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Mount Pleasant Operation

A JOINT VENTURE WITH JCDA Japan Coal Development Australia

Appendix J

Road Transport Assessment

Mount Pleasant Optimisation Project
Road Transport Assessment

Prepared for:

MACH Energy Australia Pty Ltd

14 December 2020

The Transport Planning Partnership

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Mount Pleasant Optimisation Project
Road Transport Assessment

Client: MACH Energy Australia Pty Ltd

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Final	14/12/2020	Penny Dalton	Penny Dalton	

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1 Introduction

The Mount Pleasant Operation includes the construction and operation of an open cut coal mine and associated rail spur and product coal loading infrastructure, located approximately 3 kilometres (km) north-west of Muswellbrook in the Upper Hunter Valley of New South Wales (NSW) (Figure 1.1 and Figure 1.2).

MACH Mount Pleasant Operations Pty Ltd manages the Mount Pleasant Operation as agent for and on behalf of the unincorporated Mount Pleasant Joint Venture between MACH Energy Australia Pty Ltd (95 percent owner) and J.C.D. Australia Pty Ltd (5 percent owner)[1]. The mine is approved to produce up to 10.5 million tonnes per annum (Mtpa) of run-of-mine (ROM) coal until 22 December 2026. Thermal coal products from the Mount Pleasant Operation are transported by rail to the Port of Newcastle for export, or to domestic customers for use in electricity generation.

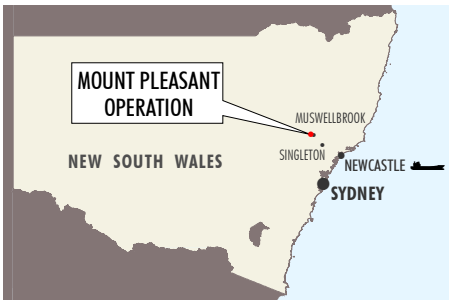
The Mount Pleasant Optimisation Project (the Project) proposes increased open cut coal extraction within Mount Pleasant Operation Mining Leases, increased handling and processing of up to 21 Mtpa ROM coal, and increased rail transport of up to 17 Mtpa product coal, with an extension of mining operations to 22 December 2048.

This Road Transport Assessment of the Project forms part of an Environmental Impact Statement (EIS) and has been prepared by The Transport Planning Partnership (TTPP) with reference to the road transport components of the Secretary's Environmental Assessment Requirements (SEARs):

> ***Traffic & Transport*** *– including:*
>
> - *an assessment of the likely transport impacts of the development on the capacity, condition, safety and efficiency of the road and rail[2] networks, including undertaking a road safety audit; and*
> - *a description of the measures that would be implemented to mitigate any impacts, including concept plans for any proposed upgrades, developed in consultation with the relevant roads authority;*

[1] *Throughout this report, MACH Energy Mount Pleasant Operations Pty Ltd and the unincorporated Mount Pleasant Joint Venture will be referred to as MACH.*

[2] *The Road Transport Assessment does not consider the impacts of the Project on the operation of the rail network.*



LEGEND

- Mining Operation
- Proposed Mining Operation (Application Lodged)
- Railway
- Local Government Boundary
- State Forest/Reserve
- National Parks and Wildlife Estate
- Mining Lease Boundary (Mount Pleasant Operation)

Source: NSW Spatial Services (2020)

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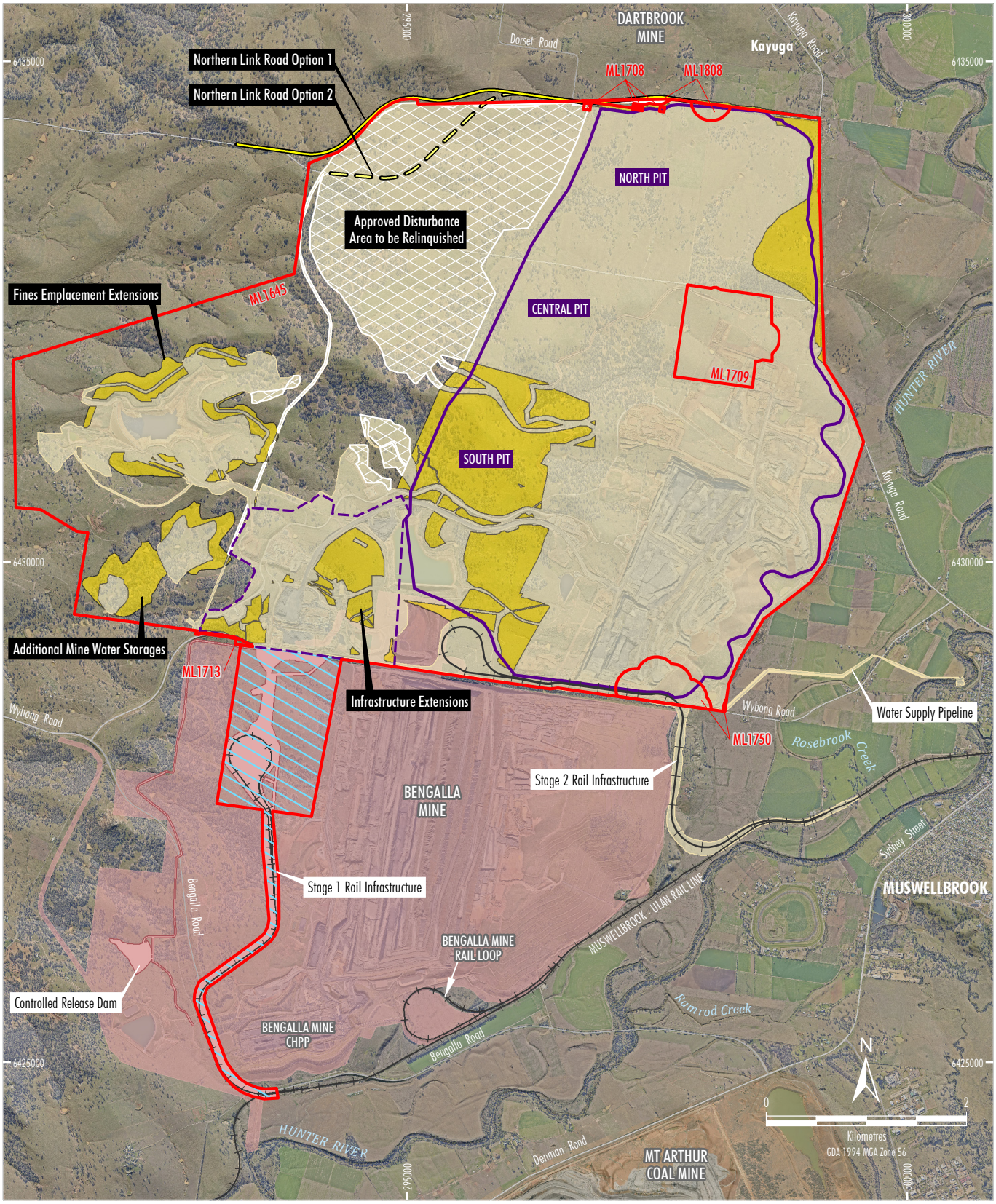
MOUNT PLEASANT OPTIMISATION PROJECT

Project Location

Figure 1.1

MAC-18-02 SSD_EIS_App Figure 1_Rev E



MAC-18-02 SSD_EIS_App Figure 2_Rev M

LEGEND

Existing Mine Elements

- Mining Lease Boundary (Mount Pleasant Operation)
- Approximate Extent of Existing/Approved Surface Development (DA92/97) [1]
- Infrastructure to be removed under the Terms of Condition 37, Schedule 3 (DA92/97)
- Bengalla Mine Approved Disturbance Boundary (SSD-5170)
- Existing/Approved Mount Pleasant Operation Infrastructure within Bengalla Mine Approved Disturbance Boundary (SSD-5170) [1]

Additional/Revised Project Elements

- Approved Disturbance Area to be Relinquished [2]
- Approximate Additional Disturbance of Project Extensions [1]
- Northern Link Road Option 1 Centreline [3]
- Northern Link Road Option 2 Centreline
- Approximate Extent of Project Open Cut and Waste Rock Emplacement Landforms
- Revised Infrastructure Area Envelope

NOTES

1. Excludes some incidental Project components such as water management infrastructure, access tracks, topsoil stockpiles, power supply, temporary offices, other ancillary works and construction disturbance.
2. Subject to detailed design of Northern Link Road alignment.
3. Preferred alignment subject to landholder access.

Source: MACH (2020); NSW Spatial Services (2020); Department of Planning and Environment (2016) Orthophoto: MACH (2020)

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MOUNT PLEASANT OPTIMISATION PROJECT

Project General Arrangement

Figure 1.2

In accordance with the SEARs for the Project, this report has regard for the relevant input from Transport for NSW (TfNSW), and Muswellbrook Shire Council (MSC). The input from TfNSW includes the following:

> *A traffic and transport study shall be prepared in accordance with the Roads and Maritime Services NSW's Guide to Traffic Generating Developments 2002 and is to include (but not be limited to) the following:*
>
> - *Assessment of all relevant vehicular traffic routes and intersections for access to / from the subject properties.*
> - *Current traffic counts for all of the traffic routes and intersections.*
> - *The anticipated additional vehicular traffic generated from both the construction and operational stages of the project, including the additional work force required and any haulage impacts on the road network.*
> - *The distribution on the road network of the trips generated by the proposed development.*
> - *It is requested that the predicted traffic flows are shown diagrammatically to a level of detail sufficient for easy interpretation.*
> - *Consideration of the traffic impacts on existing and proposed intersections, and the capacity of the local and classified road network to safely and efficiently cater for the additional vehicular traffic generated by the proposed development during both the construction and operational stages. The traffic impact shall also include the cumulative traffic impact of other proposed developments in the area.*
> - *Identify the necessary road network infrastructure upgrades that are required to maintain existing levels of service on both the local and classified road network for the development. In this regard, preliminary concept drawings shall be submitted with the EIS for any identified road infrastructure upgrades. However, it should be noted that any identified road infrastructure upgrades will need to be to the satisfaction of Transport for NSW and Council.*
> - *Traffic analysis of any major / relevant intersections impacted, using SIDRA or similar traffic model, including:*
>   - *Current traffic counts and 10 year traffic growth projections*
>   - *With and without development scenarios*
>   - *95th percentile back of queue lengths*
>   - *Delays and level of service on all legs for the relevant intersections*
>   - *Electronic data for Transport for NSW review.*
> - *Any other impacts on the regional and state road network including consideration of pedestrian, cyclist and public transport facilities and provision for service vehicles.*

The input from MSC includes the following with regard to traffic and the local road network:

1.1 *A traffic impact assessment should be prepared in relation to the project. The Assessment should investigate the effect of additional traffic movements associated with the construction, operational and decommissioning phases of the project on the local and regional road network.*

1.2 *The Traffic Assessment should review and incorporate strategies and recommendations contained in the* Muswellbrook Mine Affected Roads Network Review *(Bitzios and Northrop; 2019)* [a later version was released in April 2020]. *The Project will increase the life of the Mt Pleasant Mine by 22 years, will result in the extraction of an additional 250 million tonnes of ROM and effectively double the workforce, all during the time that the Bengalla, Mt Arthur and Mangoola Mines will also be increasing the life of their mines (and the Muswellbrook West Coal Mine Project will potentially seek approval), some also seeking approval to modifying the local road network. The cumulative impact will be:*

- *additional traffic movements on the road network for a longer period of time,*
- *an overall increase in vehicle kilometres travelled and increased CO2 emissions resulting from vehicles traveling to and from the site.*

1.3 *Council considers that Mt Pleasant Mine should make a commitment to constructing the Bengalla Link Rd to Wybong Road link recommended in the Road Network Map contained in the* Muswellbrook Mine Affected Roads Network Review.

In addition, the SEARs refer to guidelines which are relevant to the assessment, including the TfNSW (formerly Roads and Traffic Authority [RTA]) *Guide to Traffic Generating Developments* (RTA, 2002) and the TfNSW (formerly Roads and Maritime Services [RMS]) Road Design Guide (N.D.) and relevant Austroads Standards. It is noted that TfNSW and other road agencies have adopted the Austroads guides and the Australian Standards as the primary technical references, together with TfNSW Supplements, rather than the RMS Road Design Guide referred to in the SEARs. This study has therefore been prepared in accordance with RTA (2002) and with reference to the relevant Austroads guides, TfNSW Supplements to the Austroads guides and Australian Standards.

2 Mount Pleasant Operation

2.1 Approved Mount Pleasant Operation

The Mount Pleasant Operation Development Consent DA 92/97 was granted on 22 December 1999. The Mount Pleasant Operation was also approved under the *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act) in 2012 (EPBC 2011/5795). MACH acquired the Mount Pleasant Operation from Coal and Allied Operations Pty Ltd on 4 August 2016. MACH commenced construction activities at the Mount Pleasant Operation in November 2016 and commenced mining operations in October 2017, in accordance with Development Consent DA 92/97 and EPBC 2011/5795.

The mine is approved to produce up to 10.5 Mtpa of ROM coal until 22 December 2026. Up to approximately nine trains per day of thermal coal products from the Mount Pleasant Operation are transported by rail to the Port of Newcastle for export, or to domestic customers for use in electricity generation.

Development Consent DA 92/97 requires a number of changes be made to the road network, including closure of Castlerock Road and Wybong Road, construction of the Mount Pleasant Northern Link Road and Mount Pleasant Western Link Road if required (Condition 38), construction of relevant intersections if required (Condition 39), and construction of a rail over road overpass at Wybong Road and a rail over road bridge at Overton Road (Condition 39A). The current mine plan no longer requires construction of the Western Link Road and closure of Wybong Road, and works associated with construction of the Wybong Road rail overpass and Overton Road bridge are currently scheduled to be completed in 2021 (MACH, 2019a).

Condition 42 of Development Consent 92/97 requires that "*as far as possible the preferred mine access route, as described in the EIS, is the only route used by employees and contractors travelling to the mine site from Muswellbrook*". The preferred mine access route from Muswellbrook and the south is via Bengalla Road, which would also provide alternative access to Muswellbrook for most Wybong Road traffic following the closure of the section of Wybong Road adjacent to the Mount Pleasant Operation (ERM Mitchell McCotter, 1997) although this closure is no longer required.

The Site Access Management Plan (SAMP) for the Mount Pleasant Operation (MACH, 2019b) provides guidance to manage the traffic aspects of the Mount Pleasant Operation, to facilitate traffic management in and around operations during the construction commissioning and day to day activities. It presents details of:

- the traffic routes to be used for construction and operations vehicles (both company and personal vehicles);
- speed limits to be observed along routes to and from the site;
- measures in place for the safety of road users and construction/operations traffic;
- a safe interface between site traffic and local traffic; and
- measures to raise awareness to local traffic users and construction personnel.

The SAMP currently prohibits use of Kayuga Bridge and Kayuga Road east of Wybong Road for any vehicles entering or exiting the Mount Pleasant Operation (MACH, 2019b). This prohibition does not apply to emergency vehicles accessing the site or its surrounds, nor to local traffic which is not accessing the Mount Pleasant Operation. The SAMP prohibits heavy vehicles from using Wybong Road east of the Mount Pleasant Operation access road and west of Bengalla Road (MACH, 2019b). The only permitted heavy vehicle access to and from the site is via Bengalla Road, which was purpose-built to provide access for the mining lands west of Muswellbrook.

