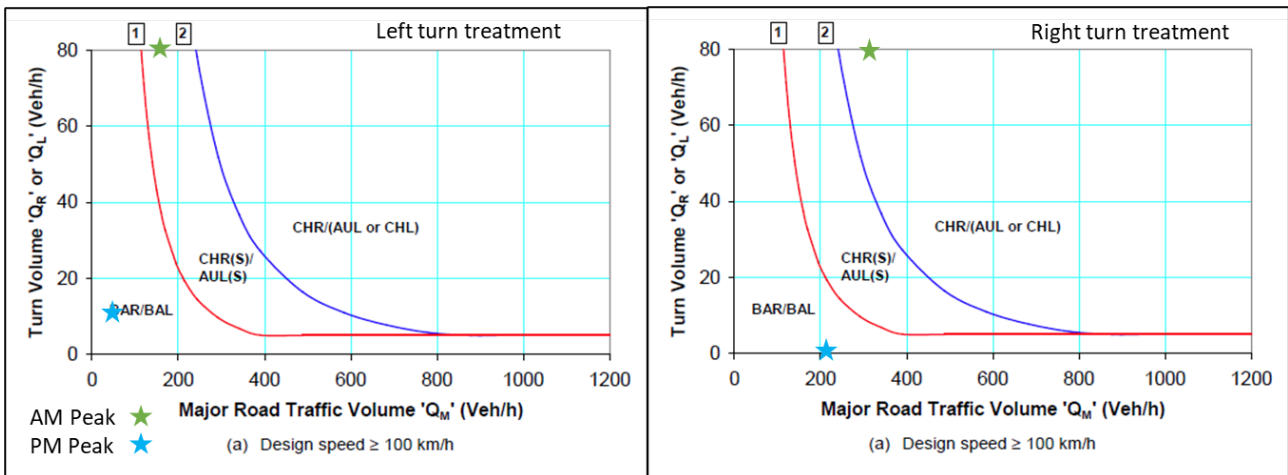


Figure 5.5 Austroads turn treatment warrant assessment for cumulative scenario

## 5.6 Road corridor upgrade

Australian Standard AS 2890.2 *parking facilities Part 2: Off-street commercial vehicle facilities* Table 3.1 (Australian Standard, 2018) provides circulation roadway widths for various commercial design vehicles. The two-way circulation roadway width required for a 26 m B-double is 6.5 m. The existing Barneys Reef Road and Birriwa Bus Route are generally less than 6.5 m wide along the site access route.

A concept plan has been prepared to widen the Barneys Reef Road and Birriwa Bus Route South along the project access route with a 9.2 m wide carriageway. The road carriageway consists of two 3.1 m sealed lanes, 0.5 m sealed shoulders and 1 m unsealed shoulders in accordance with *Austroads Guide to Road Design Part 3: Geometric Design* (Austroads, 2016) Table 4.5 single carriageway rural road widths for Average Annual Daily Traffic (AADT) of 500–1000. The concept plan is presented in Appendix C. This is the scenario assessed in the EIS. ACEN is continuing consultation with Mid-Western Regional Council and Warrumbungle Shire Council to refine the design within the development footprint of the concept plan. Should the refined design be significantly different, ie a narrower footprint, this assessment as well as other environmental assessment may be revised accordingly. However, the concept design is currently assessed as a worst-case scenario and there will be no increase of footprint proposed prior to determination of this project. Council’s traffic committee agreed on 17 June 2022 for the speed limit of Barneys Reef Road (Mid-Western Regional Council section) to be reduced to 80 km/hr (and potentially further for all construction traffic, to be defined in a Traffic Management Plan prior to road upgrades and project construction). This will allow to further refine and minimise the required upgrade works (including the footprint) along the road corridor.

## 5.7 Public road crossings

Public road crossings allow project-related vehicles to move across public road corridors and between parcels of land that form part of the development footprint. These crossings will reduce the impact of project-related vehicles on the local road network and maximise the use of the project’s internal road network during construction and operations. Up to three public road crossings will be provided within the development footprint. The locations of the public road crossings have been determined in consultation with Mid-Western Regional Council and have been indicatively located in areas to avoid vegetation impact or clearance. Mid-Western Regional Council informed ACEN that public road crossings design considerations were approved in a traffic committee on 17 June 2022.

## 5.8 Impact on rail corridor and railway crossings

The Gwabegar railway line is occasionally used by freight trains. There will be limited impact on the railway line due to low frequency of the trains. Railway crossing protection in terms of railway crossing signs and flashing lights are already present at the Castlereagh Highway railway crossing for construction traffic crossing during the construction period.

## 5.9 Impact on public transport, pedestrians and cyclists

There are school bus routes passing along Castlereagh Highway and Birriwa Bus Route South. The potential impacts on school buses associated with construction of the project will be limited to heavy vehicles only as construction staff travelling in light vehicles will be arriving and departing from the site outside of school bus operating hours. Potential impacts from heavy vehicles will be limited as the majority (75%) of the heavy vehicles will be travelling from north towards the project.

Mitigation measures to limit impacts on school buses and cyclists have been presented in Chapter 6 of this report.

As discussed in Section 3.5, there are no pedestrian facilities due to the rural location of this site. Hence, there will be no requirements for mitigation measures for traffic impacts on pedestrians.

## 5.10 Car and bus parking provision

Car and bus parking will be provided within the temporary laydown area (for either road upgrades or project construction) for the duration of the road upgrades and the construction period, which will be incorporated in detailed design.

## 6 Mitigation measures

### 6.1 Construction phase

The proposed traffic management mitigation measures for the construction phase of the project are outlined in Table 6.1.

**Table 6.1 Construction phase mitigation measures**

Requirement	Mitigation measure	Timing
Castlereagh Highway intersection upgrades	<p>Install a channelised right turn treatment (CHR) on the Castlereagh Highway at the Castlereagh Highway/Barneys Reef Road intersection northbound approach.</p> <p>Note an additional auxiliary left lane turn treatment (AUL) may also be required on the Castlereagh Highway at the Castlereagh Highway/Barneys Reef Road intersection southbound approach, if the timing of the project peak construction traffic also coincides with the cumulative construction traffic from other identified construction projects in the area (Tallawang Solar Farm and Barneys Reef Wind Farm).</p>	Pre-construction
Need for adequate road width on Barneys Reef Road and Birriwa Bus Route	Resurfacing and widening on Barneys Reef Road and Birriwa Bus Route South in compliance with Austroads rural roads design standards and in further consultation with relevant authorities during subsequent phases of project design and assessment.	Pre-construction
Worksite traffic control and confirmation of other management measures	<p>A detailed construction traffic management plan (CTMP) will be developed in consultation with TfNSW, Mid-Western Regional Council and Warrumbungle Shire Council to the satisfaction of the Secretary, prior to the commencement of road upgrades and construction of the project. The CTMP is expected to be required in the Development Consent and to include a Driver Code of Conduct addressing:</p> <ul style="list-style-type: none"> <li>informing drivers about the school bus routes along Castlereagh Highway;</li> <li>direction to avoid compression braking near residential receptors;</li> <li>direction to avoid heavy vehicle trips during school zone times (8.00 am–9.30 am and 2.30 pm–4.00 pm), where possible;</li> <li>in consultation with relevant councils and road authorities, install school bus signs at suitable locations along construction routes if necessary to warn heavy vehicle drivers of student drop-off and pick-up areas; and</li> <li>responding to local climate conditions that may affect road safety such as fog, dust and wet weather.</li> </ul> <p>The CTMP should be prepared by suitably qualified persons in accordance with the TfNSW 2022 <i>Traffic Control at Work Sites Manual</i>.</p>	Pre-construction

**Table 6.1 Construction phase mitigation measures**

Requirement	Mitigation measure	Timing
Cyclist safety along cycle trail	<p>If practicable, the portion of CWCT within the development footprint will be safely separated during the construction period onto an approximately 2 m dust lane in accordance with relevant cycling guidelines and standards and in consultation with community.</p> <p>In addition to the above following measures are to be considered:</p> <ul style="list-style-type: none"> <li>• in consultation with the CWC Trail Inc prepare a signage plan highlighting the CWC trail within and at the vicinity of the project;</li> <li>• within the site induction and driver’s code of conduct, ensure the CWC trails are highlighted to increase awareness of cyclists’ presence in the area; and</li> <li>• any site-specific circumstance eg peak construction activities, a traffic controller may be required to manage the vehicular traffic and cyclists which is subject to site supervisor’s safety assessment and discretion.</li> </ul>	Pre-construction
Road maintenance	A road maintenance program will be developed in consultation with the relevant road authorities to be undertaken during construction and will include route inspections of all the affected local roads. Any new road pavement damage which occurs to these roads during the project construction period from construction activities, which represent a potential traffic safety risk to the travelling public, will be restored to their pre-construction condition at the completion of construction.	Pre-construction and during construction
Access by oversize vehicles	Obtain a permit (from NHVR) to allow oversize or over-mass vehicles to use the road network as part of construction.	Pre-construction
Public road crossings (Birriwa Bus Route South)	ACEN will design up to three public road crossings to Mid-Western Regional Council’s satisfaction, generally in accordance with the design considerations approved at the traffic committee meeting on 17 June 2022.	Pre-construction or during construction

## 6.2 Operation phase

No material traffic impacts are expected during the operation phase. Accordingly, no mitigation measures are proposed for the operation phase. The speed limit along Barneys Reef Road (Mid-Western Regional Council) and Birriwa Bus Route South will remain at 80 km/hr.

## 6.3 Decommissioning phase

Limited traffic impacts are expected during the decommissioning phase as all mitigation measures proposed during construction stage will have been implemented. Accordingly, no additional mitigation measures are expected for the decommissioning phase.

# 7 Consultation

## 7.1 Consultations with councils

### 7.1.1 Mid-Western Regional Council

Discussions were held with Mid-Western Regional Council (MWRC) regarding access route selection and design consideration. A joint site inspection was held with MWRC in November 2021 to discuss issues relating to potential for road upgrades, treatment of roadside vegetation, road drainage, waterway crossing and intersection treatment. MWRC in its initial feedback agreed to consider access route option 1 amongst the proposed options (Section 5.1) as the preferred option. Option 1 required an Austroads design compliant 9.2 m wide cross-section plus drainage, consisting of 2 x 3.2 m lanes + 0.5 m sealed shoulder and 1 m unsealed shoulder. Further consultations were held with MWRC relating to response from Warrumbungle Shire Council (WSC), design discussions for road corridor width and public road crossings. MWRC provided feedback on the road corridor design widths suggesting mitigation measures such as reducing speed limit for construction traffic to reduce road corridor width and hence reduce impacts on roadside vegetation. It was agreed to have ongoing consultation to provide a refined design prior to determination of this SSD. MWRC in its traffic committee in June 2022 approved reduction of speed limit to 80 km/h along Barneys Reef Road and the design of public road crossings.

### 7.1.2 Warrumbungle Shire Council

ACEN provided WSC with access route option 1 to be the preferred option and the likely upgrades require upgrades within WSC. WSC acknowledged options and the work and consultation undertaken with MWRC. WSC agreed to align with any sensible and practical road upgrades requirements discussed with MWRC. ACEN had another meeting in July 2022 with WSC to discuss preliminary design and expected refinement of design prior to determination. WSC was satisfied with the approach and liaised with MWRC to understand the outcomes of June 2022 traffic committee.