2.2 Mount Pleasant Optimisation Project

The Project would include the following development:

- increased open cut coal extraction within Mount Pleasant Operation Mining Leases by mining of additional coal reserves, including lower coal seams in North Pit;
- staged increase in extraction, handling and processing of ROM coal up to 21 Mtpa (i.e. progressive increase in ROM coal mining rate from 10.5 Mtpa over the Project life);
- staged upgrades to the existing Coal Handling and Preparation Plant (CHPP) and coal handling infrastructure to facilitate the handling and processing of additional coal;
- rail transport of up to approximately 17 Mtpa of product coal to domestic and export customers;
- upgrades to workshops, electricity distribution and other ancillary infrastructure;
- existing infrastructure relocations to facilitate mining extensions (e.g. local roads, powerlines and water pipelines);
- construction and operation of new water management and water storage infrastructure in support of the mine;
- additional reject dewatering facilities to allow co-disposal of fine rejects with waste rock as part of ROM waste rock operations;

- development of an integrated waste rock emplacement landform that incorporates geomorphic drainage design principles for hydrological stability, and varying topographic relief to be more natural in exterior appearance;
- construction and operation of new ancillary infrastructure in support of mining;
- extension to the time limit on mining operations to 22 December 2048;
- an average operational workforce of approximately 600 people, with a peak of approximately 830 people in 2041;
- ongoing exploration activities; and
- other associated infrastructure, plant, equipment and activities.

The general arrangement of the Project is shown on Figure 1.2.

Construction activity is expected to occur over several distinct periods throughout the life of the Project, each requiring a construction workforce in addition to the ongoing operational activity. There are extended periods throughout the life of the Project during which no construction activity would occur. Table 2.1 summarises the anticipated construction periods and the average and peak construction workforce expected to be required for each construction period.

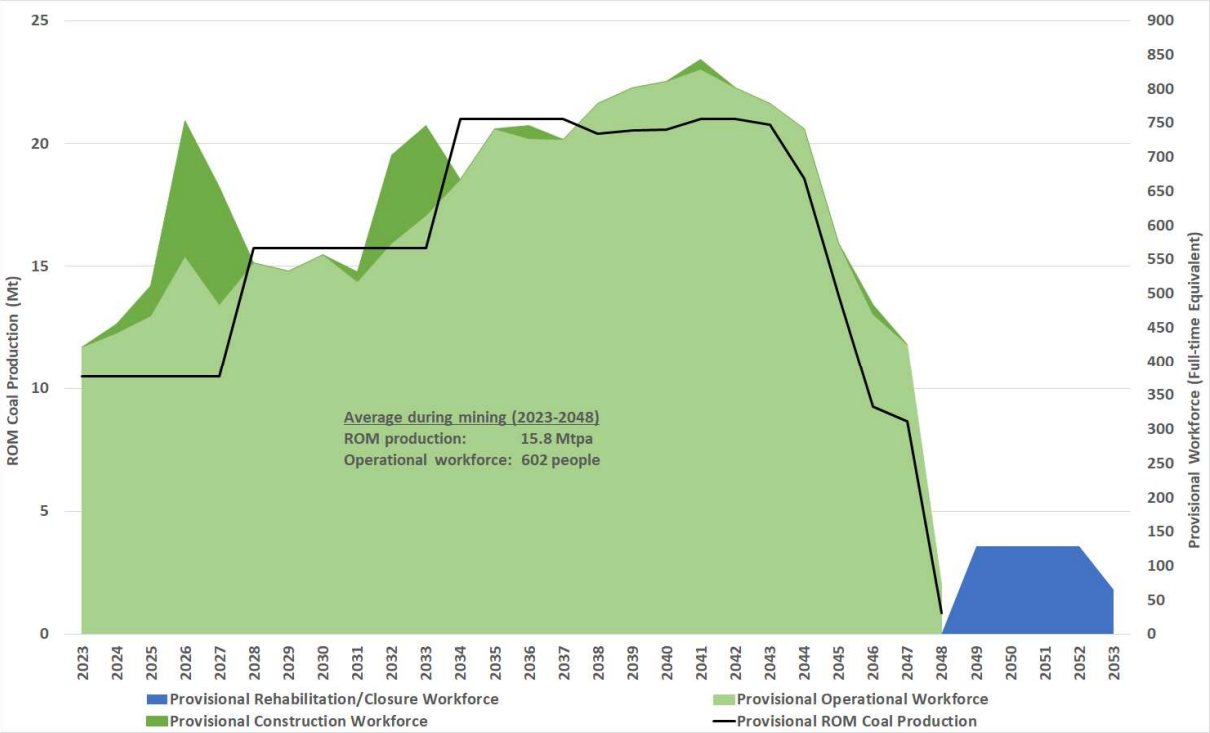
Table 2.1: Provisional Construction Workforce Schedule

Activity	Start	End	Average Workforce	Peak Workforce
Mine Water Dam (MWD) 2 Construction	January 2024	December 2024	14	30
Northern Link Road	January 2025	December 2025	44	104
Mine Infrastructure Area (MIA) Expansion Stage 2a CHPP Stage 2a Fines Emplacement Area Raise 2	January 2026	December 2027	186	414
Fines Emplacement Area Raise 3	January 2031	December 2031	14	30
MIA Expansion Stage 2b CHPP Stage 2b	January 2032	December 2033	130	309
Fines Emplacement Area Raise 4 MWD3 Construction	January 2036	December 2036	19	40
Fines Emplacement Area Raise 5	January 2041	December 2041	14	30
Fines Emplacement Area Raise 6	January 2046	December 2046	14	30

The overall peak of construction workforce required for the Project is therefore 414 people, required in late 2026.

Figure 2.1 presents the schedule for ROM coal production and the provisional Project operational, construction and rehabilitation/closure workforce. This demonstrates that peak ROM coal production would commence in 2034, and the peak operational workforce of 830 personnel is expected to occur in 2041.

Figure 2.1: Provisional Project Production and Workforce Schedule



The impacts of the Project on the road transport environment would result from the proposed:

- construction activity;
- increase in the operational workforce;
- increase in site deliveries due to increased mining and coal production rates; and
- extension of the mine life from 22 December 2026 to 22 December 2048.

2.3 Project Impact Assessment Scenarios

To assess the potential road transport impacts of the Project on the road network, and in consideration of the expected workforce and production schedules (Section 2.2) and TfNSW's input regarding assessment of 10-year traffic growth projections, the following scenarios have been adopted with regard to the potential traffic generated by the Project:

- 2026 Construction Stage, with the peak construction workforce of 414 people coinciding with the operational workforce of 555 people (Figure 2.1); and

- 2036 Operational Stage, with an assumed operational workforce of 760 personnel and construction workforce of 40 personnel. The assumed operational workforce for this assessment scenario reflects the average longer-term operational workforce expected over the period between 2033 and 2044 (Figure 2.1) and is therefore somewhat higher than that actually anticipated in 2036.

Selection of 2036 as the Operational Stage, with the operational workforce increased to reflect the average longer-term workforce, is considered reasonable and conservative for this assessment. Using the longer-term average operational workforce would provide a more representative scenario than the peak operational workforce, noting the assumed Project traffic volumes are not significantly less than those forecast for 2041 (the year with the expected peak operational workforce). Further, cumulative impacts in 2041 would not include a contribution from the nearby Bengalla Mine, which is approved to operate until 2039 (Section 5.1.2).

3 Project Traffic Generation

3.1 Construction Activity

3.1.1 Construction Workforce

During the peak construction stage described in Section 2.3, the workforce associated with construction activity at the Project in 2026 is expected to be up to 414 people, of whom 20 to 50 personnel would be undertaking night work and the remainder would work during the day. The peak workforce associated with construction activity during the operational stage scenario in 2036 is expected to be 40 people working during the day. Shifts would nominally changeover at 6:00 am and 6:00 pm.

MACH intends to operate shuttle buses to transport the construction workforce to and from the Project each day as per the methods employed in the major construction periods to date. Buses would be provided to meet demand, and services are expected to primarily operate from Muswellbrook. A small proportion of less than 10 percent of workers would travel to and from Scone and Aberdeen, and if required, buses may operate to and from Singleton. The shuttle buses would be Coaster-style buses typically with a 22-passenger capacity, and would depart the Project after dropping off passengers at the start of the shift and return to the Project to collect the staff at the end of shift.

If all buses operate at full capacity, a minimum of 19 buses would be required to transport the peak construction workforce in 2026 and two buses in 2036. However, to be robust (such that potential impacts are not understated) and to allow for variations in the number of construction workers travelling to and from the Project from each direction, this assessment has assumed that daily bus services would operate as follows:

Peak Construction 2026 Day Shift

- 18 buses to or from Muswellbrook;
- 3 buses to or from Scone and Aberdeen; and
- 1 bus to or from Singleton.

Peak Construction 2026 Night Shift

- 2 buses to or from Muswellbrook; and
- 1 bus to or from Scone and Aberdeen.

Construction Activity 2036

- 2 buses to or from Muswellbrook; and
- 1 bus to or from Scone and Aberdeen.

In 2026, it is expected that in the morning, the night workers would be transported from the Project using the same buses as those bringing day workers to the Project. Similarly, in the evening, the night workers would be brought to the Project in the same buses that would be used for transporting day workers away from the Project. Assuming that all buses depart the Project when not in use, the night shift workforce would therefore not generate any additional trips on the road network. In 2036, the shuttle buses are assumed to transport workers to the Project, depart for the day and return to collect worker at the end of the day.

The bus services above would therefore generate 88 and 12 vehicle trips[3] on the surrounding road network in 2026 and 2036, respectively.

3.1.2 Construction Visitors

Analysis of login and logout records at the Mount Pleasant Operation over an extended period of construction activity between May and December 2017 (prior to commencement of production) suggests that the number of visitor arrivals to the Mount Pleasant Operation was equivalent to 6.7 percent of construction worker arrivals. On this basis, construction activity at the Project can be expected to generate approximately 28 visitors per day in 2026 and three visitors per day in 2036. Assuming each visitor travels independently, 28 visitors would generate 56 vehicle trips per day. The visitors can be expected to generate an additional:

- 56 vehicle trips per day in 2026; and
- 6 vehicle trips per day in 2036.

It has been assumed that the visitors to the Project would arrive and depart following a similar pattern as suggested by analysis of the login and logout records of visitors during the construction period at the Mount Pleasant Operation between May and December 2017 (pattern summarised in Table 3.1).

3.1.3 Construction Heavy Vehicle Deliveries

Heavy vehicle deliveries associated with construction activities are expected to be of a similar magnitude as visitors as described in 3.1.2. On this basis, construction activity at the Project when the peak construction workforce is 414 people can be expected to generate:

- 56 heavy vehicle trips per day in 2026; and
- 6 heavy vehicle trips per day in 2036.

[3] *Throughout this report, a vehicle trip is defined as a one way movement of a vehicle. One vehicle arriving and departing the Mount Pleasant Operation generates two vehicle trips.*

It has been assumed that the deliveries for the Project would arrive and depart following a similar pattern, as suggested by analysis of the login and logout records of visitors during the construction period at the Mount Pleasant Operation between May and December 2017 (patterned summarised in Table 3.1).

3.1.4 Total Construction Traffic Generation

Table 3.1 summarises the total traffic expected to be generated by construction activity at the Project during the peak construction stage in 2026.

Table 3.1: Estimated Project Construction Traffic 2026 (vehicles per hour)

Hour Start	Workforce		Visitors		Deliveries		Total	
	Inbound	Outbound	Inbound	Outbound	Inbound	Outbound	Inbound	Outbound
3:00 am	0	0	0	0	0	0	0	0
4:00 am	0	0	0	0	0	0	0	0
5:00 am	13	0	3	0	3	0	19	0
6:00 am	**9**	**13**	**18**	**1**	**18**	**1**	**45**	**15**
7:00 am	0	9	3	0	3	0	6	9
8:00 am	0	0	1	0	1	0	2	0
9:00 am	0	0	1	1	1	1	2	2
10:00 am	0	0	0	1	0	1	0	2
11:00 am	0	0	0	0	0	0	0	0
12:00 pm	0	0	0	1	0	1	0	2
1:00 pm	0	0	1	2	1	2	2	4
2:00 pm	0	0	0	2	0	2	0	4
3:00 pm	0	0	0	1	0	1	0	2
4:00 pm	13	0	0	3	0	3	13	6
5:00 pm	**9**	**13**	**1**	**15**	**1**	**15**	**11**	**43**
6:00 pm	0	9	0	1	0	1	0	11
7:00 pm	0	0	0	0	0	0	0	0
8:00 pm	0	0	0	0	0	0	0	0
9:00 pm	0	0	0	0	0	0	0	0
Daily[A]	**44**	**44**	**28**	**28**	**28**	**28**	**100**	**100**

[A] *Vehicles per day.*

Construction activity during the peak construction stage is therefore expected to generate 200 vehicle trips per day. Peak hours for construction-generated vehicle trips would be between 6:00 am and 7:00 am, and between 5:00 pm and 6:00 pm.

Table 3.2 summarises the total traffic expected to be generated by construction activity at the Project during the peak construction stage in 2036. Table 3.2 indicates that construction activity during the 2036 construction stage is therefore expected to generate 24 vehicle trips per day. Peak hours for construction-generated vehicle trips would be between 6:00 am and 7:00 am, and between 5:00 pm and 6:00 pm.

Table 3.2: Estimated Project Construction Traffic 2036 (vehicles per hour)

Hour Start	Workforce		Visitors		Deliveries		Total	
	Inbound	Outbound	Inbound	Outbound	Inbound	Outbound	Inbound	Outbound
3:00 am	-	-	-	-	-	-	-	-
4:00 am	-	-	-	-	-	-	-	-
5:00 am	3	-	1	-	1	-	5	-
6:00 am	**-**	**3**	**2**	**-**	**2**	**-**	**4**	**3**
7:00 am	-	-	-	-	-	-	-	-
8:00 am	-	-	-	-	-	-	-	-
9:00 am	-	-	-	-	-	-	-	-
10:00 am	-	-	-	-	-	-	-	-
11:00 am	-	-	-	-	-	-	-	-
12:00 pm	-	-	-	-	-	-	-	-
1:00 pm	-	-	-	-	-	-	-	-
2:00 pm	-	-	-	-	-	-	-	-
3:00 pm	-	-	-	-	-	-	-	-
4:00 pm	3	-	-	1	-	1	3	2
5:00 pm	**-**	**3**	**-**	**2**	**-**	**2**	**-**	**7**
6:00 pm	-	-	-	-	-	-	-	-
7:00 pm	-	-	-	-	-	-	-	-
8:00 pm	-	-	-	-	-	-	-	-
9:00 pm	-	-	-	-	-	-	-	-
Daily[A]	**6**	**6**	**3**	**3**	**3**	**3**	**12**	**12**

[A] *Vehicles per day.*

3.2 Operational Activity

3.2.1 Operational Workforce

During the peak construction stage described in Section 2.3, the total operational workforce at the Project is expected to be up to 555 people in 2026, and 760 people during the operational stage assumed for 2036.

Based on the operational workforce at the time of the surveys of approximately 380 full-time equivalent (FTE) workers[4], the Project would result in an additional 175 FTE workers in 2026, and an additional 380 FTE workers in the 2036 scenario.

These additional personnel would work under similar shift arrangements to those currently occurring at the Mount Pleasant Operation, nominally 7:00 am to 5.00 pm weekdays for administration personnel, 7:00 am to 7:30 pm for mining operations personnel on day shift and 7:00 pm to 7:30 pm for mining operations personnel on night shift. Thus, their arrival and departure patterns are likely to be similar to those of the existing operational workforce (Section 3.2.4).

As a robust assessment of the potential traffic generation of those workers (i.e., to ensure that potential impacts are not understated), no allowance has been made for workers being on leave, with 100 percent of the additional operational workers assumed to attend the site each day. These workers would travel by private vehicle, with some car-pooling resulting in an average vehicle occupancy of 1.2 people per vehicle. On this basis, the additional operational workforce would generate:

- 292 vehicle trips per day in 2026; and
- 634 vehicle trips per day in 2036.

The distributions of the arrivals and departures of the additional operational workers have been determined based on the results of analysis of login and logout records at the Mount Pleasant Operation over an extended period of operational activity between 9 July 2019 and 29 November 2019 (pattern summarised in Section 3.2.4).

3.2.2 Operational Visitors

Analysis of login records for visitors over the operational period during which the Automatic Traffic Count (ATC) surveys (Section 0) were conducted indicate that over the surveyed weekdays, an average of 10 visitors logged in to the Mount Pleasant Operation per day for every 100 personnel. Based on the forecast additional operational workforce of 180 and 380 FTE workers in 2026 and 2036, respectively, compared with conditions captured in the February 2020 traffic surveys, the Project can be expected to generate an additional:

- 18 visitors per day in 2026; and
- 38 visitors per day in 2036.

It has been assumed that the operational visitors would arrive and depart following a similar pattern as suggested by analysis of login and logout records at the Mount Pleasant Operation over an extended period between 9 July 2019 and 29 November 2019, and assuming each visitor travels in a separate vehicle (pattern summarised in Section 3.2.4).

[4] TTPP understands that since the surveys were completed in early 2020, the existing workforce has increased to approximately 440 FTE personnel. However, as this assessment is based on the proposed increase to workforce relative to the surveyed traffic conditions, the current workforce has no bearing on the results of the assessment.

3.2.3 Operational Heavy Vehicle Deliveries

Operational activity at the Project requires deliveries of consumables such as diesel, coolant, oil, grease and explosives. The number of deliveries required to meet the forecast demand for these consumables in the future assessment years is presented in Table 3.3.

Table 3.3: Annual Number of Deliveries of Consumables

Consumable	Vehicle Type	2020	2026	2036
Diesel	B-double	692	1,746	2,073
Coolant	Rigid	7	18	16
Oil	Semitrailer	47	117	99
Grease	Rigid	18	36	48
Explosives	B-double	549	1,026	1,539
Total		**1,313**	**2,943**	**3,775**

Over an average week, and compared with 2020 demands, the Project can be expected to result in approximately 32 additional deliveries in 2026 and 47 additional deliveries in 2036. Deliveries may occur throughout the week, and for the purpose of this assessment are assumed to generate the following additional trips above those captured in the 2020 traffic surveys:

- 12 heavy vehicle trips per day in 2026; and
- 18 heavy vehicle trips per day in 2036.

3.2.4 Total Operational Traffic Generation

Table 3.4 summarises the additional traffic expected to be generated by operational activity at the Project during the peak construction stage in 2026.

Table 3.4: Estimated Project Additional Operational Traffic 2026 (vehicles per hour)

Hour Start	Workforce		Visitors		Deliveries		Total	
	Inbound	Outbound	Inbound	Outbound	Inbound	Outbound	Inbound	Outbound
2:00 am	-	2	-	-	-	-	-	2
3:00 am	-	11	-	-	-	-	-	11
4:00 am	3	-	-	-	-	-	3	-
5:00 am	**63**	**1**	**6**	**-**	**2**	**-**	**71**	**1**
6:00 am	57	2	2	-	1	-	60	2
7:00 am	1	1	2	1	1	-	4	2
8:00 am	1	1	2	1	1	-	4	2
9:00 am	1	1	1	1	1	-	3	2
10:00 am	1	5	1	1	-	1	2	7
11:00 am	1	1	1	1	-	-	2	2
12:00 pm	1	2	1	2	-	1	2	5
1:00 pm	1	2	1	1	-	-	2	3
2:00 pm	-	1	1	1	-	1	1	3
3:00 pm	1	1	-	1	-	-	1	2
4:00 pm	**5**	**90**	**-**	**2**	**-**	**1**	**5**	**93**
5:00 pm	10	18	-	4	-	1	10	23
6:00 pm	-	7	-	2	-	1	-	10
7:00 pm	-	-	-	-	-	-	-	-
8:00 pm	-	-	-	-	-	-	-	-
9:00 pm	-	-	-	-	-	-	-	-
Daily[A]	**146**	**146**	**18**	**18**	**6**	**6**	**170**	**170**

[A] *Vehicles per day.*

Project operational activity in 2026 is therefore expected to generate an additional 340 vehicle trips per day. Peak hours for operations-generated vehicle trips would be between 5:00 am and 6:00 am, and between 4:00 pm and 5:00 pm.

Comparing Table 3.4 with the forecast construction traffic generation in 2026 (Table 3.1), it is evident that due to the different arrival and departure patterns expected for the operational and construction activity, the peak hours for traffic generated by the operational activity and the construction activity would not coincide.

Table 3.5 summarises the additional traffic expected to be generated by operational activity at the Project during 2036.

Table 3.5: Estimated Project Additional Operational Traffic 2036 (vehicles per hour)

Hour Start	Workforce		Visitors		Deliveries		Total	
	Inbound	Outbound	Inbound	Outbound	Inbound	Outbound	Inbound	Outbound
2:00 am	-	4	-	-			-	4
3:00 am	-	25	-	1	-	-	-	26
4:00 am	8	-	-	-	-	-	8	-
5:00 am	**137**	**2**	**12**	**-**	**3**	**-**	**152**	**2**
6:00 am	125	4	4	1	1	-	130	5
7:00 am	2	3	4	1	1	-	7	4
8:00 am	1	2	3	1	1	-	5	3
9:00 am	1	2	3	2	1	-	5	4
10:00 am	3	10	3	2	1	1	7	13
11:00 am	3	2	2	2	1	-	6	4
12:00 pm	2	4	1	3	-	1	3	8
1:00 pm	1	4	2	2	-	-	3	6
2:00 pm	1	3	1	2	-	1	2	6
3:00 pm	2	2	1	2	-	1	3	5
4:00 pm	**10**	**196**	**1**	**5**	**-**	**1**	**11**	**202**
5:00 pm	21	39	1	8	-	2	22	49
6:00 pm	-	14	-	5	-	1	-	20
7:00 pm	-	-	-	-	-	-	-	-
8:00 pm	-	1	-	1	-	1	-	3
Daily[A]	**317**	**317**	**38**	**38**	**9**	**9**	**364**	**364**

[A] *Vehicles per day.*

Project operational activity in 2036 is therefore expected to generate an additional 728 vehicle trips per day. Peak hours for operations-generated vehicle trips would be between 5:00 am and 6:00 am, and between 4:00 pm and 5:00 pm.

As noted above for 2026, comparing Table 3.4 with the forecast construction traffic generation in 2036 (Table 3.2), it is evident that due to the different arrival and departure patterns expected for the operational and construction activity, the peak hours for traffic generated by the operational activity and the construction activity would not coincide.

3.3 Total Additional Project Traffic Generation

The total forecast additional traffic generated by the Project during the peak construction stage and longer-term operational stage is presented in Table 3.6, including both the additional construction and operational traffic expected under each scenario.

During 2026, the peak hours for the total additional Project traffic generation would occur between 6:00 am and 7:00 am and between 4:00 pm and 5:00 pm. During 2036, the peak

hours for the total additional Project traffic generation would occur between 5:00 am and 6:00 am and between 4:00 pm and 5:00 pm.

The difference in the timing of the AM peak hour in the two scenarios is due to 2026 having a much larger contribution from construction-related activity, which generates its peak volume of traffic later than that of the operational activity. In 2036, the contribution of construction activity to the total traffic demands is much lower, and so the operational traffic generation has the greatest impact on the timing of the AM peak hour.

Table 3.6: Estimated Total Additional[A] Project Traffic 2026 and 2036

	Light Vehicles		Heavy Vehicles		Buses		Total	
	Inbound	Outbound	Inbound	Outbound	Inbound	Outbound	Inbound	Outbound
Peak Construction Stage 2026								
AM Peak Hour (6:00 am to 7:00 am)	77	3	19	1	9	13	105	17
PM Peak Hour (4:00 pm to 5:00 pm)	5	95	0	4	13	0	18	99
Daily	192	192	34	34	44	44	270	270
Operational Stage 2036								
AM Peak Hour (5:00 am to 6:00 am)	150	2	4	0	3	0	157	2
PM Peak Hour (4:00 pm to 5:00 pm)	11	202	0	2	3	0	14	204
Daily	358	358	12	12	6	6	376	376

[A] *Forecast additional vehicle trips above 2020 levels.*

4 Existing Road Transport Environment

4.1 Road Network

The existing road network in the vicinity of the Project is shown in Figure 4.1, and the key roads in the road network surrounding the site are described below.

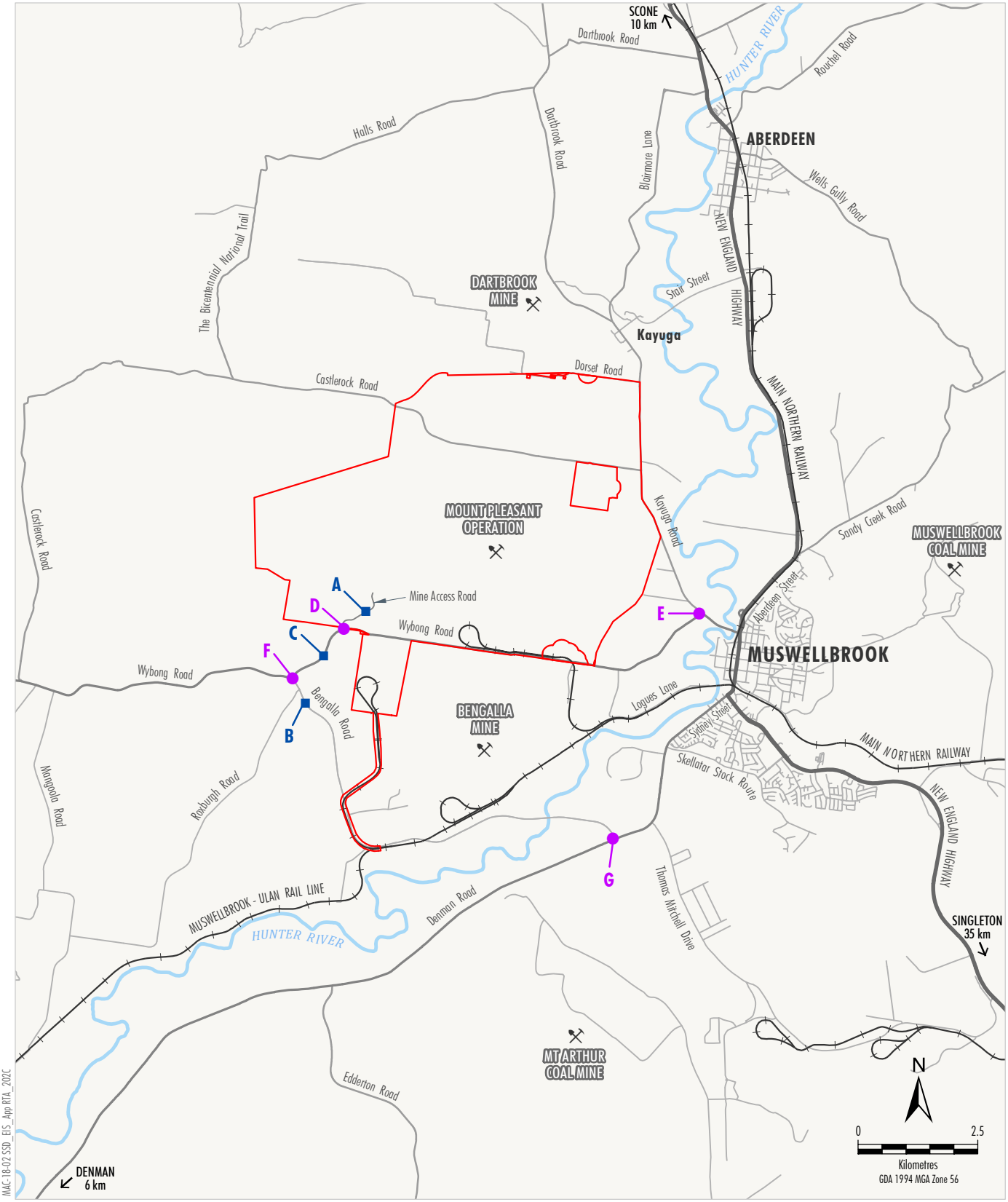
New England Highway (Highway 9, Route A15) is a major State road and forms part of the National Land Transport Network, a defined national network of road and rail infrastructure links for which Commonwealth funding is provided to assist national and regional economic and social development. New England Highway is the main north-south link through the Hunter Region and connects Muswellbrook and Newcastle as part of its route between Hexham and the Queensland border. It is an alternative to the Pacific Highway for the north-south vehicular link between Brisbane and Sydney, and as such carries a significant proportion of regional and interstate traffic movements.

Outside of the urban areas, New England Highway is generally a two-lane high standard rural highway with regular overtaking lanes, wide sealed shoulders, designated turning lanes and a posted speed limit of 100 kilometres per hour (km/h). New England Highway is an approved B-double route. The New England Highway bypass of Scone was opened to traffic in early 2020.

Golden Highway (Highway 27, Route B84) is also known as Merriwa Road, Jerrys Plains Road, Putty Road and Mitchell Line of Road, and is a State road under the control of TfNSW. Golden Highway provides a road link between New England Highway at Minimbah and Newell Highway at Dubbo. It is generally a two-lane rural highway with a posted speed limit of 100 km/h outside of urban areas. Golden Highway is an approved B-double route.

Denman Road (Main Road 209) is a State road that is funded by the RMS but maintained by MSC. Denman Road forms the primary connection between the township of Denman and Muswellbrook and provides a road link between Golden Highway and New England Highway. Outside of the urban areas, Denman Road is a two-lane rural road, with a 7 metre (m) wide sealed carriageway, additional sealed shoulders, and a posted speed limit of 100 km/h, reducing to 80 km/h west of Bengalla Road. Denman Road is a designated B-double route.

Denman Road provides access to a number of existing mining operations via local roads such as Edderton Road and Thomas Mitchell Drive. As a result, Denman Road carries a significant proportion of mine-related traffic, particularly employee traffic accessing the mining operations.



LEGEND

- Mining Operation
- Mining Lease Boundary (Mount Pleasant Operation)
- Project Road Intersection Survey Location
- Project Tube Count Survey Location

Source: TTPP (2020); NSW Spatial Services (2020)

MACHEnergy

MOUNT PLEASANT OPTIMISATION PROJECT

Traffic Survey Locations

Figure 4.1

Bengalla Road is a local road under the control of MSC and is an approved B-double route between Denman Road and the entry to Bengalla Mine. It is a sealed road, with a single travel lane in each direction and sealed shoulders. The speed limit on Bengalla Road is 100 km/h. Together with Wybong Road, Bengalla Road provides a link between Denman Road south of Muswellbrook and Merriwa Road (Golden Highway) at Sandy Hollow. It provides vehicular access to Bengalla Mine, and crosses the Muswellbrook-Ulan Rail Line at a road over rail crossing approximately 4 km from Denman Road. At the T-intersection formed with Wybong Road, Bengalla Road and Wybong Road west are the priority main road, and Wybong Road north-east is the minor road. Bengalla Road is currently the only permitted heavy vehicle access road to and from the Mount Pleasant Operation (Section 2.1). As use of the Kayuga Bridge is currently prohibited by the SAMP (MACH, 2019b), Bengalla Road is also the route used for travel between Muswellbrook and the Mount Pleasant Operation for the workforce and deliveries.

Wybong Road is a local road under the control of MSC, which provides a link between Kayuga Road north-west of Muswellbrook and Merriwa Road (Golden Highway) at Sandy Hollow. The speed limit on Wybong Road is 100 km/h, reducing to 80 km/h for approximately 750 m on approach to Kayuga Road. The vehicular access for the Mount Pleasant Operation is provided from Wybong Road, approximately 8 km from Kayuga Road and 1.5 km from Bengalla Road. East of the Mount Pleasant Operation access, Wybong Road is subject to a gross load limit of 12 tonnes (t) and has centre linemarking and no edgelines. West of the Mount Pleasant Operation access, Wybong Road has centre linemarking, solid edgelines and sealed shoulders. Signage indicates the road is subject to flooding in the vicinity of the Rosebrook Bridge east of Logues Lane. MACH has committed to resurfacing Wybong Road between the Mount Pleasant Operation Mine Road and Overton Road as part of the Stage 2 (Modification 4) rail spur construction.