## 7.2 Consultation with Central West Cycle Trail

CWC Trail Inc was provided a project update at the Dunedoo community information session in December 2021. The CWC Trail Inc committee members were concerned about potential impact of the project's construction traffic on cyclists along Birriwa Bus Route South. ACEN provided updates on access option selection at the Central West Cycle committee meeting in February 2022. The CWC Trail Inc preferred option 1 along Barneys Reef Road due to its fewer impacts on the CWCT. Concern regarding a lack of accommodation for cyclists was also raised, which may have a heavy impact on the CWCT. ACEN provided initial outcomes of the Social Impact Assessment and proposed mitigation measures that were generally accepted by the CWC Trail Inc. ACEN has committed to continuing consultation with the CWC Trail Inc.

## 7.3 Consultation with local residents

ACEN held a Gulgong and Dunedoo Community information sessions where a poster presented the 3 access options. ACEN representatives actively encouraged the attendants to have their say on the options. Option 1 along Barneys Reef Road was generally the preferred option due to better safety at intersection with Castlereagh Highway and impacts on nearby residents. Information regarding access options and preferred access route selection (option 1) has been continuously displayed at ACEN's Gulgong office. Residents at R5 had raised concerns with the use of Birriwa Bus Route South past their house during construction. ACEN indicated that no construction traffic will drive on this section of the public road. Instead, a network of internal roads will be used, with a limited number of public road crossings to access different portions of the development footprint.



## 8 Summary and conclusion

### 8.1 Summary

Construction of the project will take approximately 28 months. The construction workforce will average 600 people, increasing to approximately 800 people during the peak construction period. The operations workforce will typically consist of 20 people.

During the construction and operation phases, the Castlereagh Highway will be the main transport route. The site will be accessed via the existing Barneys Reef Road and Birriwa Bus Route South.

It is expected that approximately 65% of the construction workforce will travel from Gulgong and Mudgee, with the remaining 35% from Dunedoo and Dubbo. Approximately up to 493 peak daily and 387 peak hourly construction vehicle trips are anticipated. Construction vehicles include light vehicles and shuttle buses transporting staff, along with heavy vehicles for deliveries.

The impact of project-related vehicles on the key intersection of the Castlereagh Highway and Barneys Reef Road has been assessed. SIDRA modelling results showed that the LOS will remain A and have approximately 70% spare capacity to accommodate any additional traffic. Mid-block capacity along the Castlereagh Highway will be LOS C during the peak construction period including the vehicles from nearby developments. Sight distance towards the left and right at the Castlereagh Highway/Barneys Reef Road intersection currently meets the minimum requirement as stipulated in the Austroads Guide to Road Design.

Upgrades will be required to accommodate the increase in traffic associated with the construction phase. These upgrades will be applied to the Castlereagh Highway/Barneys Reef Road intersection and to Barneys Reef Road. The key issues and proposed mitigation measures which are likely to be required include:

- Absence of appropriate turning lane treatments at the Castlereagh Highway/Barneys Reef Road intersection. To address this, an Austroads Type CHR right turn treatment on the Castlereagh Highway at the Castlereagh Highway/Barneys Reef Road intersection will be required on the northbound approach. In addition, if there are cumulative traffic impacts with other construction projects in the area (Tallawang Solar Farm and Barneys Reef Wind Farm) an Austroads Type AUL left turn intersection treatment for southbound traffic may also be required.
- Insufficient road width along Barneys Reef Road and Birriwa Bus Route. To address this, road upgrading such as resurfacing and widening along Barneys Reef Road and Birriwa Bus Route South is required. A preliminary concept plan has been prepared in this regard (Appendix C), in consultation with Mid-Western Regional Council and Warrumbungle Shire Council. To minimise the required upgrade works (including the footprint) along this road corridor, it has been agreed with Council that speed limits will be reduced to 80 km/hr (for general traffic) along Barneys Reef Road.

Cyclists travelling along CWCT within the development footprint will be provided will be safely separated during the 2 year construction period onto an approximately 2 m dust lane in accordance with relevant cycling guidelines and standards and in consultation with community. Further safety measures such as appropriate signage and traffic controllers may also be considered.

It is recommended that a detailed CTMP including a Driver Code of Conduct is prepared prior to commencement of construction, which incorporates traffic measures to be implemented throughout the project's construction period. In the Driver Code of Conduct, school bus and cyclist safety should be highlighted within and at the vicinity of the site.

### 8.2 Conclusion

Assuming the recommendations outlined in Section 7 are implemented, the proposed development is not expected to have significant adverse impacts to the regional or local traffic or road networks.

## References

Australian Standard. (2018). *Parking facilities Part 2: Off-street commercial vehicle facilities.*

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Austrroads. (2017). *Guide to Road Design Part 4: Intersections and Crossings - General.*

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Umwelt Australia Pty Ltd. (2021). *BARNEYS REEF WIND FARM.* Scoping Report.

Umwelt Australia Pty Ltd. (2021). *TALLAWANG SOLAR FARM.* Scoping Report.

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# Appendix A

## Traffic survey data

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Castlereagh  
Highway/Barneys  
Reef Road

LV	North approach		South approach		East approach		HV	North approach		South approach		East approach				
	LT	TH	TH	RT	LT	RT		LT	TH	TH	RT	LT	RT			
7:00	0		4	2	0	0	0	6	7:00	0	0	0	0	0	0	0
7:15	0		5	2	0	1	0	8	7:15	0	0	1	0	0	0	1
7:30	1		4	1	0	0	0	6	7:30	0	0	0	0	0	0	0
7:45	0		1	3	0	1	1	6	7:45	0	1	2	0	0	0	3
8:00	0		4	3	0	1	0	8	8:00	0	0	2	0	1	0	3
8:15	0		6	4	0	0	2	12	8:15	0	1	0	0	0	0	1
8:30	0		9	6	0	0	1	16	8:30	0	0	1	0	0	0	1
8:45	0		12	4	1	0	0	17	8:45	0	1	1	0	0	0	2
4:00	0		7	6	0	0	0	13	4:00	0	0	0	0	0	0	0
4:15	0		6	8	0	0	0	14	4:15	0	1	1	0	0	0	2
4:30	0		4	5	0	0	0	9	4:30	0	1	1	0	0	0	2
4:45	0		4	4	0	0	0	8	4:45	0	0	2	0	0	0	2
5:00	1		3	5	0	0	1	10	5:00	0	0	0	0	0	0	0
5:15	0		1	5	0	0	1	7	5:15	0	2	0	0	0	0	2
5:30	0		2	0	0	0	0	2	5:30	0	0	2	0	0	0	2
5:45	0		2	3	0	0	0	5	5:45	0	0	2	0	0	0	2

LV	North approach		South approach		East approach		HV	North approach		South approach		East approach		Total			
	LT	TH	TH	RT	LT	RT		LT	TH	TH	RT	LT	RT				
7:00	1		14	8	0	2	1	26	7:00	0	1	3	0	0	0	4	30
7:15	1		14	9	0	3	1	28	7:15	0	1	5	0	1	0	7	35
7:30	1		15	11	0	2	3	32	7:30	0	2	4	0	1	0	7	39
7:45	0		20	16	0	2	4	42	7:45	0	2	5	0	1	0	8	50
<b>8:00</b>	<b>0</b>		<b>31</b>	<b>17</b>	<b>1</b>	<b>1</b>	<b>3</b>	<b>53</b>	<b>8:00</b>	<b>0</b>	<b>2</b>	<b>4</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>7</b>	<b>60</b>
<b>4:00</b>	<b>0</b>		<b>21</b>	<b>23</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>44</b>	<b>4:00</b>	<b>0</b>	<b>2</b>	<b>4</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>6</b>	<b>50</b>
4:15	1		17	22	0	0	1	41	4:15	0	2	4	0	0	0	6	47
4:30	1		12	19	0	0	2	34	4:30	0	3	3	0	0	0	6	40
4:45	1		10	14	0	0	2	27	4:45	0	2	4	0	0	0	6	33
5:00	1		8	13	0	0	2	24	5:00	0	2	4	0	0	0	6	30

Castlereagh  
Highway/Birriwa  
Bus Route South

LV	North approach		South approach		East approach		HV	North approach		South approach		East approach				
	LT	TH	TH	RT	LT	RT		LT	TH	TH	RT	LT	RT			
7:00	0		4	5	0	0	0	9	7:00	0	1	1	0	0	0	2
7:15	0		4	6	0	0	0	10	7:15	0	1	1	0	0	0	2
7:30	0		6	4	0	1	0	11	7:30	0	2	2	0	0	0	4
7:45	0		6	3	0	0	0	9	7:45	0	1	0	0	0	0	1
8:00	0		2	3	1	0	0	6	8:00	0	1	0	0	0	0	1
8:15	0		6	4	0	0	0	10	8:15	0	0	1	0	0	0	1
8:30	0		5	9	0	2	0	16	8:30	0	1	4	0	0	0	5
8:45	0		8	6	0	0	0	14	8:45	0	4	1	0	0	0	5
4:00	0		2	4	2	0	0	8	4:00	0	0	0	0	0	0	0
4:15	0		6	7	0	1	0	14	4:15	0	0	0	0	0	0	0
4:30	0		8	7	0	0	0	15	4:30	0	1	1	0	0	0	2
4:45	0		5	3	0	0	0	8	4:45	0	0	2	0	0	0	2
5:00	0		1	5	0	1	0	7	5:00	0	1	2	0	0	0	3
5:15	0		6	3	0	0	0	9	5:15	0	0	1	0	0	0	1
5:30	0		2	3	1	0	0	6	5:30	0	0	0	0	0	0	0
5:45	0		1	6	0	0	0	7	5:45	0	1	1	0	0	0	2

LV	North approach		South approach		East approach		HV	North approach		South approach		East approach		Total			
	LT	TH	TH	RT	LT	RT		LT	TH	TH	RT	LT	RT				
7:00	0		20	18	0	1	0	39	7:00	0	5	4	0	0	0	9	48
7:15	0		18	16	1	1	0	36	7:15	0	5	3	0	0	0	8	44
7:30	0		20	14	1	1	0	36	7:30	0	4	3	0	0	0	7	43
7:45	0		19	19	1	2	0	41	7:45	0	3	5	0	0	0	8	49
<b>8:00</b>	<b>0</b>		<b>21</b>	<b>22</b>	<b>1</b>	<b>2</b>	<b>0</b>	<b>46</b>	<b>8:00</b>	<b>0</b>	<b>6</b>	<b>6</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>12</b>	<b>58</b>
4:00	0		21	21	2	1	0	45	4:00	0	1	3	0	0	0	4	49
<b>4:15</b>	<b>0</b>		<b>20</b>	<b>22</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>44</b>	<b>4:15</b>	<b>0</b>	<b>2</b>	<b>5</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>7</b>	<b>51</b>
4:30	0		20	18	0	1	0	39	4:30	0	2	6	0	0	0	8	47
4:45	0		14	14	1	1	0	30	4:45	0	1	5	0	0	0	6	36
5:00	0		10	17	1	1	0	29	5:00	0	2	4	0	0	0	6	35