Kayuga Road is a local road under the control of MSC, which provides a link between Aberdeen Street on the western side of the Main Northern Railway Muswellbrook, and the locality of Kayuga. It is a sealed road with a single travel lane in each direction, with the exception of at Kayuga Bridge over the Hunter River immediately west of Aberdeen Street, which is a single lane bridge, at which westbound vehicles must give way to vehicles on the bridge. Use of the Kayuga Bridge by Mount Pleasant Operation-related traffic is currently prohibited by the SAMP (MACH, 2019b). Kayuga Road has centre linemarking east of Wybong Road and no linemarking to the north-west of Wybong Road. The speed limit on Kayuga Road is 80 km/h from Aberdeen Street to approximately 1.5 km north-west of Wybong Road, 100 km/h over the next approximately 3.5 km, then reduces to 80 km/h through Kayuga.

Blairmore Lane and **Dartbrook Road** are local roads which link Kayuga Road to New England Highway north of Aberdeen. Most of the length of both roads are under the control of Upper Hunter Shire Council, and a short length at the southern end of each road are under the control of MSC. These roads are of similar standards, being sealed rural roads of varying width with limited linemarking and signage, and each containing a single lane bridge.

Thomas Mitchell Drive is a local road under the control of MSC and is an approved B-Double route. It provides a link between Denman Road and New England Highway to the south of Muswellbrook township, thus providing a bypass of Muswellbrook for some traffic and is signposted as an alternative route to Singleton from Denman Road. It is a 7 m wide sealed road, and provides access to the Mt Arthur Coal Mine, the Muswellbrook Industrial Area, and the Maxwell Infrastructure. Thomas Mitchell Drive crosses the Antiene Rail Spur at rail over road crossings at two locations approximately 3 km and 4.8 km west of New England Highway. The speed limit on Thomas Mitchell Drive is 80 km/h through and to the west of the Industrial Area, and between the Maxwell Infrastructure access and New England Highway. The remainder has a speed limit of 100 km/h.

The NSW Department of Planning and Environment (now the Department of Planning, Industry and Environment [DPIE]) produced the Thomas Mitchell Drive Contributions Study (GHD, 2015), with a supplementary report (GHD, 2018). These establish a contributions framework for the allocation of funding to upgrade and maintain Thomas Mitchell Drive. Currently, Mangoola Coal, Bengalla Mine, Mt Arthur Coal Mine and the Mount Pleasant Operation contribute funding.

Mount Pleasant Operation Mine Access Road is the private access road for the Mount Pleasant Operation, and intersects with Wybong Road at a priority-controlled T-intersection. It has a single travel lane in each direction, with centre linemarking and painted edge lines.

Mount Pleasant Northern Link Road is an approved road realignment that will provide an east-west link between Dorset Road and Castlerock Road, to the north of the Mount Pleasant Operation. This realignment would occur with or without the Project, and will be constructed prior to closure of the eastern section of Castlerock Road to allow access to coal reserves in North Pit. Development of the Northern Link Road is currently scheduled to commence in early 2024. The alignment of the Northern Link Road would be revised for the Project to improve the safety of the intersection between the Northern Link Road and the western section of Castlerock Road. If the Project is approved, development of the Northern Link Road may commence approximately 12 months later than currently scheduled.

4.2 Intersections

The key intersections in the road network of relevance to the Project are described below.

The intersection of **Wybong Road and Mount Pleasant Operation Mine Access Road** is a priority-controlled T-intersection with a channelised left turn deceleration lane in Wybong Road for vehicles entering the access road, and wide sealed shoulders and a wire rope barrier on the southern side of Wybong Road over approximately 300 m past the intersection. The site access road has a single approach and single departure lane at the intersection.

The intersection of **Wybong Road and Bengalla Road** is a priority-controlled T-intersection with a channelised left turn deceleration lane in Wybong Road west and a channelised right turn deceleration lane in Bengalla Road. Wybong Road north is the minor approach to the intersection, and has a single approach and single departure lane, separated by a concrete median island.

The intersection of **Bengalla Road and Denman Road** is a priority-controlled T-intersection, with channelised left and right turn deceleration lanes in Denman Road, and an eastbound acceleration lane in Denman Road for those vehicles that have turned left from Bengalla Road. Bengalla Road has a single approach and single departure lane at the intersection, separated by a concrete median island. Overhead lighting is provided at the intersection.

The intersection of **Wybong Road and Kayuga Road** is a basic rural priority-controlled T-intersection, with single approach and departure lanes on all legs, and no auxiliary turn lanes. Kayuga Road is the major road at the intersection, and Wybong Road is the minor road, with "give way" signs. Wybong Road meets Kayuga Road at approximately 75 degrees, and both roads follow a straight and level alignment in the immediate vicinity of the intersection, such that sight lines are good.

The intersection of **Thomas Mitchell Drive and Denman Road** has a left turn deceleration lane and short left turn acceleration lane in Denman Road, and widening of the northbound carriageway that allows northbound vehicles to pass around vehicles waiting to turn right into Thomas Mitchell Drive. Separate left and right turn lanes are provided in Thomas Mitchell Drive on the approach to the intersection. A single departure lane is provided in Thomas Mitchell Drive, which widens to two eastbound lanes before merging to a single lane over approximately 300 m. Condition 47(c), Schedule 3 of Project Approval 09_0062 for the Mt Arthur Coal Mine Open Cut Consolidation Project requires upgrading of the intersection of Denman Road and Thomas Mitchell Drive.

The intersection of **Thomas Mitchell Drive and New England Highway** is a seagull intersection with channelised deceleration lanes for vehicles turning into Thomas Mitchell Drive, and acceleration lanes for vehicles turning into New England Highway in both directions. Vehicles turning right into Thomas Mitchell Drive have priority over those turning left into Thomas Mitchell Drive, which approach via a slip lane with "give way" control. Vehicles turning right from Thomas Mitchell Drive have a "stop" control prior to crossing the northbound lane of New England Highway.

4.3 Traffic Survey Program

To quantify existing traffic conditions as a baseline against which future conditions can be assessed, a program of traffic surveys was undertaken on roads and intersections of relevance to the Project. The traffic survey program was developed to quantify the existing characteristics of the traffic generated by the Mount Pleasant Operation, and its contribution to traffic on the primary Mount Pleasant Operation access routes. It is considered that the main constraint on the capacity of the road network serving the Mount Pleasant Operation is the operation of the intersections in the network during peak hours rather than the midblock capacity of the roads. This is due to the need for vehicles in opposing directions to occupy the same road space at intersections. While the traffic survey program includes midblock traffic volumes, and the assessment which follows considers the midblock capacity at the surveyed locations, the intersection operating characteristics are considered to be the more critical and relevant criteria.

The survey program included mid-block surveys using ATCs of classified vehicle volumes by direction over one week between Tuesday 11 February and Monday 17 February 2020 (inclusive) on:

- Mount Pleasant Operation main access road north of Wybong Road;
- Bengalla Road south-east of Wybong Road; and
- Wybong Road between Bengalla Road and Mount Pleasant Operation Road.

To examine the distribution of traffic, vehicle turning movement surveys were undertaken between 6:00 am and 6:00 pm on Wednesday 27 November 2019 at the intersections of:

- Mount Pleasant Operation Road and Wybong Road;
- Wybong Road and Kayuga Road;
- Wybong Road and Bengalla Road; and
- Bengalla Road and Denman Road.

A check survey using an ATC was also conducted on the Mount Pleasant Operation Road at the same time as the intersection surveys. The survey locations are presented on Figure 4.1, and results of the midblock and intersection surveys are presented in Appendix A.

4.4 Midblock Traffic Volumes

Table 4.1 presents a summary of the daily traffic volumes[5] surveyed at the midblock locations during February 2020.

[5] *Throughout this report, the traffic volume at a point on the road network is the sum of the number of vehicles passing that point in both directions (or a single direction only if stated) within the given time period.*

Table 4.1: Surveyed Daily Traffic Volumes (vehicles per day)

Site[A]	Road	Mon	Tue	Wed	Thu	Fri	Sat	Sun
A	Mount Pleasant Operation Road	784	895	988	951	820	380	344
B	Bengalla Road south-east of Wybong Road	1,913	1,943	2,111	2,128	1,958	948	900
C	Wybong Road north of Bengalla Road	1,164	1,362	1,460	1,448	1,314	683	661

[A] *Refer to Figure 4.1.*

The results demonstrate that the weekday volumes are distinctly different from those on weekend days at all the surveyed locations. Over the surveyed week, Mount Pleasant Operation generated an average of 888 vehicles per weekday, and 362 vehicles per weekend day.

The surveys included classification of the vehicles based on the Austroads Vehicle Classification System. Light vehicles include motorcycles, cars, vans, 4-wheel drives (4WDs), and utes (including those towing a trailer or caravan). Heavy vehicles include single unit rigid trucks and buses with two, three or four axles and up to 14.5 m long, as well as articulated vehicles (which include semi-trailers and rigid trucks with trailers, B-Doubles and road trains where permitted). The surveyed average weekday daily classified traffic volumes are summarised in Table 4.2.

Table 4.2: Surveyed Average Weekday Daily Traffic Classification (vehicles per day)

Site[A]	Road	Light	Rigid	Articulated	Total	Percent Heavy
A	Mount Pleasant Operation Road	734	136	18	888	17.3
B	Bengalla Road south-east of Wybong Road	1,635	331	44	2,010	18.7
C	Wybong Road north of Bengalla Road	1,146	181	22	1,349	15.0

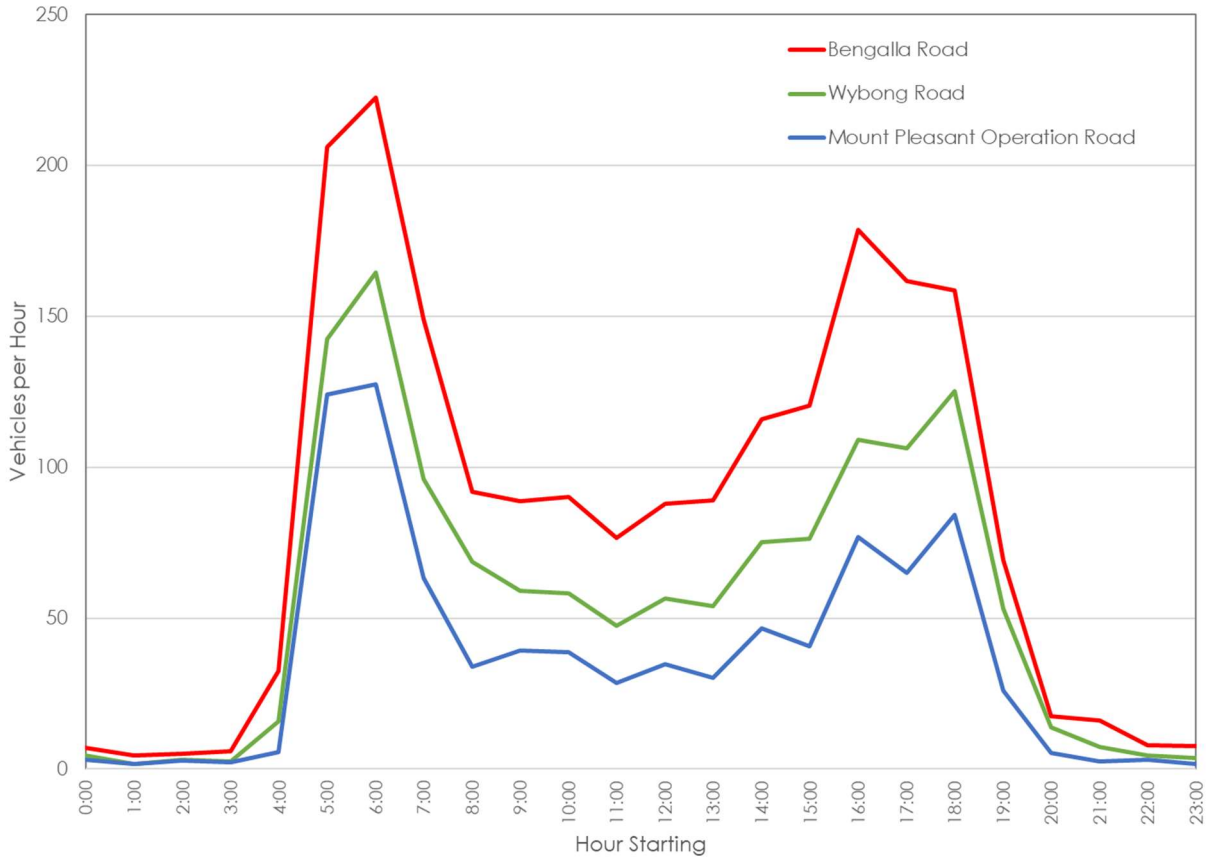
[A] *Refer to Figure 4.1.*

It is noted that, of the rigid vehicles on the Mount Pleasant Operation Road in Table 4.2, the significant majority are "Class 3" vehicles under the Austroads system, which include longer wheelbase utilities and 4WDs (such as Ford Rangers and RAM 1500 utilities), which are commonly used in mining operations, and which would otherwise be considered as light vehicles. The reported percent heavy vehicles in Table 4.2 assume that these vehicles are all heavy vehicles, and is therefore considered to overestimate the actual number of rigid heavy vehicles.

The survey results allow the distribution of traffic through the day on each road to be quantified. Figure 4.2 presents the hourly two-way traffic volumes over the average weekday at the surveyed locations.

Figure 4.2 demonstrates that the distribution of traffic throughout the day on the surveyed roads follows a similar pattern, with a distinct peak in traffic during the early morning, decreasing through the middle of the day, before increasing to a peak in the evening. The peak traffic on Bengalla Road in the evening occurred earlier than that on the Mount Pleasant Operation Road and on Wybong Road.

Figure 4.2: Surveyed Average Weekday Traffic by Time of Day (vehicles per hour)



On the average weekday, the peak hourly traffic generation of the Mount Pleasant Operation occurred in the morning, with an average of 128 vehicles per hour between 6:00 am and 7:00 am, and a slightly lower peak of 124 vehicles per hour between 5:00 am and 6:00 am. The peak hour in the evening was significantly lower than the morning peak hour, with 84 vehicles per hour between 6:00 pm and 7:00 pm. The trip generation surveyed between 4:00 pm and 5:00 pm was only slightly below that of the peak hour, with 77 vehicles per hour.

Table 4.3 summarises the surveyed average weekday two-way traffic flows during the morning and afternoon peak hours, which represent the busiest hour before and after midday at each survey location, measured over the average weekday.