---

# Appendix B

## SIDRA results

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# MOVEMENT SUMMARY

Site: 101 [Castlereagh Highway/Barneys Reef Road intersection AM Peak (Site Folder: Existing)]

Site Category: (None)  
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV ] veh/h	[ Total veh/h	HV ] %				[ Veh. veh	Dist ] m				
South: Castlereagh Highway														
2	T1	21	4	21	19.0	0.013	0.0	LOS A	0.0	0.0	0.01	0.03	0.01	59.7
3	R2	1	0	1	0.0	0.013	5.5	LOS A	0.0	0.0	0.01	0.03	0.01	57.4
Approach		22	4	22	18.2	0.013	0.3	NA	0.0	0.0	0.01	0.03	0.01	59.5
East: Barneys Reef Road														
4	L2	2	1	2	50.0	0.004	6.3	LOS A	0.0	0.1	0.11	0.55	0.11	51.3
6	R2	3	0	3	0.0	0.004	5.6	LOS A	0.0	0.1	0.11	0.55	0.11	52.8
Approach		5	1	5	20.0	0.004	5.9	LOS A	0.0	0.1	0.11	0.55	0.11	52.2
North: Castlereagh Highway														
7	L2	1	0	1	0.0	0.018	5.5	LOS A	0.0	0.0	0.00	0.02	0.00	58.2
8	T1	33	2	33	6.1	0.018	0.0	LOS A	0.0	0.0	0.00	0.02	0.00	59.8
Approach		34	2	34	5.9	0.018	0.2	NA	0.0	0.0	0.00	0.02	0.00	59.8
All Vehicles		61	7	61	11.5	0.018	0.7	NA	0.0	0.1	0.01	0.07	0.01	59.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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# MOVEMENT SUMMARY

Site: 101 [Castlereagh Highway/Barneys Reef Road intersection PM Peak (Site Folder: Existing)]

Site Category: (None)  
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h ]	[ HV veh/h ]	[ Total veh/h ]	[ HV % ]				[ Veh. veh ]	[ Dist m ]				
South: Castlereagh Highway														
2	T1	27	4	27	14.8	0.016	0.0	LOS A	0.0	0.0	0.01	0.02	0.01	59.7
3	R2	1	0	1	0.0	0.016	5.5	LOS A	0.0	0.0	0.01	0.02	0.01	57.5
Approach		28	4	28	14.3	0.016	0.2	NA	0.0	0.0	0.01	0.02	0.01	59.7
East: Barneys Reef Road														
4	L2	1	0	1	0.0	0.001	5.6	LOS A	0.0	0.0	0.08	0.56	0.08	53.4
6	R2	1	0	1	0.0	0.001	5.6	LOS A	0.0	0.0	0.08	0.56	0.08	52.9
Approach		2	0	2	0.0	0.001	5.6	LOS A	0.0	0.0	0.08	0.56	0.08	53.1
North: Castlereagh Highway														
7	L2	1	0	1	0.0	0.013	5.5	LOS A	0.0	0.0	0.00	0.02	0.00	58.1
8	T1	23	2	23	8.7	0.013	0.0	LOS A	0.0	0.0	0.00	0.02	0.00	59.7
Approach		24	2	24	8.3	0.013	0.2	NA	0.0	0.0	0.00	0.02	0.00	59.7
All Vehicles		54	6	54	11.1	0.016	0.4	NA	0.0	0.0	0.01	0.04	0.01	59.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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# MOVEMENT SUMMARY

Site: 101 [Castlereagh Highway/Barneys Reef Road intersection AM Peak (Site Folder: Existing + project scenario)]

Site Category: (None)  
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h ]	[ HV veh/h ]	[ Total veh/h ]	[ HV % ]				[ Veh. veh ]	[ Dist m ]				
South: Castlereagh Highway														
2	T1	21	4	21	19.0	0.181	0.7	LOS A	0.9	6.8	0.32	0.55	0.32	54.4
3	R2	251	16	251	6.4	0.181	6.2	LOS A	0.9	6.8	0.32	0.55	0.32	52.2
Approach		272	20	272	7.4	0.181	5.8	NA	0.9	6.8	0.32	0.55	0.32	52.4
East: Barneys Reef Road														
4	L2	5	4	5	80.0	0.030	6.6	LOS A	0.1	1.1	0.18	0.61	0.18	48.8
6	R2	14	11	14	78.6	0.030	9.6	LOS A	0.1	1.1	0.18	0.61	0.18	48.2
Approach		19	15	19	78.9	0.030	8.8	LOS A	0.1	1.1	0.18	0.61	0.18	48.4
North: Castlereagh Highway														
7	L2	137	11	137	8.0	0.096	5.7	LOS A	0.0	0.0	0.00	0.47	0.00	54.1
8	T1	33	2	33	6.1	0.096	0.0	LOS A	0.0	0.0	0.00	0.47	0.00	55.9
Approach		170	13	170	7.6	0.096	4.6	NA	0.0	0.0	0.00	0.47	0.00	54.4
All Vehicles		461	48	461	10.4	0.181	5.4	NA	0.9	6.8	0.20	0.52	0.20	53.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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# MOVEMENT SUMMARY

Site: 101 [Castlereagh Highway/Barneys Reef Road intersection PM Peak (Site Folder: Existing + project scenario)]

Site Category: (None)  
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h ]	[ HV veh/h ]	[ Total veh/h ]	[ HV % ]				[ Veh. veh ]	[ Dist m ]				
South: Castlereagh Highway														
2	T1	27	4	27	14.8	0.019	0.0	LOS A	0.0	0.3	0.04	0.06	0.04	59.1
3	R2	3	3	3	100.0	0.019	6.9	LOS A	0.0	0.3	0.04	0.06	0.04	52.1
Approach		30	7	30	23.3	0.019	0.7	NA	0.0	0.3	0.04	0.06	0.04	58.3
East: Barneys Reef Road														
4	L2	250	16	250	6.4	0.278	5.7	LOS A	1.3	9.7	0.11	0.56	0.11	53.0
6	R2	137	11	137	8.0	0.278	5.9	LOS A	1.3	9.7	0.11	0.56	0.11	52.4
Approach		387	27	387	7.0	0.278	5.8	LOS A	1.3	9.7	0.11	0.56	0.11	52.8
North: Castlereagh Highway														
7	L2	11	11	11	100.0	0.023	6.7	LOS A	0.0	0.0	0.00	0.18	0.00	51.9
8	T1	23	2	23	8.7	0.023	0.0	LOS A	0.0	0.0	0.00	0.18	0.00	57.8
Approach		34	13	34	38.2	0.023	2.2	NA	0.0	0.0	0.00	0.18	0.00	55.7
All Vehicles		451	47	451	10.4	0.278	5.2	NA	1.3	9.7	0.09	0.50	0.09	53.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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# MOVEMENT SUMMARY

Site: 101 [Castlereagh Highway/Barneys Reef Road intersection AM Peak (Site Folder: Cumulative)]

Site Category: (None)  
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h ]	[ HV veh/h ]	[ Total veh/h ]	[ HV % ]				[ Veh. veh ]	[ Dist m ]				
South: Castlereagh Highway														
2	T1	44	17	44	38.6	0.219	1.3	LOS A	1.1	8.6	0.44	0.57	0.44	54.2
3	R2	251	16	251	6.4	0.219	6.8	LOS A	1.1	8.6	0.44	0.57	0.44	52.1
Approach		295	33	295	11.2	0.219	6.0	NA	1.1	8.6	0.44	0.57	0.44	52.4
East: Barneys Reef Road														
4	L2	5	4	5	80.0	0.037	7.4	LOS A	0.1	1.4	0.43	0.69	0.43	47.7
6	R2	14	11	14	78.6	0.037	11.5	LOS A	0.1	1.4	0.43	0.69	0.43	47.2
Approach		19	15	19	78.9	0.037	10.5	LOS A	0.1	1.4	0.43	0.69	0.43	47.3
North: Castlereagh Highway														
7	L2	137	11	137	8.0	0.164	5.7	LOS A	0.0	0.0	0.00	0.27	0.00	55.6
8	T1	157	15	157	9.6	0.164	0.0	LOS A	0.0	0.0	0.00	0.27	0.00	57.5
Approach		294	26	294	8.8	0.164	2.7	NA	0.0	0.0	0.00	0.27	0.00	56.6
All Vehicles		608	74	608	12.2	0.219	4.5	NA	1.1	8.6	0.23	0.43	0.23	54.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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# MOVEMENT SUMMARY

Site: 101 [Castlereagh Highway/Barneys Reef Road intersection PM Peak (Site Folder: Cumulative)]

Site Category: (None)  
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h ]	[ HV veh/h ]	[ Total veh/h ]	[ HV % ]				[ Veh. veh ]	[ Dist m ]				
South: Castlereagh Highway														
2	T1	151	17	151	11.3	0.087	0.0	LOS A	0.0	0.3	0.01	0.01	0.01	59.8
3	R2	3	3	3	100.0	0.087	7.1	LOS A	0.0	0.3	0.01	0.01	0.01	52.6
Approach		154	20	154	13.0	0.087	0.2	NA	0.0	0.3	0.01	0.01	0.01	59.6
East: Barneys Reef Road														
4	L2	250	16	250	6.4	0.301	5.8	LOS A	1.4	10.4	0.17	0.57	0.17	52.9
6	R2	137	11	137	8.0	0.301	6.8	LOS A	1.4	10.4	0.17	0.57	0.17	52.3
Approach		387	27	387	7.0	0.301	6.2	LOS A	1.4	10.4	0.17	0.57	0.17	52.6
North: Castlereagh Highway														
7	L2	11	11	11	100.0	0.039	6.7	LOS A	0.0	0.0	0.00	0.11	0.00	52.3
8	T1	46	15	46	32.6	0.039	0.0	LOS A	0.0	0.0	0.00	0.11	0.00	58.3
Approach		57	26	57	45.6	0.039	1.3	NA	0.0	0.0	0.00	0.11	0.00	57.0
All Vehicles		598	73	598	12.2	0.301	4.2	NA	1.4	10.4	0.11	0.38	0.11	54.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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# Appendix C

## Barneys Reef Road upgrade concept plan

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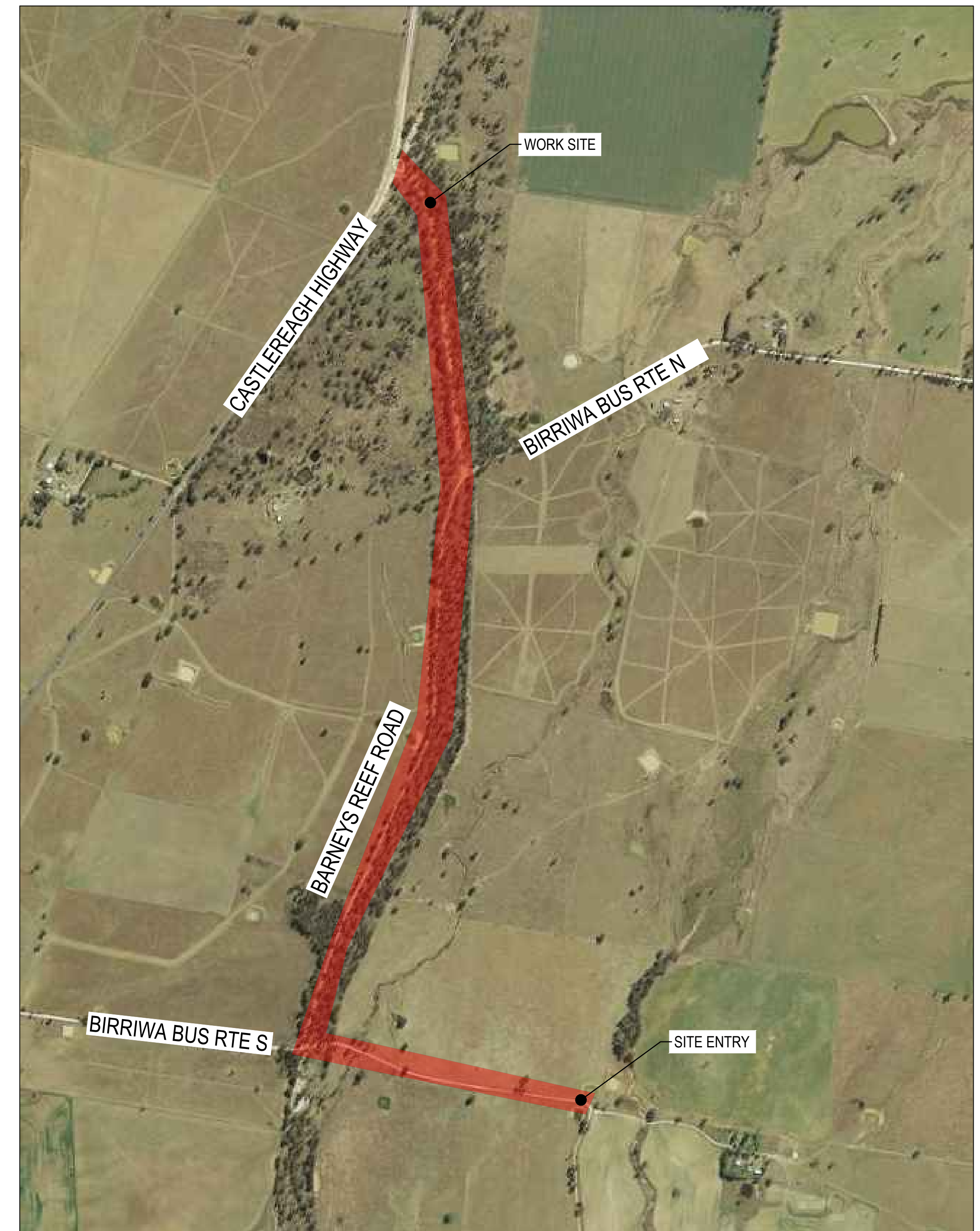
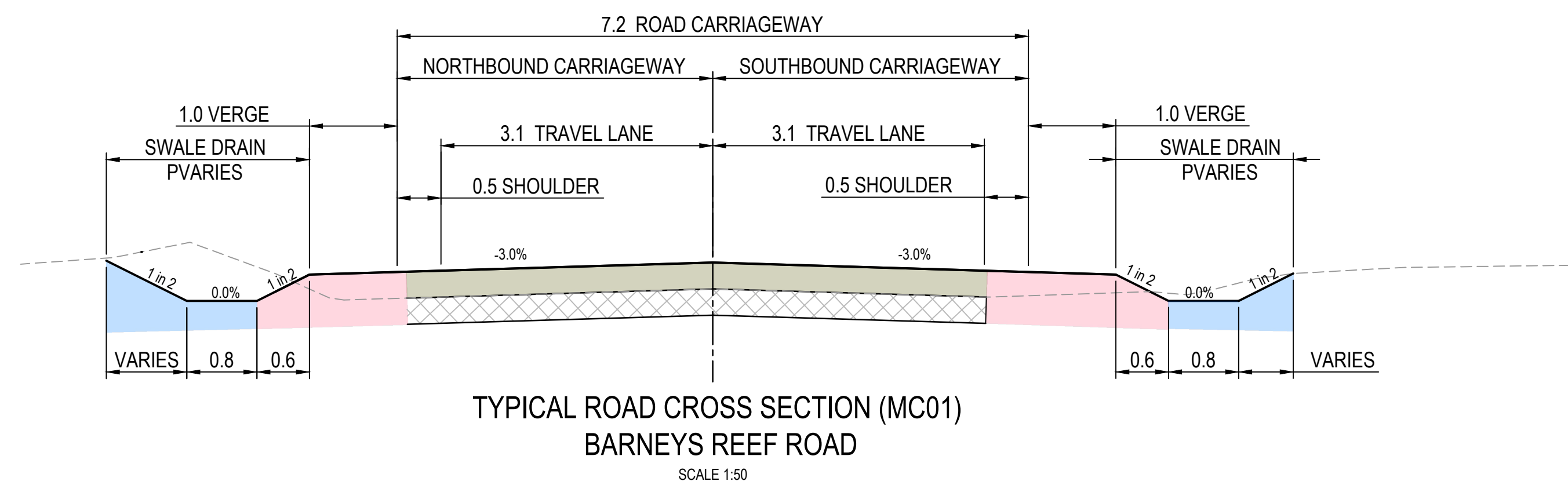
# UPC/AC RENEWABLES AUSTRALIA

## BARNEYS REEF ROAD UPGRADE

### CONCEPT DESIGN

DWG No.	DESCRIPTION	REV
C1.001	COVER SHEET AND DRAWING INDEX	P1
C1.002	GENERAL ARRANGMENT PLAN - SHEET 1 - MC01	P1
C1.003	GENERAL ARRANGMENT PLAN - SHEET 2 - MC01	P1
C1.004	GENERAL ARRANGMENT PLAN - SHEET 3 - MC01	P1
C1.005	GENERAL ARRANGMENT PLAN - SHEET 4 - MC01	P1
C1.006	GENERAL ARRANGMENT PLAN - SHEET 5 - MC02	P1
C1.007	GENERAL ARRANGMENT PLAN - SHEET 6 - MC02	P1

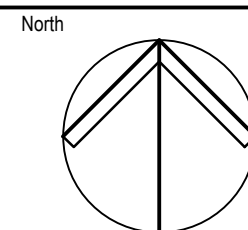
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	ROAD CONTROL LINE
	DESIGN ROADWAY
	EXISTING SURVEY
	EXISTING TREE
	EXISTING UNSEALED GRAVEL ROAD
	ROAD / DRIVEWAY CONTROL LABEL
	DESIGN CONTOURS - MAJOR
	DESIGN CONTOURS - MINOR
	EXISTING CONTOURS
	NEW STORMWATER PIPE AND HEADWALL



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Issue	Description	Date	Drawn	Approved
P1	PRELIMINARY ISSUE FOR DISCUSSION	13.04.22	UF	CG



Client  
**UPC/AC RENEWABLES AUSTRALIA**  
Suite 2, Level 2, Castray Esplanade  
Battery Point, TAS, 7004

UPC/AC Renewables AUSTRALIA



ENGINEERS | MANAGERS | INFRASTRUCTURE PLANNERS | DEVELOPMENT CONSULTANTS

**ACOR Consultants Pty Ltd**  
Unit 10, Level 1, No.1 Maitland Place  
Baulkham Hills NSW 2153  
T +61 2 9634 6311



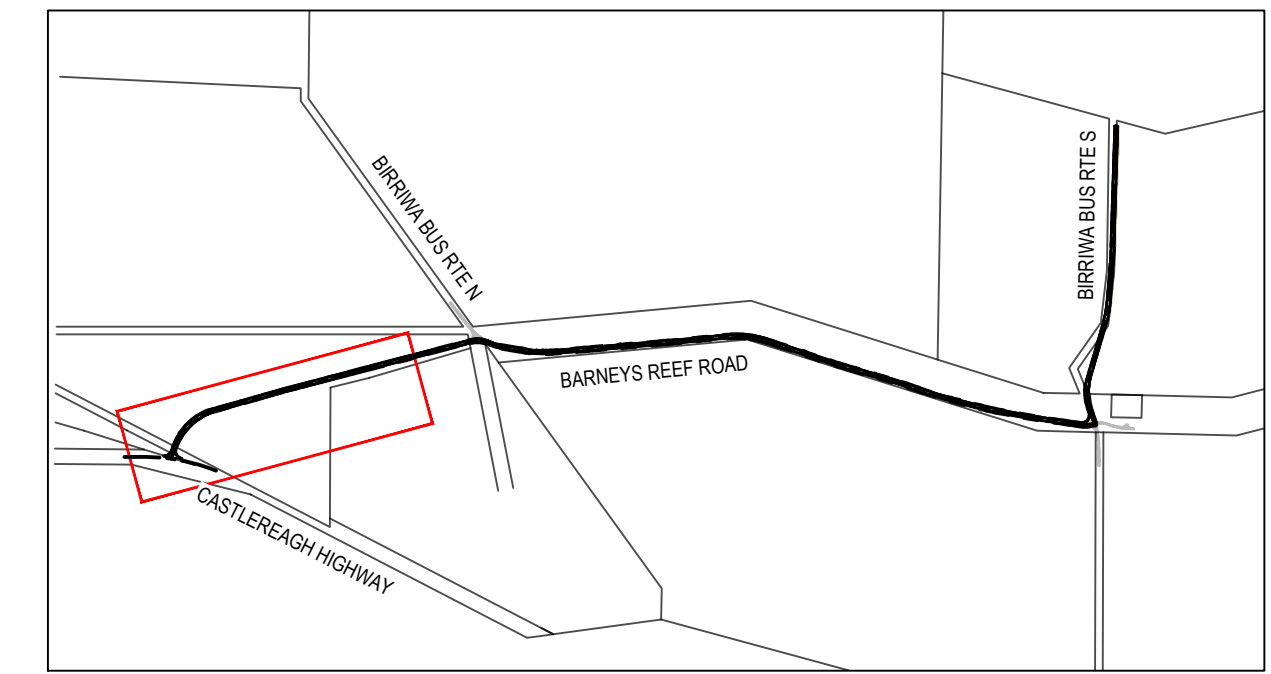
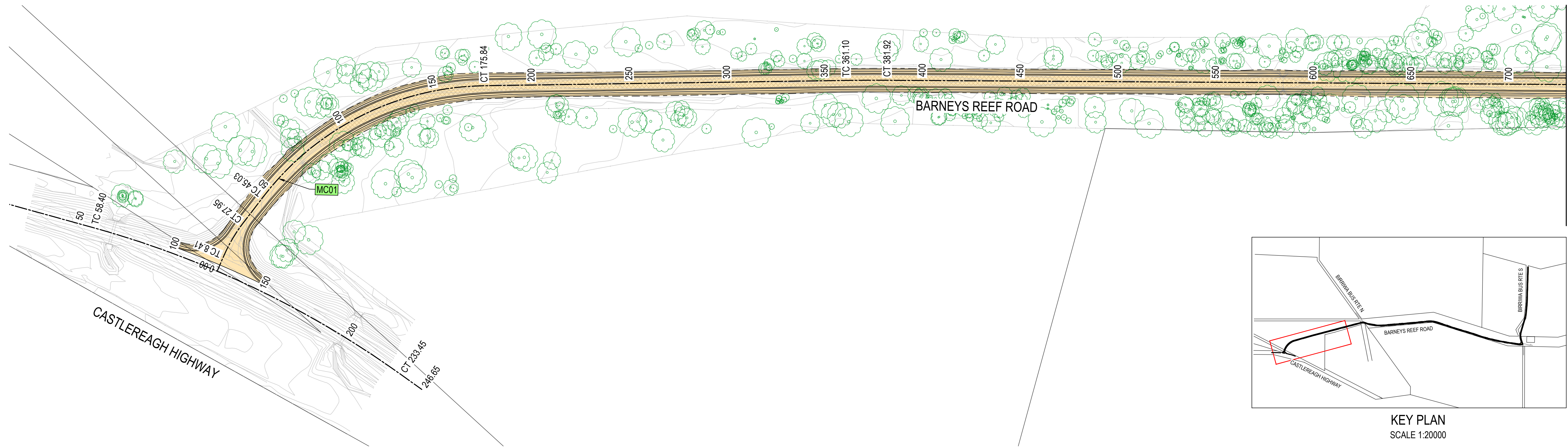
Project  
**BARNEYS REEF ROAD UPGRADE**  
**SOLAR FARM ACCESS**  
BIRRIWA