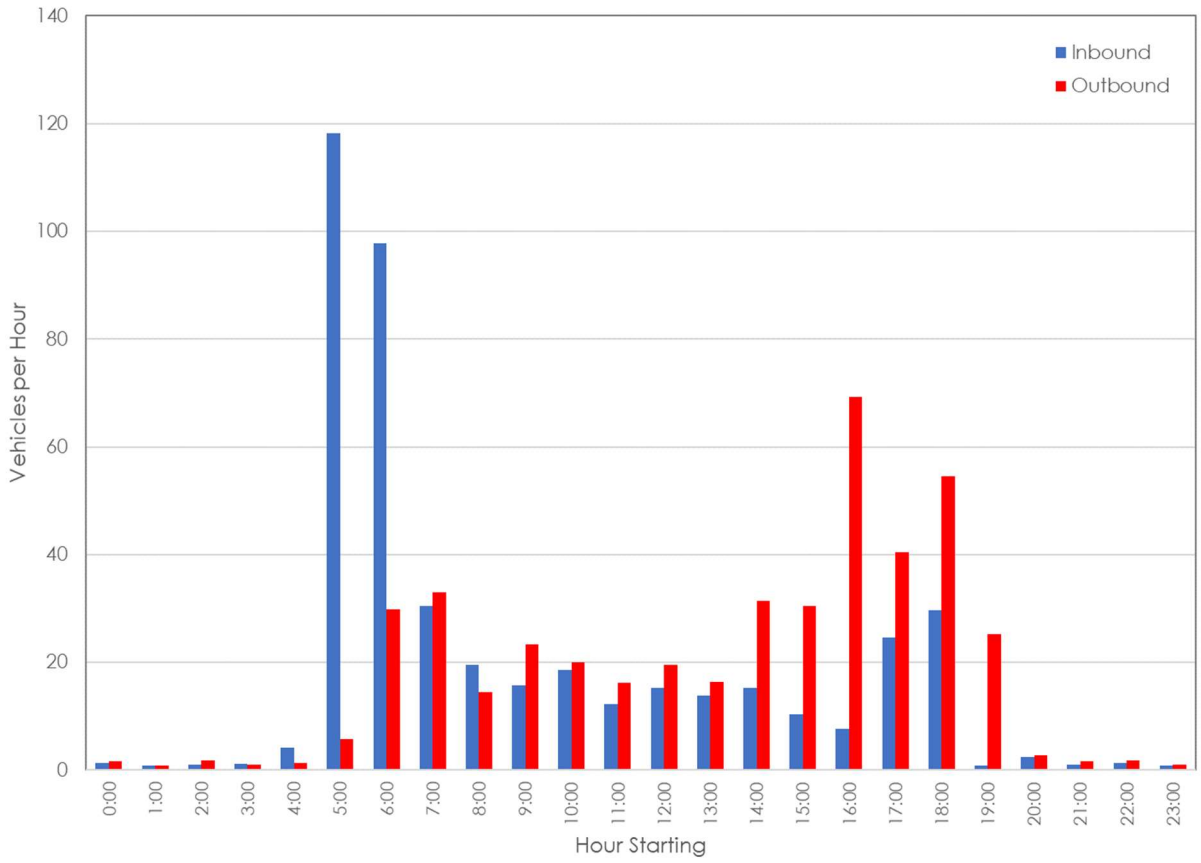
Table 4.3: Surveyed Average Weekday Peak Hourly Traffic Volumes (vehicles per hour)

Site[A]	Road	AM Peak				PM Peak			
		Hour	Light	Heavy	Total	Hour	Light	Heavy	Total
A	Mount Pleasant Operation Road	6:00	109	19	128	18:00	75	9	84
B	Bengalla Road south-east of Wybong Road	6:00	186	36	222	16:00	152	27	179
C	Wybong Road north of Bengalla Road	6:00	145	19	164	18:00	110	15	125

[A] *Refer to Figure 4.1.*

Examination of the survey data (Figure 4.3) indicates that the traffic generated by the Mount Pleasant Operation displays a peak in inbound vehicles between 5:00 am and 7:00 am, and a lower and more spread peak in outbound vehicles between 4:00 pm and 7:00 pm.

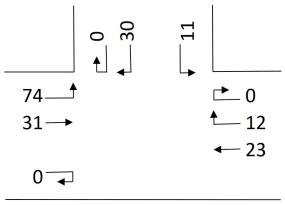
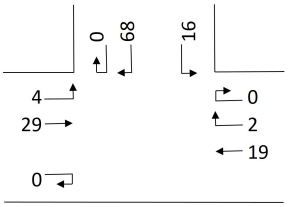
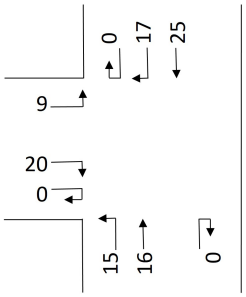
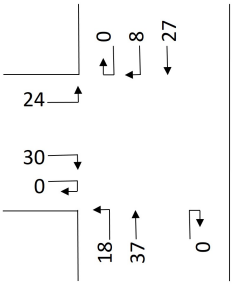
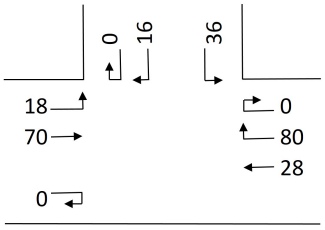
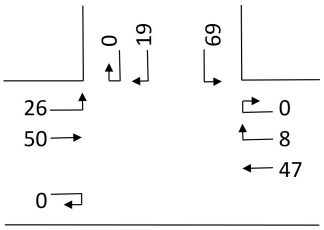
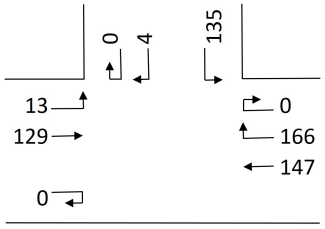
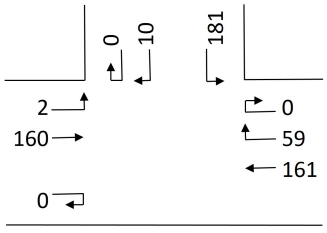
Figure 4.3: Mount Pleasant Operation Average Weekday Hourly Traffic Distribution 2020



4.5 Intersection Turning Movements

Vehicle turning movements were recorded at the surveyed intersections at 15-minute intervals between 6:00 am and 6:00 pm on Wednesday 27 November 2019, during fine weather. The number of vehicle movements turning into and out of the Mount Pleasant Operation access with Wybong Road occurred between 6:15 am and 7:15 am (AM peak) and between 4:00 pm and 5:00 pm (PM peak). The surveyed turning movements at all intersections during those peaks associated with the Mount Pleasant Operation traffic are summarised in Table 4.4.

Table 4.4: Surveyed Traffic at Intersections During Mount Pleasant Operation Peak Hours

Site[A]	Intersection	AM Peak Hour 6:15 am to 7:15 am (vehicles per hour)	PM Peak Hour 4:00 pm to 5:00 pm (vehicles per hour)
D	Mount Pleasant Operation Road and Wybong Road		
E	Wybong Road and Kayuga Road		
F	Wybong Road and Bengalla Road		
G	Bengalla Road and Denman Road		

[A] *Refer to Figure 4.1.*

The following observations were made from the results of the 12-hour intersection turning movement surveys:

- During the 12 hours surveyed at the intersection, 700 vehicles entered or exited the Mount Pleasant Operation, of which 87 percent were light vehicles and 13 percent were heavy vehicles. A check ATC survey undertaken on the access road on the same day indicates that over the 12 hours surveyed, 79 percent of vehicles were light, 11 percent of vehicles were small trucks, 7 percent were medium trucks and less than 2 percent were large trucks (a small number of vehicles were unclassified by the tube counter). This confirms that the ATC results tend to overestimate the number of rigid heavy vehicles by classifying some larger light vehicles as small heavy vehicles.
- 80 percent of vehicles using the Mount Pleasant Operation access road approached or departed to the west on Wybong Road.

4.6 Historic Traffic Demands

TfNSW collects and publishes Annual Average Daily Traffic (AADT) volume data at selected locations on its roads. Available AADT data on roads in the vicinity of Muswellbrook since 2015 were reviewed and collated, and are summarised in Table 4.5.

Table 4.5: Historic Annual Average Daily Traffic Volumes (vehicles per day)

Road	TfNSW Station	2015	2017	2018	2019
New England Highway South of Macqueen Street, Aberdeen	06158	10,179	10,355	10,311	10,311
New England Highway North of Burtons Lane (north of Muswellbrook)	06157	10,161	10,336	10,324	10,299
New England Highway South of Muscle Creek Road (south of Muswellbrook)	06154	9,359	9,349	9,393	9,569
New England Highway North of Rixs Creek Lane (north of Singleton)	06153	13,254	13,796	14,284	14,671
Merriwa Road (Golden Highway) West of Giants Creek Road, Sandy Hollow	06164	2,023	2,203	2,221	2,160
Palace Street (Golden Highway) North of Kenilworth Street, Denman	05223	2,741	2,908	-	-

Historic daily traffic volume data for roads of relevance to the Project have also been collated from other available sources, and are summarised in Table 4.6, noting that as mining activity levels have changed over time, current volumes may be significantly different from the historic volumes, particularly on those roads used for access to and from mines in the region. The majority of this available data pre-dates commencement of construction at the Mount Pleasant Operation.

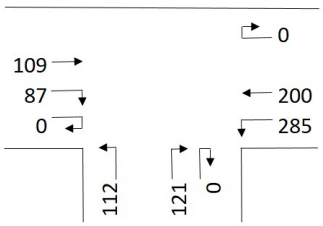
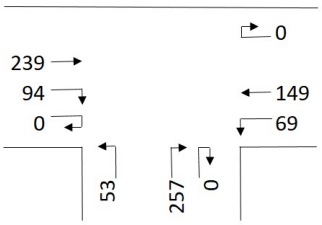
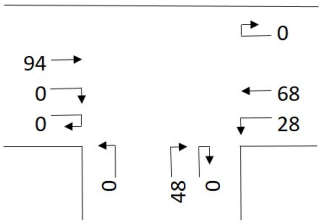
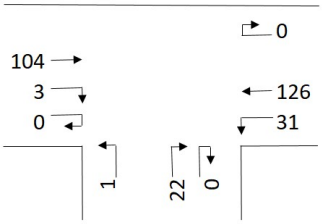
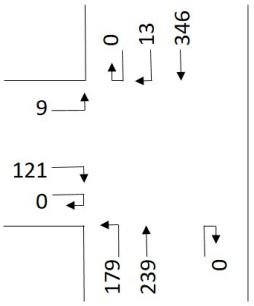
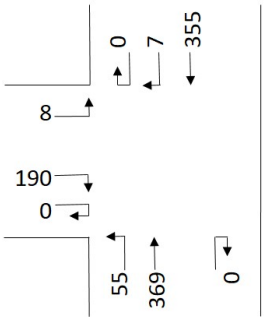
Table 4.6: Historic Daily Traffic Volumes (vehicles per day)

Road	Survey Date	Average Weekday	Average Daily	Data Source
Denman Road east of Thomas Mitchell Drive	2012	-	9,392	GHD, 2017
Denman Road west of Bengalla Road	2012	-	2,993	GHD, 2017
Denman Road north of Golden Highway	October 2013	2,371	2,094	TTPP, 2019
Denman Road north of Thomas Mitchell Drive	October 2013	8,675	7,184	TTPP, 2019
Denman Road between Golden Highway and Edderton Road	November 2013	2,446	2,219	Cardno, 2013
Golden Highway west of Denman Road	October 2013	4,231	3,898	TTPP, 2019
Golden Highway at Ogilvies Pass	November 2014	2,166	2,141	TTPP, 2019
Thomas Mitchell Drive east of Industrial Area	February 2013	3,993	3,191	Hyder, 2013
Thomas Mitchell Drive Denman Road to Industrial Area Industrial Area to Mt Arthur Coal Mine Mt Arthur Coal Mine to Maxwell Underground Project Maxwell Underground Project to New England Highway	November 2013	8,801 4,702 3,789 4,146	- - - -	Cardno, 2015[A]
Thomas Mitchell Drive near Denman Road	November 2016	-	5,006	GHD, 2017
Thomas Mitchell Drive east of Denman Road west of New England Highway	June 2018	6,125 3,350	4,902 2,817	TTPP, 2019

[A] *Volumes are modelled, not surveyed.*

Intersection turning movement survey data for roads in proximity to the Project have also been collated from other available sources for the period following commencement of construction of the Mount Pleasant Operation. These are summarised in Table 4.7 for the peak hours identified by the traffic survey program for traffic generated by the Mount Pleasant Operation.

Table 4.7: Historic Traffic at Intersections During Mount Pleasant Operation Peak Hours

Intersection	AM Peak Hour 6:15 am to 7:15 am (vehicles per hour)	PM Peak Hour 4:00 pm to 5:00 pm (vehicles per hour)
Denman Road and Thomas Mitchell Drive 13 and 14 June 2018 (TTPP, 2019)		
Denman Road and Edderton Road 13 and 14 June 2018 (TTPP, 2019)		
Thomas Mitchell Drive and New England Highway 13 and 14 June 2018 (TTPP, 2019)		

4.7 Road Crash History

Road crash information was obtained from TfNSW for the most recent five-year period available, being from 1 July 2014 to 30 June 2019. The data include those crashes that conform to the national guidelines for reporting and classifying road vehicle crashes based on the following criteria:

- The crash was reported to the police.
- The crash occurred on a road open to the public.
- The crash involved at least one moving vehicle.
- The crash involved at least one person being killed or injured or at least one motor vehicle being towed away.

Crash data were reviewed for the following routes relevant to the Project and surrounding roads:

- Wybong Road;
- Bengalla Road;
- Denman Road;
- Thomas Mitchell Drive;
- Kayuga Road; and
- Castlerock Road.

Over the investigation period and routes reviewed, a total of 60 crashes occurred, resulting in three fatalities, 15 people being seriously injured, and 32 people being moderately injured. Table 4.8 summarises the number and general types of crashes which occurred on the sections of road under consideration.

Table 4.8: General Crash Types (1 July 2014 to 30 June 2019)

Route	Route Length (km)	Pedestrian	Adjacent Approaches	Opposing Directions	Same Direction	U-turn/Parking	Overtaking	On Path	Off Path on Straight	Off Path on Curve	Total
Wybong Road	33	-	2	1	-	-	-	3	2	8	16
Bengalla Road	10	-	-	-	1	-	-	3	-	-	4
Denman Road	21	-	1	3	2	2	1	1	9	8	27
Thomas Mitchell Drive	11	-	-	-	1	1	-	-	4	2	8
Kayuga Road	8	-	-	-	1	-	-	-	1	2	4
Castlerock Road	20	-	-	-	-	-	-	-	-	1	1
Total Crashes by Type		**0**	**3**	**4**	**5**	**3**	**1**	**7**	**16**	**21**	**60**

Table 4.8 demonstrates that the most common types of crashes involved single vehicles leaving the carriageway, known as run-off-road (ROR) crashes, which made up over 60 percent of the total reported crashes in Table 4.8. This is consistent with the Transport for NSW Centre for Road Safety (2019) crash and casualty statistics for NSW, which indicate that over the period 2014 to 2018 inclusive, nearly 70 percent of all crashes in 100 km/h speed zones in country areas were off path or out of control vehicle crashes. The Australian Road Research Board (2011) states that known causes of ROR crashes include:

- driver behaviours such as speed, inattention, avoidance manoeuvres, errant vehicles;
- driver impairment including fatigue, alcohol, drugs, mood state;

- road conditions such as horizontal alignment, shoulder deficiencies, slippery surface, poor delineation, damaged surfaces;
- vehicle failure; and
- environmental conditions such as rain, fog, snow, livestock or native fauna.

The two fatal crashes that occurred over the period investigated are detailed below.

- At the intersection of Wybong Road with Bengalla Road at 6:20 pm on 18 August 2018, a westbound car in Wybong Road turning right disobeyed the traffic control and struck a southbound light truck utility. The crash occurred in darkness on a dry road surface in fine weather. Neither speed nor fatigue were nominated as contributing factors to the crash, which resulted in two fatalities and one person being moderately injured.
- At 3:50 am on 6 February 2018, an eastbound car in Denman Road moved to the incorrect side of the road and struck a westbound large rigid truck head on. The crash occurred approximately 3.7 km from Golden Highway, in darkness on a dry road surface in fine weather conditions. Speeding and fatigue were nominated as contributing factors to the crash, which resulted in one fatality and one person being seriously injured.

A summary of the characteristics of the crashes on the access routes is provided in Appendix B and are briefly discussed below.

Wybong Road: Of the reported crashes on Wybong Road, one crash occurred between Kayuga Road and Bengalla Road, which involved a vehicle striking a kangaroo on the carriageway 2 km west of Kayuga Road. No crashes occurred at or near the intersection of Wybong Road with the Mount Pleasant Operation access road.

Five crashes occurred at the intersection of Wybong Road with Bengalla Road, including the fatal crash described above. Three crashes at the intersection were single-vehicle crashes, involving loss of control of the vehicle, and two were two-vehicle crashes, both involving a vehicle turning right at the intersection.