Drawing Title  
COVER SHEET AND DRAWING INDEX

Drawn	Date	Scale	A1	G.A. Check	Date
UF	Apr-22	AS SHOWN			
Designed	Project No.	Dwg. No.	Issue		
VG	NSW220659	C1.001	P1		

NOT FOR CONSTRUCTION



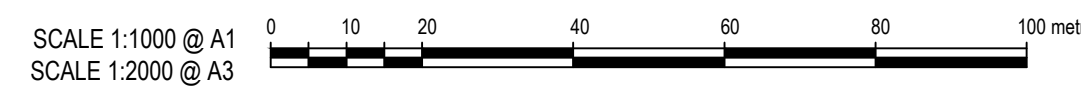


KEY PLAN  
SCALE 1:20000

CHAINAGE	EXISTING LEVELS	DESIGN LEVELS	CUT / FILL DEPTH	HORIZONTAL GEOMETRY	VERTICAL GEOMETRY
0	420.16	420.16	0.00	L = 8.41	G = 5.11%
3.4	420.34	420.34	0.00	R = 80	G = 2.65%
7.55	420.45	420.45	0.00	L = 17.09	G = -4.15%
8.41	420.43	420.41	-0.01	R = 145	K = 15.46
14.38	420.16	420.17	-0.01		L = 80
27.95	419.68	419.66	-0.02		G = 1.02%
45.03	419.20	419.20	-0.00		
50	419.09	419.10	0.01		
94.38	418.97	418.92	-0.05		
100	419.00	418.97	-0.03		
150	419.45	419.49	0.03		
175.84	419.75	419.75	0.00		
200	419.95	420.00	0.05		
211.66	420.05	420.12	0.07		
250	420.28	420.28	-0.01	L = 185.26	G = 0.41%
300	420.53	420.48	-0.04		
342.94	420.64	420.66	0.02		
350	420.68	420.69	0.01		
361.1	420.72	420.72	-0.00	R = 1000	K = 97.85
381.92	420.70	420.74	0.04		L = 100
400	420.67	420.73	0.06		
442.94	420.51	420.56	0.05		
450	420.51	420.52	0.01		
500	420.24	420.22	-0.02	L = 499.21	G = -0.61%
550	419.91	419.91	0.00		
557.83	419.89	419.86	-0.03		
584.65	420.08	420.08	0.00		
600	420.00	420.00	-0.00		
622.39	419.90	419.88	-0.02		
650	419.92	419.89	-0.03		
658.34	419.92	419.90	-0.02		
700	420.15	420.12	-0.03		

BARNEYS REEF ROAD - MC01

A1 Horizontal Scale 1 : 1000  
A1 Vertical Scale 1 : 200



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Issue	Description	Date	Drawn Approved

Client  
**UPCIAC RENEWABLES AUSTRALIA**  
Suite 2, Level 2, Castray Esplanade  
Battery Point, TAS, 7004

**ACOR CONSULTANTS**  
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Project  
**BARNEYS REEF ROAD UPGRADE SOLAR FARM ACCESS**  
BIRRIWA

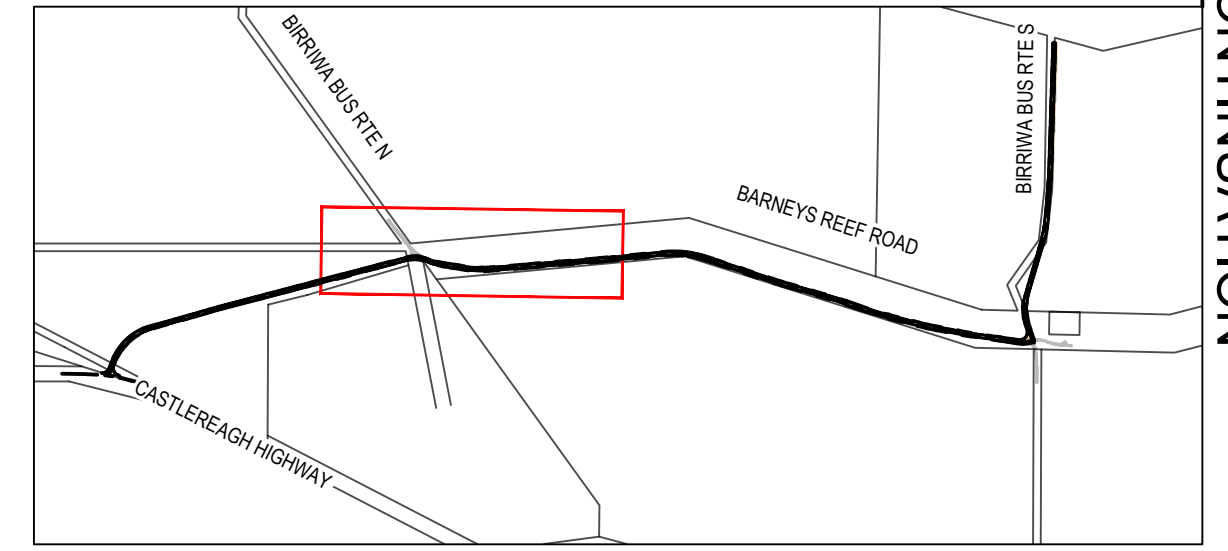
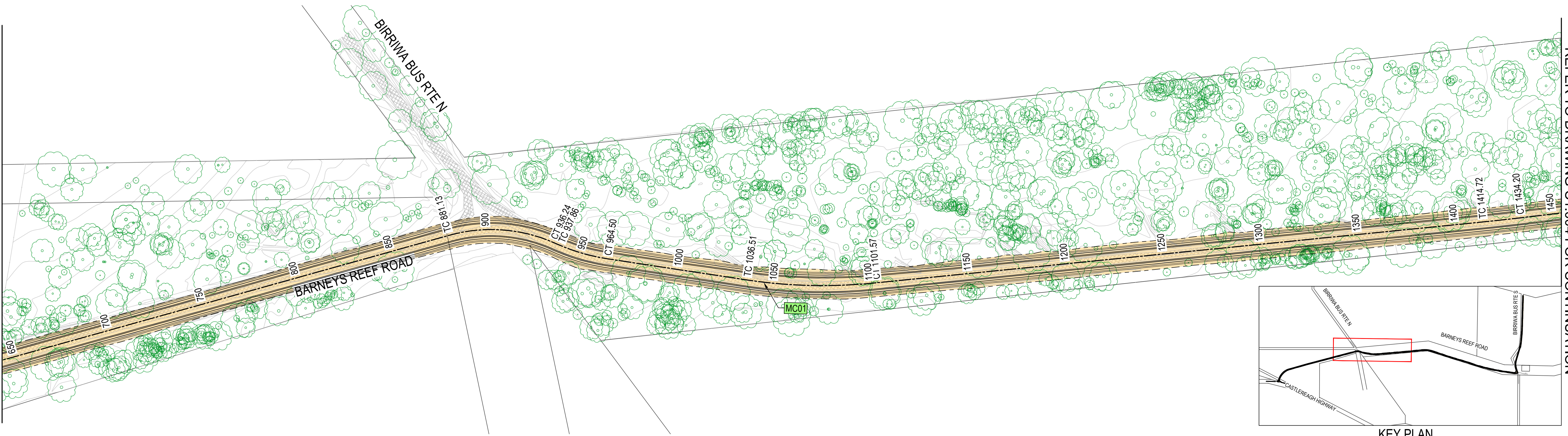
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Drawn	Date	Scale	A1
UF	Apr-22	1:500	
Designed	Project No.	Dwg. No.	Issue
VG	NSW220659	C1.002	P1

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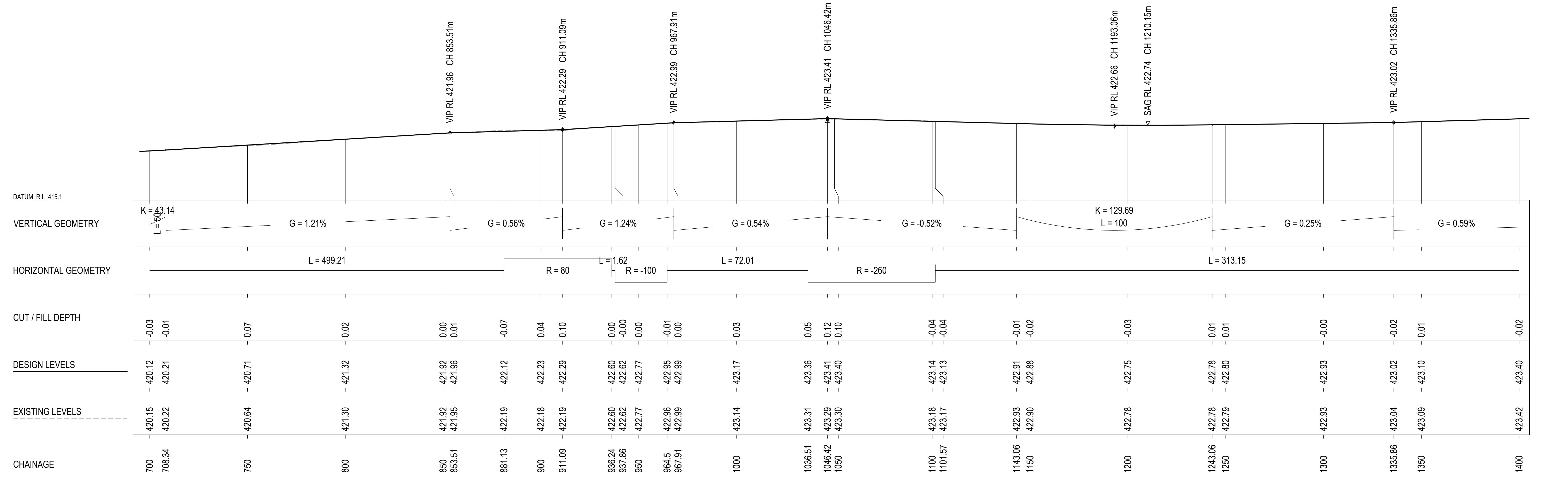