Bengalla Road: Of the four crashes on Bengalla Road, two involved a vehicle striking an animal in darkness and one involved a vehicle striking an object on the road in daylight.

One crash occurred at the intersection of Bengalla Road with Roxburgh Road, involving a sideswipe between a large rigid truck turning left into Roxburgh Road and a light truck overtaking. Speeding was nominated as a contributing factor.

Denman Road: No crashes occurred at or near the intersection of Denman Road with Bengalla Road over the period investigated.

One crash occurred on Denman Road on the section from 1 km east of Edderton Road to Skelletar Stock Route Road. It occurred west of Thomas Mitchell Drive in daylight and dry weather conditions. It involved a westbound semitrailer with an insecure or projecting load striking a parked large rigid truck, resulting in the semitrailer leaving the carriageway. Speeding was nominated as a contributing factor.

No crashes occurred on Denman Road between Thomas Mitchell Drive and Skelletar Stock Route Road, nor in the section from 1 km east of Edderton Road to Bengalla Road.

Thomas Mitchell Drive: No crashes occurred at or near the intersection of Thomas Mitchell Drive with Denman Road with Bengalla Road over the period investigated.

Two crashes occurred on the same day in 2014 at the intersection of Thomas Mitchell Drive with Mt Arthur Coal Mine access road. One of these involved a vehicle emerging from the driveway in daylight, and the other was a rear-end crash between two eastbound vehicles in darkness with street lighting on. Both involved a driver being distracted by something outside of the vehicle.

Two crashes occurred at the intersection of Thomas Mitchell Drive with New England Highway, both of which involved loss of control of a northbound vehicle travelling on New England Highway which left the carriageway. One of these occurred as a driver avoided an animal on the road in darkness.

Kayuga Road: No crashes occurred at or near the intersection of Kayuga Road with Wybong Road over the period investigated.

North of Wybong Road, a two-vehicle sideswipe crash occurred in rain between a motorcycle and car on Kayuga Road approximately 1 km north of Wybong Road. A crash occurred at dusk on Kayuga Road (Invermein Street) near Kayuga, in which a northbound vehicle struck a kangaroo. Speeding was nominated as a contributing factor to the crash.

South of Wybong Road, two single-vehicle crashes occurred in darkness on or near the bridge on Kayuga Road west of Aberdeen Street, one of which involved a vehicle striking roadwork equipment and the other involved a distracted driver striking the bridge while avoiding another vehicle.

Castlerock Road: One crash occurred on Castlerock Road 10 km north of Wybong Road, which involved loss of control of a northbound car that left the carriageway on a bend and struck a tree or bush. Speeding was nominated as a contributing factor.

The data do not highlight any specific location with a notably poor crash history that may suggest an inherent concern with the road layout at that location.

4.8 Road Safety Audit

In accordance with the SEARs, a Road Safety Audit of existing conditions was conducted to identify existing issues relating to the road environment that might constitute a road safety risk, and is presented in Appendix C. This included the main Project access routes (Figure 4.4):

- Wybong Road between Kayuga Road and Mangoola Road;
- Bengalla Road between Wybong Road and Denman Road;
- Denman Road between Skellatar Stock Route Road and approximately 2 km west of Edderton Road;
- Thomas Mitchell Drive between Denman Road and New England Highway; and
- Kayuga Road/Invermein Street between Wybong Road and Kayuga.

A high risk item is considered very important and needs to be addressed urgently. The road safety audit found no items with a high risk rating.

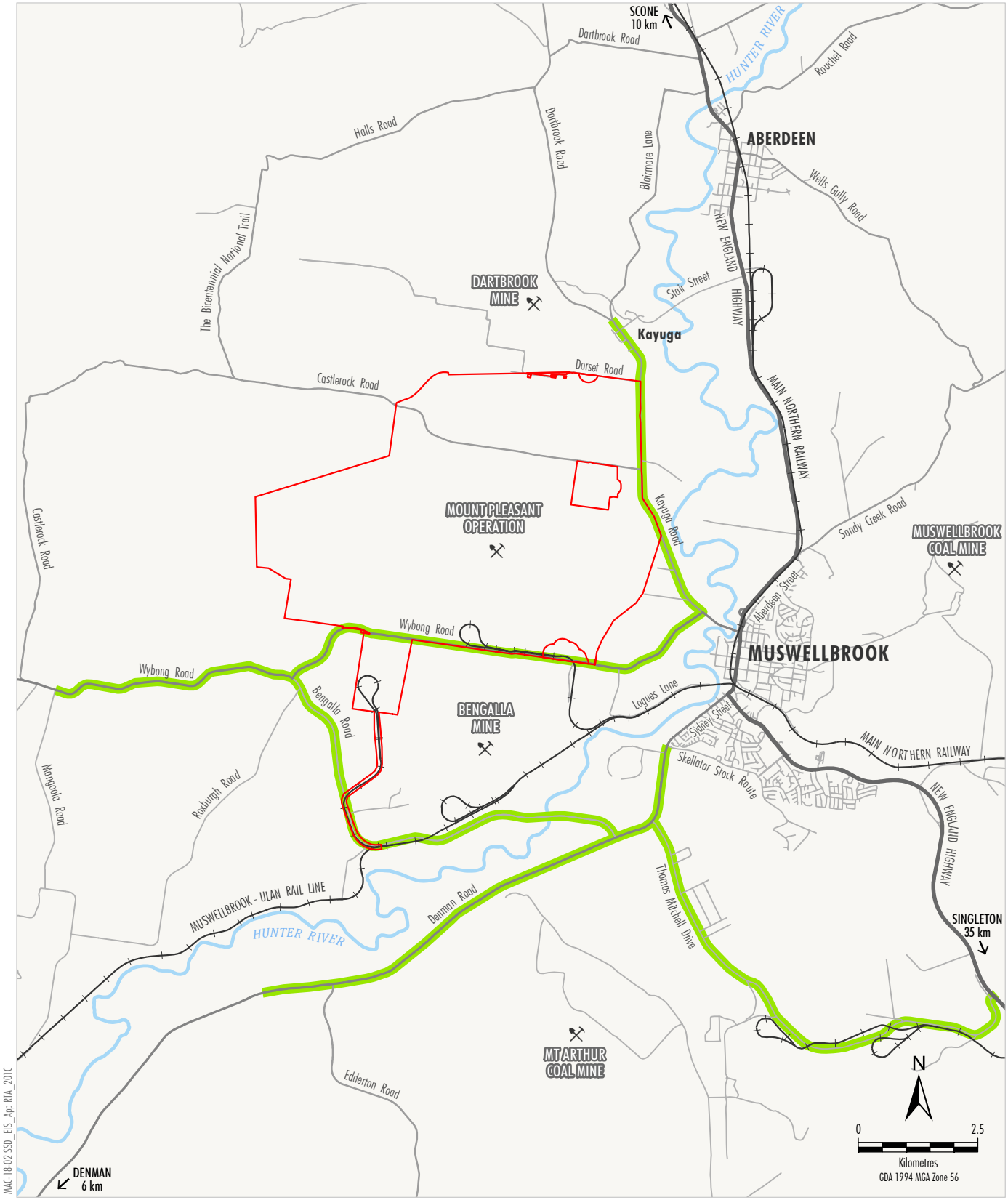
A medium risk item is important and needs to be addressed as soon as possible. The following items with a medium risk rating were identified:

- general lack of linemarking along Kayuga Road (Item 7);
- an unmarked crest on Kayuga Road south of Castlerock Road (Item 5);
- an unmarked crest on Kayuga Road south of Stair Street (Item 6);
- improperly connected W beam guard rails on the Ramrod Creek Bridge on Denman Road (Items 10 and 11);
- trees in the clear zone on Denman Road approximately midway between Bengalla Road and Edderton Road (Item 12); and
- improperly connected W beam guard rails on the Keys Bridge over the Hunter River on Bengalla Road (Item 13).

These items may be appropriately addressed with installation of appropriate linemarking and barriers where required.

A low risk item needs to be considered as part of regular maintenance and planning programming. The majority of low risk rating issues generally also relate to a lack of appropriate linemarking, signage or guide posts, together with some need for pavement or drainage improvements.

The issues raised in the audit do not highlight any particular concerns regarding the basic characteristics of the Project access routes that might adversely impact road safety. In addition, no specific road safety issues were identified at the intersection of Wybong Road and Mount Pleasant Operation Mine Access Road.



LEGEND

- Mining Operation
- Mining Lease Boundary (Mount Pleasant Operation)
- Audited Road

Source: NSW Spatial Services (2020)

MACHEnergy

MOUNT PLEASANT OPTIMISATION PROJECT

Road Safety Audit Area

Figure 4.4

5 Baseline Future Traffic Conditions

This section describes the expected changes to traffic conditions in the region with approved and planned developments and growth in traffic compared with the surveyed traffic conditions. These are the conditions which are expected to occur without the Project, and thus their cumulative impacts form the baseline conditions against which the Project can be assessed.

5.1 Non-Project Developments in the Region

5.1.1 Mount Pleasant Operation

Should the Project not proceed, the Mount Pleasant Operation can be expected to continue to operate with extraction of up to 10.5 Mtpa until 22 December 2026. Until that time, its traffic generation is expected to remain similar to that surveyed during the traffic survey program described in Section 0.

After 2026, mining activity would cease, and some traffic would be expected to continue to be generated as a result of decommissioning and rehabilitation activity, which would be completed prior to 2036. The small volume of traffic that would be generated by ongoing care and maintenance activity in the 2036 scenario has therefore not been considered for the purpose of this assessment.

Should the Project not proceed, the traffic generated by the Mount Pleasant Operation and captured by the traffic survey program would therefore be removed from the road network after 2026. Based on the surveyed midblock traffic volumes during the AM and PM Project peak hours, and the expected distribution of Mount Pleasant Operation traffic as forecast (GHD, 2017), the resulting changes to two-way traffic on the surrounding network in 2036 compared with those surveyed in 2020 have been estimated and are presented in Table 5.1.

Table 5.1: Change in Mount Pleasant Operation Traffic from 2020 to 2036 – No Project

Road and Location	AM Peak Hour		PM Peak Hour		Daily	
	Light	Heavy	Light	Heavy	Light	Heavy
Mount Pleasant Operation Road	-109	-19	-70	-7	-734	-154
Bengalla Road Wybong Road to Denman Road	-76	-19	-49	-7	-507	-154
Denman Road Golden Highway to Bengalla Road	-4	-1	-3	-1	-26	-16
Denman Road Bengalla Road to Thomas Mitchell Drive	-72	-18	-46	-6	-481	-138
Denman Road Thomas Mitchell Drive to Muswellbrook	-43	-10	-28	-4	-287	-76
Kayuga Road Wybong Road to Kayuga	-26	0	-17	0	-180	0
New England Highway Thomas Mitchell Drive to Singleton	-29	-8	-18	-2	-194	-62
Thomas Mitchell Drive Denman Road to New England Highway	-29	-8	-18	-2	-194	-62
Wybong Road Kayuga Road to Mount Pleasant Operation	-26	0	-17	0	-180	0
Wybong Road Mount Pleasant Operation to Bengalla Road	-83	-19	-53	-7	-554	-154
Wybong Road Bengalla Road to Golden Highway	-7	0	-4	0	-47	0

AM Project peak hour 6:00 am to 7:00 am (vehicles per hour).
PM Project peak hour 4:00 pm to 5:00 pm (vehicles per hour).
Daily (vehicles per day).

5.1.2 Bengalla Mine

The Bengalla Mine is an open cut coal mine located immediately to the south of the Mount Pleasant Operation, and 4 km west of Muswellbrook. Development Consent SSD-5170 (as modified) permits open cut coal mining operations and associated activities to 2039, with open cut mining at a rate of up to 15 Mtpa ROM coal, utilising a workforce of up to 900 FTE personnel at peak production. Modifications 1 to 4 to that Consent have been approved, which generally do not impact the traffic generation potential of the operational mine.

Bengalla Mining Company commenced operating under SSD-5170 from 1 October 2015 (Bengalla Mining Company, 2019). The production schedule anticipated by the Bengalla Continuation Project EIS (Hansen Bailey, 2013) suggested that coal production would reach its maximum in Year 4, and continue at that level throughout the life of the mine.

Bengalla Mine currently employs approximately 800 employees and contractors (Bengalla Mining Company, 2020), with production of 12.5 million tonnes (Mt) of ROM coal expected during 2019 (Bengalla Mining Company, 2019). Activity at the time of the traffic surveys was therefore below the approved peak production of 15 Mtpa of ROM coal and peak workforce of 900 people. It is therefore assumed that up to 100 additional people may work at the mine at any time throughout the remainder of the life of the mine above those working at the time of the traffic surveys.

Based on the travel characteristics presented by DC Engineering (2013), Table 5.2 summarises the additional traffic that may be expected to be generated by the potential increase in the workforce at Bengalla Mine. The DC Engineering assessment identified the AM and PM peak hours for traffic generation of Bengalla Mine as occurring between 6:00 am and 7:00 am, and between 4:00 pm and 5:00 pm, respectively.

Table 5.2: Average Weekday Continuation of Bengalla Mine Project Additional[A] Operational Traffic

Road and Location	AM and PM Peak Hours[B] (vehicles per hour)		Daily (vehicles per day)	
	Light	Heavy	Light	Heavy
Bengalla Mine Access Road	50	2	100	12
Bengalla Road Bengalla Mine to Wybong Road	14	0	28	0
Wybong Road Bengalla Road to Kayuga Road	14	0	28	0
Kayuga Road Wybong Road to Kayuga	14	0	28	0
Bengalla Road Bengalla Mine to Denman Road	36	2	72	12
Denman Road Bengalla Road to Denman	3	0	6	0
Denman Road Bengalla Road to Thomas Mitchell Drive	33	2	68	12
Denman Road Thomas Mitchell Drive to Muswellbrook	20	0	40	0
Thomas Mitchell Drive Denman Road to New England Highway	13	2	28	12
New England Highway South of Thomas Mitchell Drive	13	2	28	12

[A] *Potential additional traffic above 2020 levels, until 2039.*
[B] *AM peak hour 6:00 am to 7:00 am, PM peak hour 4:00 pm to 5:00 pm.*

5.1.3 Mangoola Coal

Mangoola Coal is an open cut coal mine located approximately 20 km west of Muswellbrook and 10 km north of Denman. It is owned by Mangoola Coal Operations Pty Limited (a subsidiary of Glencore plc), and is approved under PA 06_0014 (as modified) to produce up to 13.5 Mtpa of ROM coal until November 2029. Product coal is transported by rail, and Mangoola Coal operates 24 hours per day, seven days per week.

The EIS for the proposed Mangoola Continued Operations Project (MCOP) is currently under assessment by the DPIE, and involves development of a new open cut pit to continue to extract approximately 13.5 Mtpa of ROM coal, extension of the life of the mine to late 2030, construction of a haul road overpass over Wybong Road and Big Flat Creek, and realignment of a section of Wybong Post Office Road (Umwelt, 2019).

GHD (2019) indicates that the MCOP proposes a 16-month construction phase with a peak construction workforce of approximately 145 people. The construction workforce and heavy vehicles associated with construction activity would increase the traffic generation of the mine during the construction stage only. The MCOP anticipates no change to the hours of operation, the number of operational employees or the coal transport methods at Mangoola Coal once the construction stage is completed.

If approved, the construction stage of the MCOP would be completed by 2022 (GHD, 2019), and when operational, would not impact the ongoing traffic conditions on the wider road network in the region, beyond the localised impact of the realignment of Wybong Post Office Road. This assessment therefore assumes that the MCOP will be approved and that the traffic generated by Mangoola Coal and captured in the Project traffic surveys in 2020 would continue at the same level until 2030. As a robust assessment of future traffic conditions (i.e., to ensure that potential cumulative future traffic demands are not understated), it has been assumed that for the Project 2036 scenario, post-mining rehabilitation activity at Mangoola Coal would generate the same volumes of traffic as the existing operational activity.

5.1.4 Maxwell Underground Project

The EIS for a proposed underground coal mining operation, known as the Maxwell Underground Project, at the site of the former Drayton Mine is currently under assessment. Mining activity at the Drayton Mine ceased in October 2016, and care and maintenance and rehabilitation activities have occurred at the site since then, with vehicular access via Thomas Mitchell Drive and the site access road. The Maxwell Underground Project would use existing Maxwell Infrastructure to produce coal over a period of approximately 26 years. TTPP (2019) assessed the road traffic generation of the Maxwell Underground Project during its initial construction phase (nominally 2020), its short-term peak operational stage (nominally 2026) and its longer-term peak operational stage (nominally 2033).

TTPP (2019) assessed the traffic being generated by care and maintenance and rehabilitation activities for the Maxwell Infrastructure (formerly known as Drayton Mine) occurring during June 2018 and expected to continue for five years. It was found that care and maintenance activity generates some 98 vehicle trips per day on the Maxwell Infrastructure Road, of which 66 vehicles per day travel to or from the east on Thomas Mitchell Drive and 32 vehicles per day travel to or from the west on Thomas Mitchell Drive. Care and maintenance activities would cease as a separate activity upon commencement of the Maxwell Underground Project if approved, and hence, that traffic would no longer be generated.

Table 5.3 summarises the peak hourly and daily traffic expected to be generated by the Maxwell Underground Project in 2026 as forecast in TTPP (2019). The morning peak hour for traffic generated by the Maxwell Underground Project is anticipated to occur between 6:00 am and 7:00 am, and the evening peak hour for traffic generated by the Maxwell Underground Project is anticipated to occur between 5:00 pm and 6:00 pm.

Table 5.3: Average Weekday Maxwell Underground Project Traffic in 2026

Road and Location	AM Peak Hour		PM Peak Hour		Daily	
	Light	Heavy	Light	Heavy	Light	Heavy
Site Access Road South of Thomas Mitchell Drive	98	6	90	6	414	80
Denman Road South of Thomas Mitchell Drive	7	0	7	0	28	2
Denman Road North of Thomas Mitchell Drive	1	1	1	1	12	14
New England Highway North of Thomas Mitchell Drive	44	3	40	3	184	32
New England Highway South of Thomas Mitchell Drive	46	2	42	2	190	32
Thomas Mitchell Drive East of Site Access Road	90	5	82	5	374	64
Thomas Mitchell Drive West of Site Access Road	8	1	8	1	40	16

AM peak hour 6:00 am to 7:00 am (vehicles per hour).
PM peak hour 5:00 pm to 6:00 pm (vehicles per hour).
Daily (vehicles per day).

Table 5.4 summarises the peak hourly and daily traffic expected to be generated by the Maxwell Underground Project in 2033 as forecast in TTPP (2019). As for 2026, the morning peak hour for traffic generated by the Maxwell Underground Project is anticipated to occur between 6:00 am and 7:00 am, and the evening peak hour for traffic generated by the Maxwell Underground Project is anticipated to occur between 5:00 pm and 6:00 pm.

Table 5.4: Average Weekday Maxwell Underground Project Traffic in 2033

Road and Location	AM Peak		PM Peak		Daily	
	Light	Heavy	Light	Heavy	Light	Heavy
Site Access Road South of Thomas Mitchell Drive	92	5	84	5	382	60
Denman Road South of Thomas Mitchell Drive	8	0	7	0	26	2
Denman Road North of Thomas Mitchell Drive	1	1	1	1	12	10
New England Highway North of Thomas Mitchell Drive	40	2	38	2	168	24
New England Highway South of Thomas Mitchell Drive	43	2	38	2	176	24
Thomas Mitchell Drive East of Site Access Road	83	4	76	4	344	48
Thomas Mitchell Drive West of Site Access Road	9	1	8	1	38	12

AM peak hour 6:00 am to 7:00 am (vehicles per hour).
PM peak hour 5:00 pm to 6:00 pm (vehicles per hour).
Daily (vehicles per day).

For the purpose of this assessment, it has been assumed that the Maxwell Underground Project will proceed, and that its forecast traffic generation for 2026 and 2033 will coincide with the Project traffic generation in 2026 and 2036. For a robust assessment to ensure future cumulative traffic demands are not understated, the traffic generated by care and maintenance activity and captured in the 2020 traffic surveys has not been removed from the road network for the future assessment periods.

5.1.5 Maxwell Solar Project

The Maxwell Solar Project (SSD 9820) was approved by the Minister for Planning and Public Spaces on 19 August 2020. The Maxwell Solar Project will comprise the installation of a solar plant with a capacity of 25 megawatts (MW) at the Maxwell Infrastructure, which will supply electricity to the Maxwell Underground Project and/or the National Energy Market. Construction of the Maxwell Solar Project is expected to take 18 months if constructed in one stage, although construction may be staged and therefore take longer than 18 months. The Maxwell Solar Project is expected to operate for more than 25 years.

TTPP (2019) and Amber Organisation (2019) assessed the traffic impacts of the Maxwell Solar Project, which found that during peak construction periods, the Maxwell Solar Project will generate 100 to 110 light vehicle trips per day, and 20 heavy vehicle trips per day. TTPP (2019) anticipated that construction of the Maxwell Solar Project would coincide with construction of the Maxwell Underground Project in 2020. The Maxwell Solar Project construction activity would therefore not coincide with the Project construction or long-term operational stages, and has not been considered further in this assessment.

Once operational, the Maxwell Solar Project would operate with a very small workforce of three operational staff attending the Maxwell Solar Project each day via the site access road, and delivery and visitor trips would be negligible. Considering the traffic generated by the operational stage of the Maxwell Solar Project would be fewer than 10 vehicle trips per day, it has not been considered further in this assessment.

5.1.6 Mt Arthur Coal Mine

The Mt Arthur Coal Mine is located approximately 5 km south-west of Muswellbrook, accessed via Thomas Mitchell Drive. It is owned by Hunter Valley Energy Coal Pty Ltd, a wholly owned subsidiary of BHP. The open cut mining operation is approved to mine up to 32 Mtpa of ROM coal until 30 June 2026 under Project Approval 09_0062. The approval includes realignment of the northern section of Edderton Road and its intersection with Denman Road. The Mt Arthur Underground has not yet commenced longwall extraction and is approved until 2030.

GTA Consultants (2012) assessed the road transport implications of the Mt Arthur Coal Open Cut Modification, which estimated the overall generation of the Mt Arthur Coal Mine to be as presented in Table 5.5.

Table 5.5: Mt Arthur Coal Mine Traffic Generation Forecasts

Road and Location	Peak Hours		Daily	
	Light	Heavy	Light	Heavy
Forecast for 2019 and 2022				
Thomas Mitchell Drive Access	322	23	3,505	289
Edderton Road Access	36	7	72	14
Forecast for 2026				
Thomas Mitchell Drive Access	322	23	3,505	289
Edderton Road Access	43	7	72	14

Source: GTA Consultants, 2012

Those forecasts assumed that the operational workforce at the Mt Arthur Coal Mine would remain stable at up to 2,600 employees throughout the period from 2012 to 2026, however over that period, the workforce at the Mt Arthur Coal Mine has decreased. As a result, it can be expected that the traffic generation of Mt Arthur Coal Mine has remained below these forecasts.

Based on the Mt Arthur Coal Mine's current workforce of 1,915 FTE workers (BHP, 2019), and expected future reductions in the workforce to 1,500 FTE in 2026 (as suggested by TfNSW in its consideration of the Maxwell Underground Project), the traffic generated by the mine at the time of the traffic surveys and during the future years assessed for the Project has been estimated as presented in Table 5.6. This assumes that by 2036, the Mt Arthur Coal Mine would have ceased operating, and that care and maintenance activity would generate low traffic volumes which are not considered here.

Table 5.6: Mt Arthur Coal Mine Traffic Generation Estimates

Road and Location	Peak Hours		Daily	
	Light	Heavy	Light	Heavy
2020 – Workforce 1,915 FTE in June 2019[A]				
Thomas Mitchell Drive Access	242	17	2,628	218
Edderton Road Access	27	5	54	10
2026 – Workforce 1,500 FTE[B]				
Thomas Mitchell Drive Access	193	14	2,104	174
Edderton Road Access	26	4	44	8
2036 – Cessation of Operations				
Thomas Mitchell Drive Access	0	0	0	0
Edderton Road Access	0	0	0	0

[A] *Traffic generation estimated to be approximately 75 percent of 2019 forecast (Table 5.5).*
[B] *Traffic generation estimated to be approximately 60 percent of 2026 forecast (Table 5.5).*

The effects of the reduced traffic generation of the Mt Arthur Coal Mine on its contribution to peak hourly and daily traffic on the road network has been estimated, with regard to the surveyed temporal distribution of Mt Arthur Coal Mine traffic (GTA Consultants, 2012). That distribution demonstrates that the AM peak hour for Mt Arthur Coal Mine traffic generation occurs between 6:00 am and 7:00 am, and that during the Project PM peak hour (4:00 pm to 5:00 pm), the total Mt Arthur Coal Mine traffic generation is approximately 60 percent of that occurring during its PM peak (6:00 pm to 7:00 pm).

Table 5.7 presents the forecast changes in traffic generated by the Mt Arthur Coal Mine in 2026 compared with those occurring during the traffic surveys in 2020 during the Project peak hours and average weekday total.

Table 5.7: Change in Mt Arthur Coal Mine Traffic from 2020 Surveys to 2026

Road and Location	AM Peak		PM Peak		Daily	
	Light	Heavy	Light	Heavy	Light	Heavy
Mt Arthur Coal Mine Main Access	-49	-3	-28	-2	-524	-42
Mt Arthur Coal Mine Edderton Road Access	-1	-1	-1	-1	-10	-2
Thomas Mitchell Drive Mt Arthur Coal Mine to Denman Road	-32	-2	-18	-1	-346	-26
Thomas Mitchell Drive Mt Arthur Coal Mine to New England Highway	-17	-1	-10	-1	-186	-16
New England Highway south of Thomas Mitchell Drive	-17	-1	-10	-1	-186	-16
Denman Road south of Thomas Mitchell Drive	-3	0	-1	0	-36	-2
Denman Road Thomas Mitchell Drive to Muswellbrook	-30	-3	-18	-2	-316	-28

AM peak hour 6:00 am to 7:00 am (vehicles per hour).
PM peak hour 4:00 pm to 5:00 pm (vehicles per hour).
Daily (vehicles per day).

Table 5.8 presents the forecast changes in traffic generated by the Mt Arthur Coal Mine in 2036 compared with those occurring during the traffic surveys in 2020 during the Project peak hours and average weekday total.

Table 5.8: Change in Mt Arthur Coal Mine Traffic from 2020 Surveys to 2036

Road and Location	AM Peak		PM Peak		Daily	
	Light	Heavy	Light	Heavy	Light	Heavy
Mt Arthur Coal Mine Main Access	-242	-17	-145	-10	-2,628	-218
Mt Arthur Coal Mine Edderton Road Access	-27	-5	-16	-3	-54	-10
Thomas Mitchell Drive Mt Arthur Coal Mine to Denman Road	-166	-12	-101	-7	-1,726	-134
Thomas Mitchell Drive Mt Arthur Coal Mine to New England Highway	-94	-9	-56	-5	-938	-90
New England Highway south of Thomas Mitchell Drive	-94	-9	-56	-5	-938	-90
Denman Road south of Thomas Mitchell Drive	-23	-2	-15	-1	-176	-4
Denman Road Thomas Mitchell Drive to Muswellbrook	-159	-13	-95	-8	-1,582	-136

AM peak hour 6:00 am to 7:00 am (vehicles per hour).
PM peak hour 4:00 pm to 5:00 pm (vehicles per hour).
Daily (vehicles per day).

A sensitivity analysis of the potential cumulative traffic volumes in 2036 if the Mt Arthur Coal Mine was to receive approval to extend operations until at least 2036 is provided in Section 6.11.

5.1.7 Dartbrook Mine

The Dartbrook Mine is an underground coal mine located immediately north of the Mount Pleasant Operation. DA 231-7-200 permits mining of up to 6 Mtpa of ROM coal until 5 December 2022, however the mine was placed in care and maintenance in 2006. AQC Dartbrook Management Pty Limited (a wholly owned subsidiary of Australian Pacific Coal Limited) has received consent to restart mining operations using bord and pillar methods and varied coal clearance and handling system. DA 231-7-200 continues to limit the mining operations to 5 December 2022, however Australian Pacific Coal Limited has indicated that it intends to appeal the rejection of an application to extend the life of the mine by an additional five years to 5 December 2027 (Newcastle Herald, 2019).

During care and maintenance, Dartbrook Mine employed 11 full-time personnel, and recommencement of mining operations would employ an additional 26 FTE construction workers during the short-term construction phase and 99 FTE operational workers until cessation of mining operations (Hansen Bailey, 2018). The workforce would primarily access the site via New England Highway and the Dartbrook Western Access Road (Stair Street).

Therefore, Dartbrook Mine may recommence operations, which would continue until 5 December 2022. However, should the aforementioned appeal be successful, mining activity may recommence and continue until 5 December 2027. Under this scenario, the Dartbrook Mine operations may coincide with the Project construction activity in 2026.

Considering the residential distribution of the mining workforce in the region, and the likely use of the Dartbrook Western Access Road, traffic generated by the Dartbrook Mine is expected to have little overlap with Project-generated traffic on the roads in proximity to the Project. Overlap may be expected on New England Highway north of Stair Street (employees travelling to and from Scone and Aberdeen) and on New England Highway south of Thomas Mitchell Drive (employees travelling to and from Singleton). Dartbrook Mine employees living in the west may use Wybong Road and Kayuga Road via Kayuga to access Dartbrook Mine, however this would represent only a small proportion of employees, and the impacts on the road conditions are not expected to be significant.

For the purpose of this assessment, therefore the potential traffic generation of the Dartbrook Mine should it be approved to be operating in 2026 has not been considered.

5.1.8 West Muswellbrook Mine

The West Muswellbrook Mine is a proposed open cut coal mine north-west of the Project. The proposed West Muswellbrook Mine comprises the extraction of up to 621 Mt of coal over a 30-year period, with an expected 15 Mtpa of saleable thermal coal for export. A rail spur and loop and coal loading infrastructure and mining infrastructure area would be constructed. A workforce of about 900 people is anticipated for operations plus additional contractors from time to time. The West Muswellbrook Mine proposes the permanent closure of Halls Road and Dorset Road and partial closure of Castlerock Road.

A Gateway Certificate for the West Muswellbrook Mine was granted in 2015. In its most recent Project Update (November 2019), Muswellbrook Coal Company indicated it recently submitted its renewal application to extend its Assessment Lease over the West Muswellbrook project area for a period of five years, and that a drilling program will be undertaken in 2020.

No details of the timing or travel characteristics of the proposed West Muswellbrook Mine are currently available, and as it is not a currently approved project, it has not been considered further in this assessment.

Notwithstanding, it is expected that any proposal for the West Muswellbrook Mine would be accompanied by a road transport assessment incorporating a cumulative traffic assessment inclusive of the Project.

5.1.9 Cumulative Impacts of Non-Project Developments

Table 5.9 summarises how the activity and traffic generation of the various developments described above has been assumed to vary during the Project assessment years.