REFER TO DRAWING C1.002 FOR CONTINUATION

REFER TO DRAWING C1.004 FOR CONTINUATION

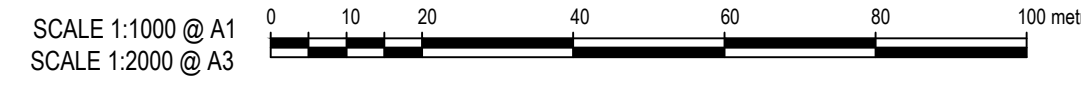


KEY PLAN  
SCALE 1:20000



BARNEYS REEF ROAD - MC01

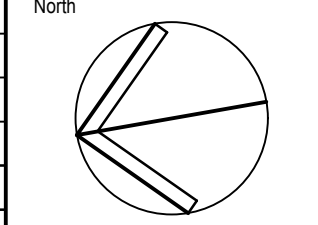
A1 Horizontal Scale 1 : 1000  
A1 Vertical scale 1 : 200



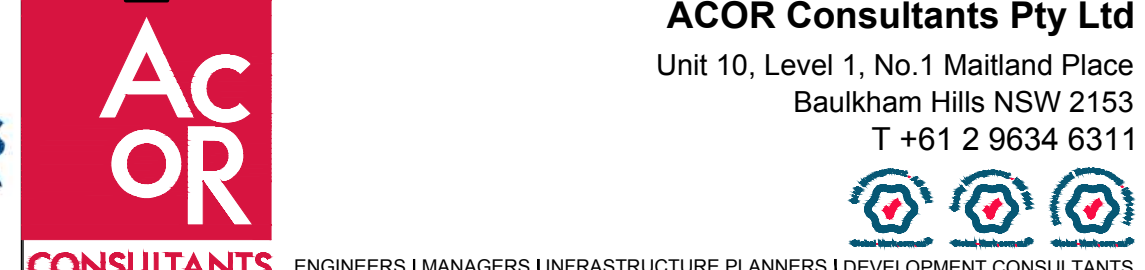
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Issue	Description	Date	Drawn	Approved



Client  
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Project  
**BARNEYS REEF ROAD UPGRADE SOLAR FARM ACCESS**  
BIRRIWA

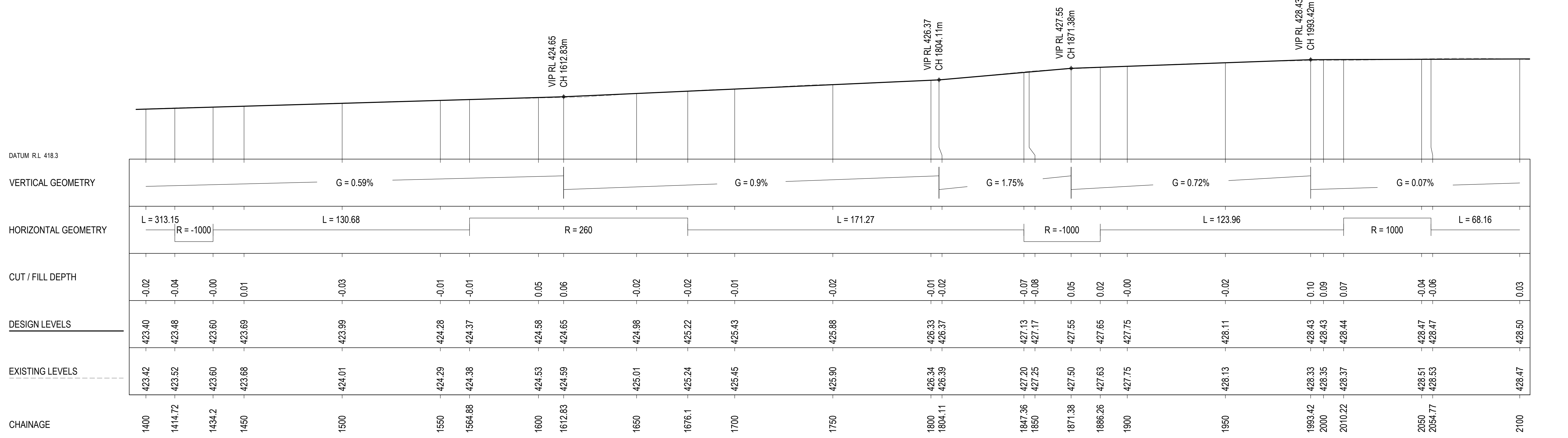
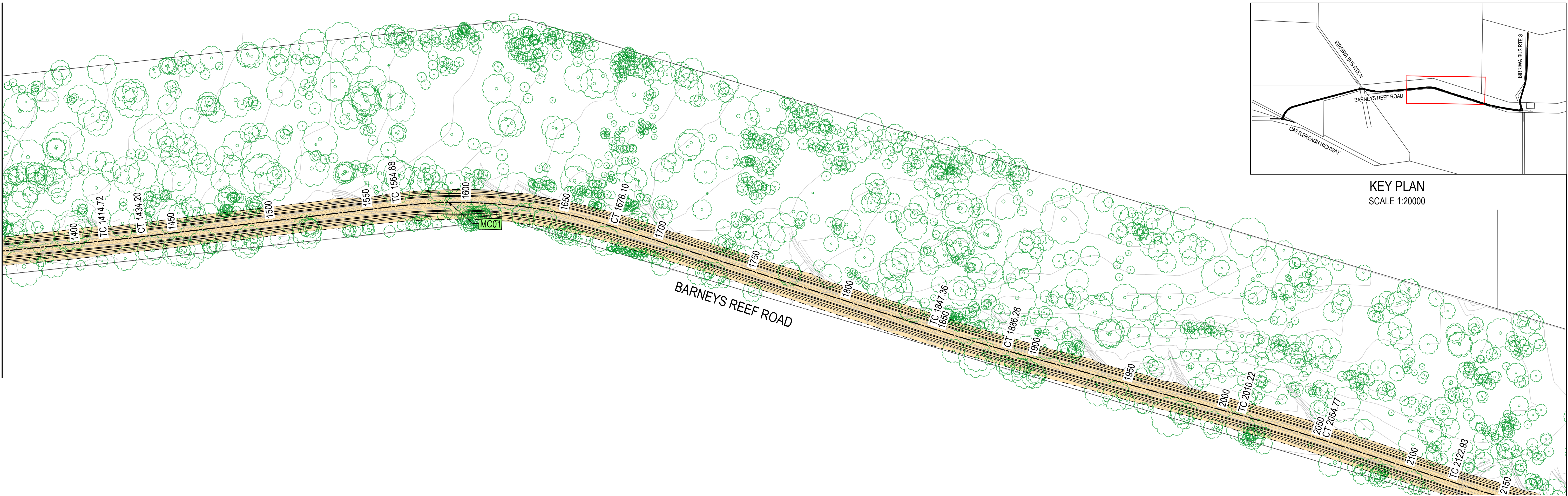
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Drawn	Date	Scale	A1	G.A. Check
UF	Apr-22	1:1000		
Designed	Project No.	Dwg. No.	Issue	
VG	NSW220659	C1.003	P1	

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REFER TO DRAWING C1.003 FOR CONTINUATION

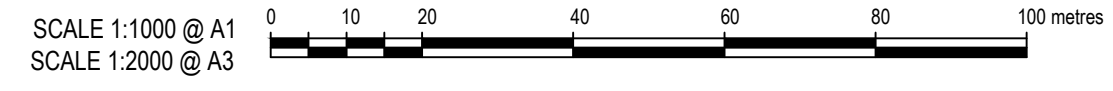
REFER TO DRAWING C1.005 FOR CONTINUATION



BARNEYS REEF ROAD - MC01

A1 Horizontal Scale 1 : 1000  
A1 Vertical scale 1 : 200

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Issue	Description	Date	Drawn Approved

Client  
**UPCIAC RENEWABLES AUSTRALIA**  
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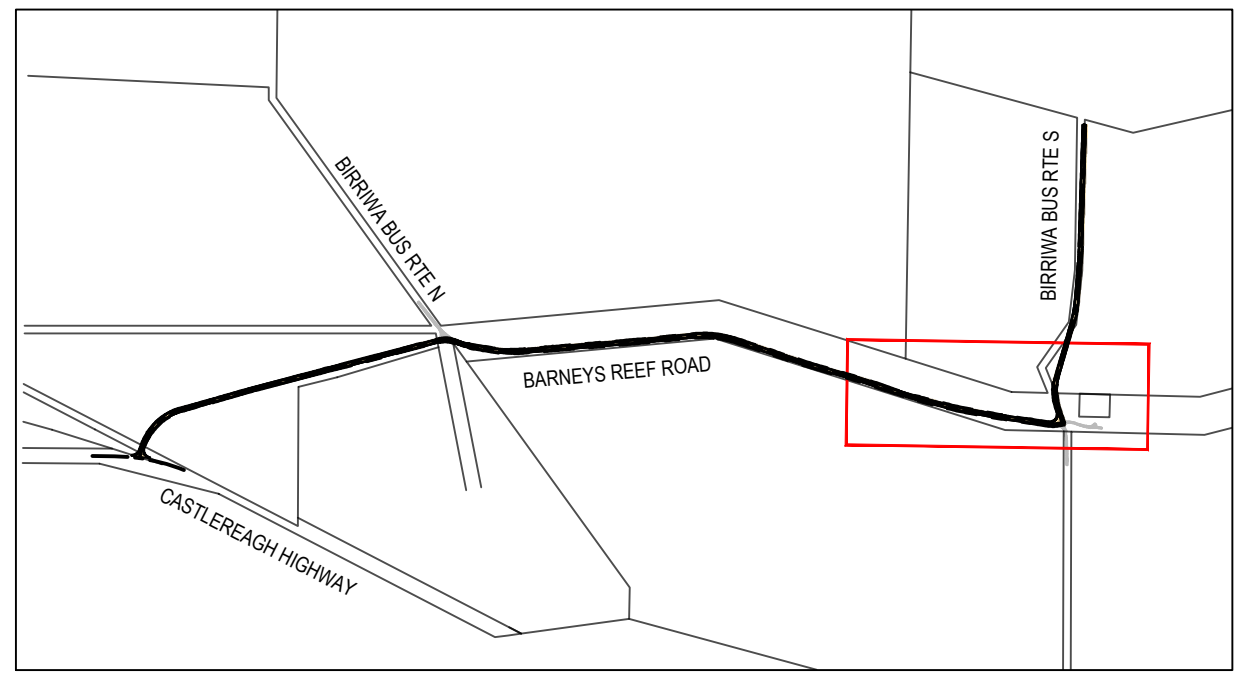
Project  
**BARNEYS REEF ROAD UPGRADE SOLAR FARM ACCESS**  
BIRRIWA

Drawing Title GENERAL ARRANGMENT PLAN SHEET 3 MC01			
Drawn UF	Date Apr-22	Scale 1:1000	A1
Designed VG	Project No. NSW220659	Dwg. No. C1.004	Issue P1



REFER TO DRAWING C1.004 FOR CONTINUATION

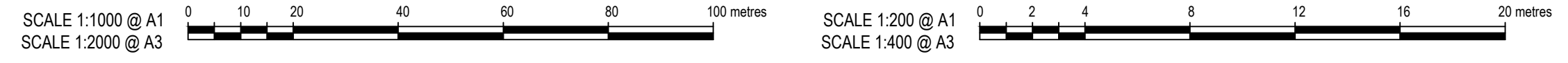
REFER TO DRAWING C1.006 FOR CONTINUATION



DATUM RL 423.4																										
VERTICAL GEOMETRY	G = 0.07%						G = 0.85%						G = 0.98%				G = 0.43%		G = 1.97%		G = 0.18%		G = 0.97%		G = 0.12%	
HORIZONTAL GEOMETRY	L = 68.16			R = -1000			L = 55.19			R = -1000			L = 69.45			R = -1000			L = 102.27			R = -100		L = 14.6		
CUT / FILL DEPTH	0.03	-0.06	0.02	-0.00	-0.00	-0.10	-0.04	-0.02	0.02	0.02	0.00	0.00	-0.02	-0.03	-0.02	0.02	-0.00	0.01	0.00	-0.07	-0.06	0.00	0.00	0.00	0.00	
DESIGN LEVELS	428.50	428.52	428.54	428.57	428.57	428.58	428.87	428.92	429.30	429.52	429.69	429.73	430.18	430.22	430.50	430.71	431.19	431.27	431.37	431.44	431.49	431.71	431.71	431.73	431.73	431.70
EXISTING LEVELS	428.47	428.58	428.51	428.57	428.58	428.68	428.92	428.95	429.28	429.50	429.69	429.72	430.20	430.25	430.52	430.69	431.20	431.26	431.37	431.51	431.55	431.71	431.72	431.73	431.77	431.70
CHAINAGE	2100	2122.93	2150	2200	2200.71	2215.61	2250	2255.89	2300	2326.44	2346.5	2350	2395.89	2400	2429.02	2450	2500	2507.48	2531.29	2547.22	2550	2561.15	2562.74	2570.43	2574.28	2577.34

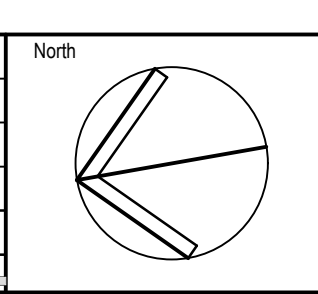
BARNEYS REEF ROAD - MC01

A1 Horizontal Scale 1 : 1000  
A1 Vertical scale 1 : 200

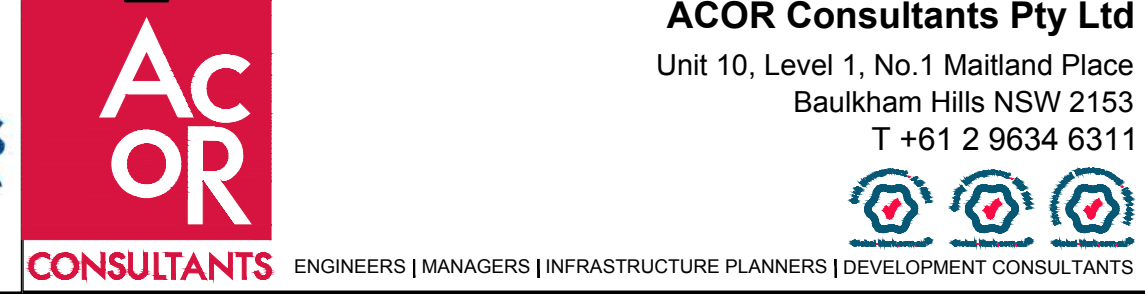


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Issue	Description	Date	Drawn	Approved



Client  
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Suite 2, Level 2, Castray Esplanade  
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T +61 2 9634 6311

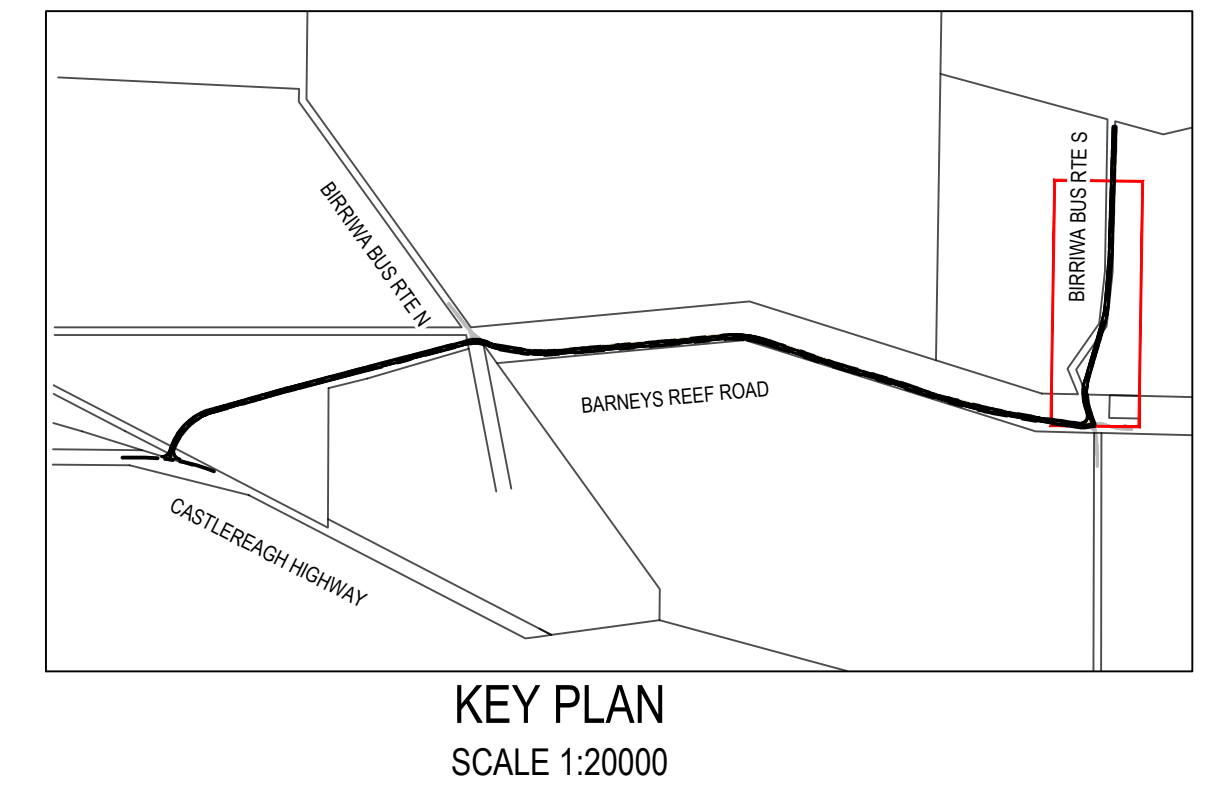
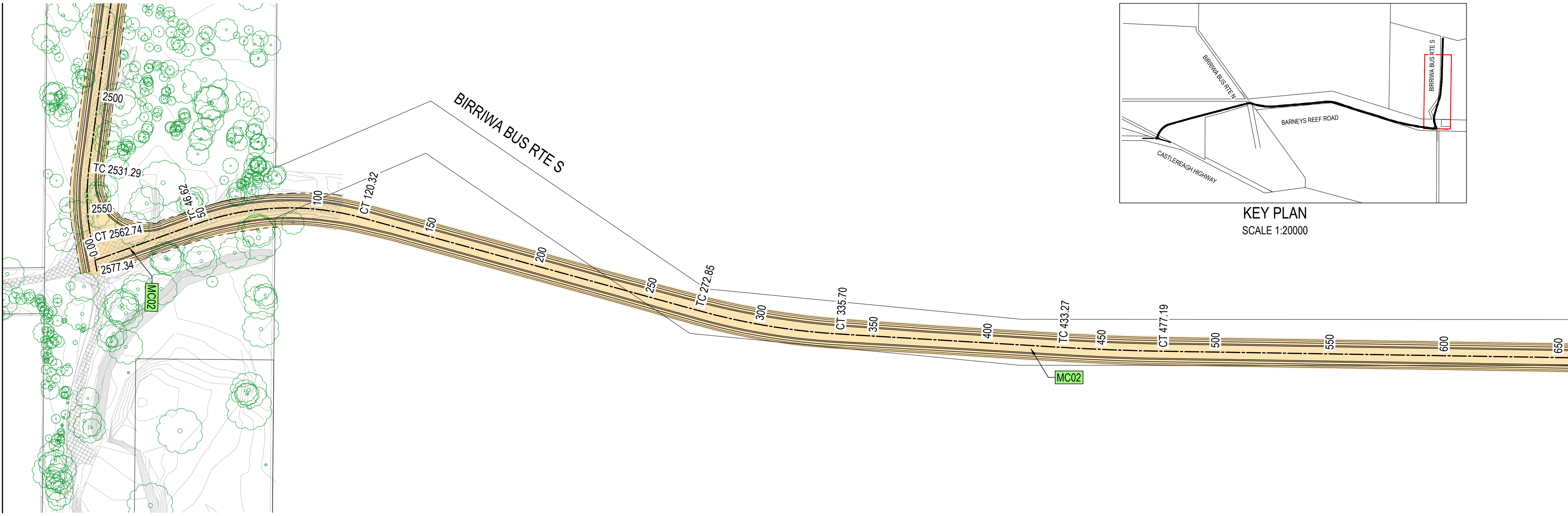
Project  
**BARNEYS REEF ROAD UPGRADE SOLAR FARM ACCESS**  
BIRRIWA

Drawing Title <b>GENERAL ARRANGMENT PLAN SHEET 4 MC01</b>				
Drawn	Date	Scale	A1	G.A. Check
UF	Apr-22	1:1000		
Designed	Project No.	Dwg. No.	Issue	
VG	NSW220659	C1.005	P1	

NOT FOR CONSTRUCTION



REFER TO DRAWING C1.005 FOR CONTINUATION



REFER TO DRAWING C1.007 FOR CONTINUATION

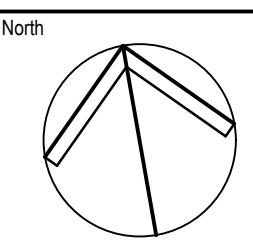
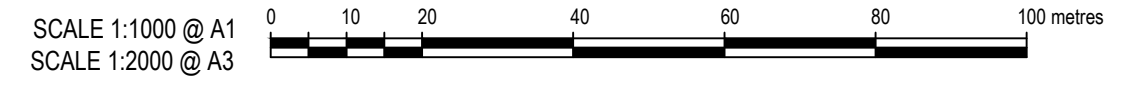
CHAINAGE	0	12.2	25.47	46.62	50	72.95	100	120.32	120.62	150	172.03	200	250	256.15	265.84	272.85	280.21	300	327.94	335.7	350	400	413.57	433.27	450	477.19	500	550	576.41	600	650	689.2	700
EXISTING LEVELS	431.76	431.64	431.66	431.55	431.54	431.42	431.61	431.72	431.72	431.48	431.72	431.57	431.24	431.13	430.95	431.06	431.09	431.24	431.51	431.53	431.62	431.65	431.66	431.66	431.64	431.65	431.66	431.62	431.56	431.56	431.44	431.36	431.25
DESIGN LEVELS	431.76	431.64	431.66	431.55	431.54	431.42	431.60	431.73	431.73	431.75	431.77	431.55	431.17	431.13	430.95	431.02	431.09	431.27	431.51	431.53	431.55	431.64	431.66	431.65	431.64	431.63	431.62	431.59	431.58	431.53	431.44	431.36	431.32
CUT / FILL DEPTH	0.00	0.00	0.00	0.01	0.01	-0.01	-0.02	0.01	0.01	0.27	0.05	-0.01	-0.07	0.00	0.00	-0.04	-0.00	0.03	0.00	-0.01	-0.07	-0.01	0.00	-0.01	0.00	-0.02	-0.04	-0.03	0.00	-0.03	-0.01	0.00	0.07
HORIZONTAL GEOMETRY	L = 46.62		R = 120				L = 152.53				R = 300				L = 97.58				R = 1000				L = 322.46										
VERTICAL GEOMETRY	G = -1.03%		G = 0.22%		G = -0.52%		G = 0.66%		G = 0.06%		G = -0.76%		G = -1.81%		G = 0.99%		G = 0.88%		G = 0.18%		G = -0.05%				G = -0.19%		G = -0.34%						
DATUM RL 425.2	VIP RL 431.64 CH 12.20m		VIP RL 431.66 CH 25.47m		VIP RL 431.42 CH 72.95m		VIP RL 431.73 CH 120.62m		VIP RL 431.77 CH 172.03m		VIP RL 431.13 CH 256.15m		VIP RL 430.95 CH 265.84m		VIP RL 431.09 CH 280.21m		VIP RL 431.51 CH 327.94m		VIP RL 431.66 CH 413.57m		VIP RL 431.58 CH 576.41m		VIP RL 431.36 CH 689.20m										

BARNEYS REEF ROAD - MC02  
A1 Horizontal Scale 1 : 1000  
A1 Vertical scale 1 : 200

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Client  
**UPCIAC RENEWABLES AUSTRALIA**  
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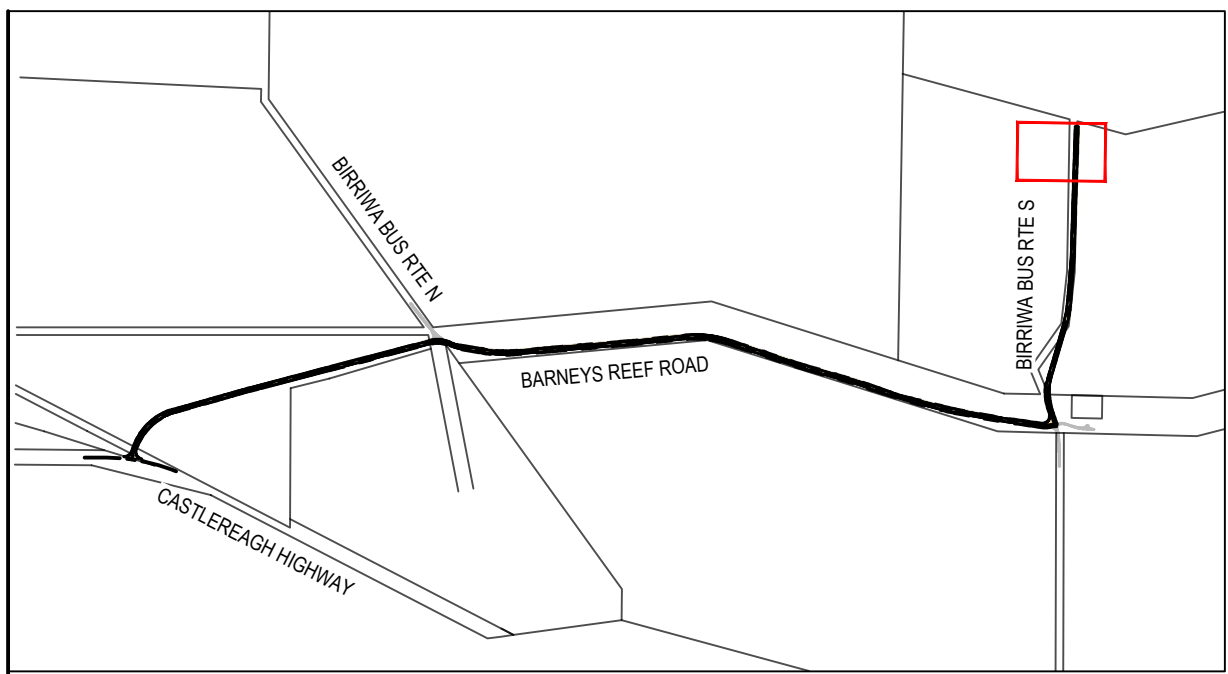
Project  
**BARNEYS REEF ROAD UPGRADE SOLAR FARM ACCESS**  
BIRRIWA

Drawn	Date	Scale	A1	Q.A. Check	Date
UF	Apr-22	1:1000			
Designed	Project No.	Dwg. No.	Issue		
VG	NSW220659	C1.006	P1		

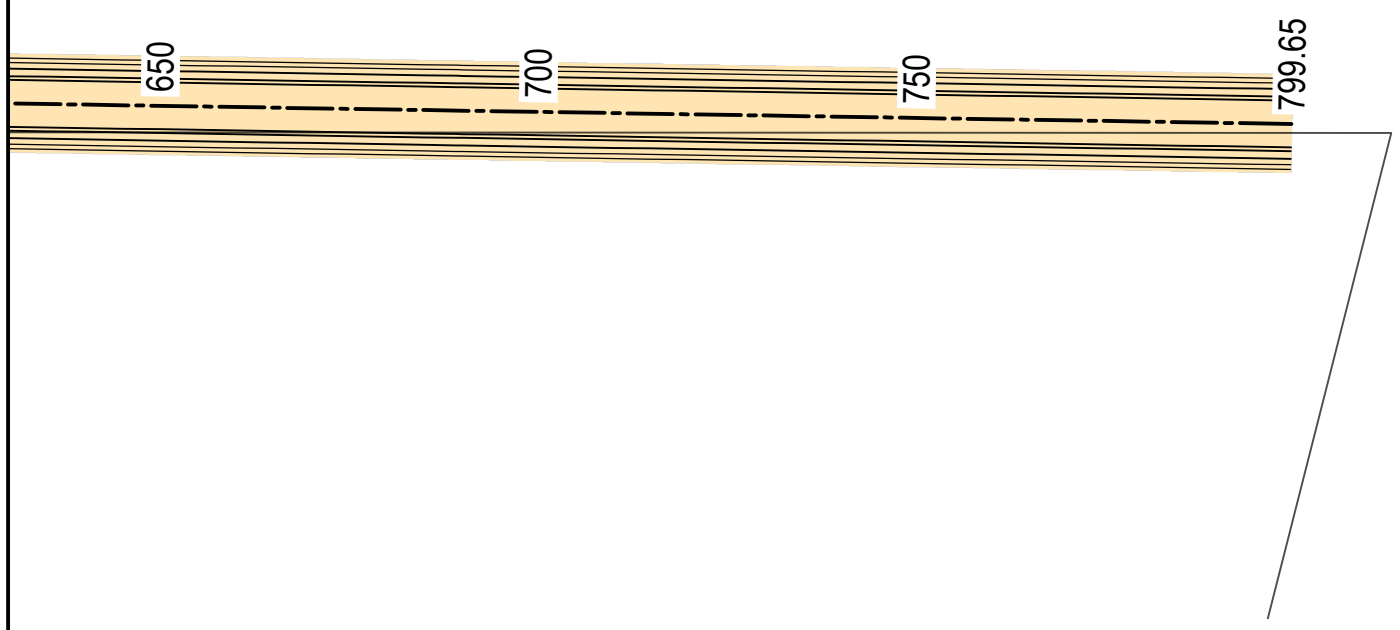
NOT FOR CONSTRUCTION

REFER TO DRAWING C1.007 FOR CONTINUATION

REFER TO DRAWING C1.006 FOR CONTINUATION



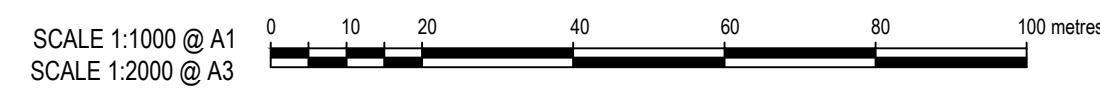
KEY PLAN  
SCALE 1:20000



DATUM R.L. 425.9			
VERTICAL GEOMETRY	G = -0.34%		
HORIZONTAL GEOMETRY	L = 322.46		
CUT / FILL DEPTH	0.07	0.20	0.00
DESIGN LEVELS	431.32	431.15	430.98
EXISTING LEVELS	431.25	430.95	430.98
CHAINAGE	700	750	799.65

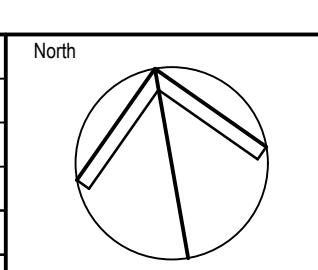
BARNEYS REEF ROAD - MC02

A1 Horizontal Scale 1 : 1000  
A1 Vertical scale 1 : 200

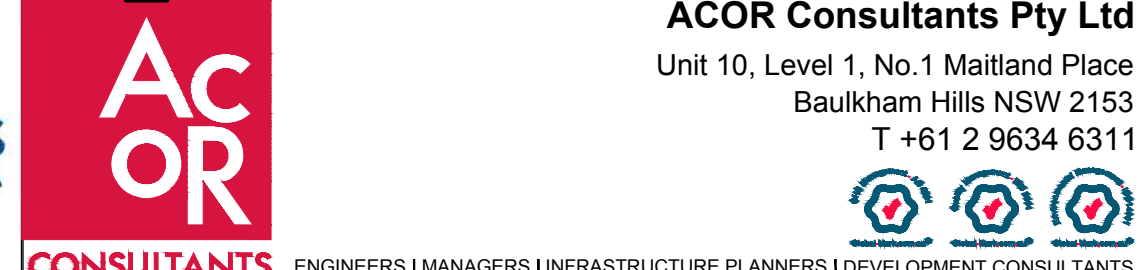


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Issue	Description	Date	Drawn Approved



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Project  
**BARNEYS REEF ROAD UPGRADE SOLAR FARM ACCESS**  
BIRRIWA

Drawing Title GENERAL ARRANGMENT PLAN SHEET 6 MC02			
Drawn	Date	Scale	A1
UF	Apr-22	1:1000	
Designed	Project No.	Dwg. No.	Issue
VG	NSW220659	C1.007	P1

NOT FOR CONSTRUCTION

C:\Users\mccoy\Documents\Projects\NSW220659\Drawings\C1.007\_C1.006\_C1.008.dwg

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# Appendix D

Mid-Western Regional Council consultation

---

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Spring Hill QLD 4000  
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Canberra City ACT 2601

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### **MELBOURNE**

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### **PERTH**

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Perth WA 6000

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