Table 5.9: Consideration of Other Developments in Project Assessment Years

Development	Surveyed 2020	Project Construction Stage 2026	Project Operational Stage 2036
Mount Pleasant Operation (no Project)	Operational traffic accounted for in surveyed traffic volumes		Cessation of mining, removal of existing operational traffic
Bengalla Mine	Operational traffic accounted for in surveyed traffic volumes	Additional workforce traffic (Table 5.2)	
Mangoola Coal	Operational traffic accounted for in surveyed traffic volumes		Rehabilitation traffic accounted for in surveyed traffic volumes.
Maxwell Underground Project	Existing activity accounted for in surveyed traffic volumes	Operational traffic (Table 5.3)	Operational traffic (Table 5.4)
Maxwell Solar Project	No activity	Operational, with negligible traffic generation	
Mt Arthur Coal Mine	Operational traffic accounted for in surveyed traffic volumes	Operational traffic reduced below that accounted for in the surveyed traffic volumes (Table 5.6 and Table 5.7)	Cessation of mining, removal of existing operational traffic. (Table 5.6 and Table 5.8)
Dartbrook Mine	Care and maintenance activity accounted for in surveyed traffic volumes		
West Muswellbrook Mine	No activity	Subject to future assessment and approval, not accounted for in this assessment	

Table 5.10 summarises the combined effects of the various developments in 2026 as described in Table 5.9 on weekday daily and peak hour traffic volumes at locations on the road network which are relevant to the Project. These baseline volumes assume that the Project is not constructed but represent the hours during which the Project traffic generation is expected to peak (Section 6.2).

Table 5.10: Cumulative Impacts of Non-Project Developments on Traffic Volumes 2026

Road and Location	6:00 am to 7:00 am (vehicles per hour)		4:00 pm to 5:00 pm (vehicles per hour)		Daily (vehicles per day)	
	Light	Heavy	Light	Heavy	Light	Heavy
Bengalla Road Wybong Road to Denman Road	14	0	14	0	28	0
Denman Road Bengalla Road to Golden Highway	7	0	9	0	2	0
Denman Road Bengalla Road to Thomas Mitchell Drive	37	2	39	2	64	12
Denman Road Thomas Mitchell Drive to Muswellbrook	-7	-2	4	-1	-258	-10
Kayuga Road Wybong Road to Kayuga	14	0	14	0	28	0
New England Highway Thomas Mitchell Drive to Singleton	43	1	45	4	36	28
New England Highway Thomas Mitchell Drive to Muswellbrook	45	0	40	3	184	32
Thomas Mitchell Drive Denman Road to Mt Arthur Coal Mine	-10	0	3	1	-274	2
Thomas Mitchell Drive Mt Arthur Coal Mine to Maxwell Underground Project	5	1	11	1	-114	12
Thomas Mitchell Drive Maxwell Underground Project to New England Highway	88	1	85	7	220	60
Wybong Road Mount Pleasant Operation to Kayuga Road	14	0	14	0	28	0
Wybong Road Mount Pleasant Operation to Bengalla Road	14	0	14	0	28	0
Wybong Road Bengalla Road to Golden Highway	0	0	0	0	0	0

Table 5.10 demonstrates that changes to other major developments in the region in 2026 are expected to result in significant decreases in traffic on some roads, notably Thomas Mitchell Drive between Denman Road and the Maxwell Underground Project, and Denman Road between Thomas Mitchell Drive and Muswellbrook. Increases in traffic are expected on Thomas Mitchell Drive between the Maxwell Underground Project and New England Highway, and New England Highway between Thomas Mitchell Drive and Muswellbrook.

Table 5.11 summarises the combined effects of the various developments in 2036 as described in Table 5.9 on weekday daily and peak hour traffic volumes at locations on the road network that are relevant to the Project. These baseline "No Project" volumes assume that the Project is not constructed but represent the hours during which the Project traffic generation is expected to peak (Section 6.2).

While the AM peak hour traffic generation of the Project in 2036 is expected to occur between 5:00 am and 6:00 am (Section 3.3), the AM peak hour for trips generated by the other major developments in the region tends to occur between 6:00 am and 7:00 am. Therefore, the AM peak hour assessed herein is nominally between 6:00 am and 7:00 am. This will tend to overestimate the total trips on the road network in that hour, however the difference is considered insignificant, noting that the Project's forecast trip generation between 6:00 am and 7:00 am (142 vehicles per hour) is similar to that expected to occur between 5:00 am and 6:00 am (159 vehicles per hour).

Table 5.11 demonstrates that, due to changes to other major developments in the region including closure of the Mount Pleasant Operation after 2026, significant decreases in traffic can be expected on many of the roads in 2036.

Table 5.11: Cumulative Impacts of Non-Project Developments on Traffic Volumes 2036

Road and Location	6:00 am to 7:00 am (vehicles per hour)		4:00 pm to 5:00 pm (vehicles per hour)		Daily (vehicles per day)	
	Light	Heavy	Light	Heavy	Light	Heavy
Bengalla Road Wybong Road to Denman Road	-62	-19	-35	-7	-479	-154
Denman Road Bengalla Road to Golden Highway	-8	-1	-3	-1	-152	-16
Denman Road Bengalla Road to Thomas Mitchell Drive	-46	-16	-16	-4	-545	-126
Denman Road Thomas Mitchell Drive to Muswellbrook	-164	-20	-93	-9	-1,785	-194
Kayuga Road Wybong Road to Kayuga Road	-12	0	-3	0	-152	0
New England Highway Thomas Mitchell Drive to Singleton	-57	-13	-16	-2	-910	-112
New England Highway Thomas Mitchell Drive to Muswellbrook	42	0	38	2	168	24
Thomas Mitchell Drive Denman Road to Mt Arthur Coal Mine	-164	-16	-93	-5	-1,836	-168
Thomas Mitchell Drive Mt Arthur Coal Mine to Maxwell Underground Project	-92	-13	-48	-3	-1,048	-124
Thomas Mitchell Drive Maxwell Underground Project to New England Highway	-15	-13	22	0	-742	-88
Wybong Road Mount Pleasant Operation to Kayuga Road	-12	0	-3	0	-152	0
Wybong Road Mount Pleasant Operation to Bengalla Road	-69	-19	-39	-7	-526	-154
Wybong Road Bengalla Road to Golden Highway	-7	0	-4	0	-47	0

5.2 Road Network Changes

5.2.1 Muswellbrook Bypass

A corridor for a future bypass of Muswellbrook is included in MSC's Local Environment Plan, and preserves a route to the east of Muswellbrook from south of Muscle Creek Road to north of Sandy Creek Road. A review of the options for the Muswellbrook Bypass (the Bypass) recommended an updated version of this route as the preferred route option, with minor route changes to improve its economic viability (RMS, 2018).

TfNSW has advised that funding for the Bypass was announced in February 2019, and the preferred route is currently being reviewed and is expected to be displayed for community feedback in late 2020. Opening of the Bypass is anticipated to occur in 2027, subject to project approval.

The preferred option proposes that at its southern end, the Bypass would connect to New England Highway approximately 4 km north of Thomas Mitchell Drive, and its northern end would connect to New England Highway approximately 4 km south of Stair Street. The Project-generated traffic would therefore only use New England Highway south of the southern end of the Bypass and north of the northern end of the Bypass. On these lengths of New England Highway, the traffic demands would not be directly impacted by the presence of the Bypass, although the Bypass may be expected to induce some additional demands due to improved travel conditions. The study of options for the Bypass prepared by RMS (2018) forecast traffic conditions on New England Highway (for the "do nothing" scenario) and on the Bypass only, in order to compare travel times, construction costs and economic viability of the options. Details of the nature of the future connections between the Bypass and New England Highway (and other roads) are not described, nor are forecasts of future traffic demands on New England Highway north and south of the Bypass presented.

Broadly, while the Bypass can be expected to reap significant benefits by removing conflicts between local and through traffic in the town centre, removing heavy vehicles from the town centre and reducing congestion for through traffic on New England Highway, its direct impacts on the roads to the west of Muswellbrook and directly serving the Mount Pleasant Operation are expected to be minimal.

5.2.2 Muswellbrook Mine Affected Roads Network Plan Review

MSC's *Muswellbrook Mine Affected Roads Network Plan Review* (Bitzios Consulting and Northrop [Bitzios], 2020) reviews and updates MSC's original *Mine Affected Road Network Plan* (Cardno, 2015) and was adopted by MSC on 19 May 2020. The assessment of options for the road network recommended key strategies to provide a road network that accommodates existing and future demands, including (option names are as presented in Bitzios [2020]):

- a Western Corridor connecting Golden Highway near Edderton Road with New England Highway south of Aberdeen, formed via:
  - upgrades to Edderton Road and retaining the northern deviation of Edderton Road to Denman Road (rather than reinstating the existing alignment following completion of mining at Mt Arthur Coal Mine);
  - a new link between Denman Road at the Edderton Road northern deviation and Bengalla Road, crossing the Hunter River and the railway line (Option W1);
  - connecting Wybong Road near Overton Road to Kayuga Road then east via a new bridge over the Hunter River and upgraded Burtons Lane to New England Highway north of Sandy Creek Road (Option W7);
  - connecting Castlerock Road to Dorset Road to offset the closure of Dorset Road (i.e. Mount Pleasant Operation's Northern Link Road);
- an Inner West Link created by connecting Bengalla Road to Wybong Road west of the rail line via Overton Road (Option 2B), which would then connect with the Option W7 link to New England Highway described above;
- upgrading the Wybong network including closure of Wybong Post Office Road west of the Wybong Community Hall and upgrading of Yarraman Road between Wybong Post Office Road and Wybong Road (Option W5), upgrading of Wybong Road between Sandy Hollow and Reedy Creek Road to collector standard (Option W6), manage Wybong Road between Sandy Hollow and Bengalla Road as an over-size over-mass route, and widen sections of Wybong Road to a consistent and acceptable standard; and
- improving other infrastructure including upgrading of the Hunter River bridge at Denman and Denman bypass, and reclassification of Thomas Mitchell Drive as a State road.

The Western Corridor envisaged by the *Muswellbrook Mine Affected Roads Network Plan Review* would form a western bypass route around Muswellbrook for traffic between Golden Highway and Denman Road south of Muswellbrook, and New England Highway north of Muswellbrook. The Inner West Link is intended to improve travel efficiency between Thomas Mitchell Drive and the mines, and provide a western local bypass of Muswellbrook town. Construction of the Inner West link between Bengalla Road and Wybong Road via Overton Road may have implications for the approved construction of the Stage 2 rail spur for the Mount Pleasant Operation, with a rail over road overpass at Wybong Road and a rail over road bridge at Overton Road (Section 2.1). The link from Wybong Road to New England Highway (Option W7) is noted to travel through a flood plain, with potential impacts on the flow of flood water and may have some property impacts. These aspects have not yet been investigated. Similarly, the Inner West link between Bengalla Road and Wybong Road (Option 2B) is noted to include road and bridge ramping in a flood plain area.

Even considering the high-level nature of the *Muswellbrook Mine Affected Roads Network Plan Review* (Bitzios, 2020) strategies, it is evident that further investigation of the recommended strategies would be required if it were to proceed to construction. Refinement of the options to address these and other constraints are beyond the scope of this study, which assumes that the connectivity of the road network would remain in its current state, with the known changes planned as a result of the approved Mount Pleasant Operation (Section 2.1) and other mining operations in the region (Section 5.1).

5.2.3 Cumulative Impacts of Road Network Changes

In the absence of detailed forecasts being available for the impacts of the Bypass and possible changes to the road network described in Bitzios (2020), the implications of the possible changes are discussed in Section 6.11.

5.3 Background Traffic Growth

Regardless of the status of specific developments, other changes in traffic may be expected as a result of general growth or changes in population or travel behaviour. In preparing the *Muswellbrook Mine Affected Roads Plan,* Cardno (2015) considered forecasts of background traffic growth on roads in the Muswellbrook region, taking into consideration advice from RMS Assets Branch and with reference to the study for the Bypass prepared by Hyder (2008). The Hyder study applied a marginal through traffic growth of 1.45 percent per annum on New England Highway between 2007 and 2020, and 1 percent until 2037. On that basis, the resulting background growth rates applied for the purpose of modelling future traffic volumes on the road network for the *Muswellbrook Mine Affected Roads Stage 1 Road Network Plan* (Cardno, 2015) were:

- Thomas Mitchell Drive 1.45 percent per annum for 20 years (2015 to 2035), reducing to 1 percent per annum thereafter; and

- all other local roads 1 percent per annum for 20 years (2015 to 2035) and 0.9 percent per annum thereafter.

The recent RMS (2018) study of options for the Bypass, future growth rates applied to all vehicles were:

- 1.1 percent per annum between 2024 (assumed opening date of the Bypass) and 2034; and
- 1 percent per annum thereafter to 2044 (10 to 20 years after assumed opening date).

The growth rate applied prior to 2024 is not explicitly stated, and used historical growth rates together with consideration of background population growth and higher growth rates from heavy vehicle through traffic. Rates over that period appear to be between 1.0 percent and 1.1 percent per annum.

On the basis of the above, traffic volumes on the key routes have been forecast by applying a background traffic growth rate of 1.0 percent per annum on all roads with the exception of the Mount Pleasant Operation Mine Access Road. As a robust assessment to ensure future cumulative traffic demands are not understated, the growth rate has been applied to all background traffic, including that associated with the non-Project developments described in Section 5.1, for which changes are also allowed for in the forecasts associated with each development as per Table 5.10. This effectively assumes that the existing mine-generated traffic captured by the traffic survey program will grow at the rates described above, irrespective of the expected changes in activity at each of the mines.

6 Project Traffic Impacts

6.1 Project Traffic Distribution

As described in Section 3.1.1, construction bus services would operate as required for the workforce between Muswellbrook, Scone and Aberdeen and Singleton. Table 6.1 summarises the routes that would be used by the construction shuttle buses when travelling to and from the Project. It is noted that shuttle buses operating to and from Scone and Aberdeen are likely to travel via Muswellbrook town to pick up and set down passengers, rather than running exclusive routes to/from the north. For the purpose of this assessment however, it has been assumed that exclusive services would operate to and from the north via Kayuga Road, which will overestimate the number of shuttle buses on the roads directly to the east of the Mount Pleasant Access Road should all buses operate via Muswellbrook.

Table 6.1: Construction Workforce Shuttle Bus Travel Routes

Bus Service	Travel Route
Muswellbrook	Wybong Road – Bengalla Road – Denman Road (East)
Scone and Aberdeen	Wybong Road – Kayuga Road – Blairmore Lane or Dartbrook Road – New England Highway
Singleton	Wybong Road – Bengalla Road – Denman Road – Thomas Mitchell Drive – New England Highway (South)

A review of the residential location of the workforce at the Mount Pleasant Operation undertaken by MACH in November 2019 found that 37 percent of the workforce resided within the Muswellbrook Local Government Area (LGA), 21 percent resided in Singleton LGA 16 percent resided in the Upper Hunter LGA, with the remainder in various other NSW LGAs and a small number living interstate. The distribution of the operational workforce for the Project is likely to differ from that of the 2019 workforce, because the latter was a combination of construction and operational workforces. Once construction is completed, a higher proportion of the workforce is expected to reside locally in the Muswellbrook, Upper Hunter and Singleton LGAs compared with that which occurred in 2019.

Table 6.2 summarises the expected residential distribution of the operational workforce and the routes those workers are likely to use when approaching and departing the Project. These generally assume that drivers will use the shortest route available, noting that some alternative routes exist and may be used by some drivers.

Table 6.2: Operational Workforce Residential Locations and Travel Routes

Residential Location	Percent of Workforce	Travel Route
Muswellbrook	40	Wybong Road – Bengalla Road – Denman Road (East)
Singleton and Lower Hunter	30	Wybong Road – Bengalla Road – Denman Road – Thomas Mitchell Drive – New England Highway (South)
Scone, Aberdeen and North	20	Wybong Road – Kayuga Road – Blairmore Lane or Dartbrook Road – New England Highway
Sandy Hollow, Merriwa and West	5	Wybong Road (West)
Denman, Jerrys Plains	5	Wybong Road – Bengalla Road – Denman Road (West)

With regard to access routes to and from Scone, Aberdeen and the north, drivers may use either Blairmore Lane or Dartbrook Road to travel between New England Highway and Kayuga Road. Residents of Aberdeen are more likely to use Blairmore Lane, as it is the most direct, while residents of Scone and farther north may choose to use either route. Blairmore Lane offers a slightly shorter route for those drivers, although the travel time differences are expected to be marginal between the two routes.

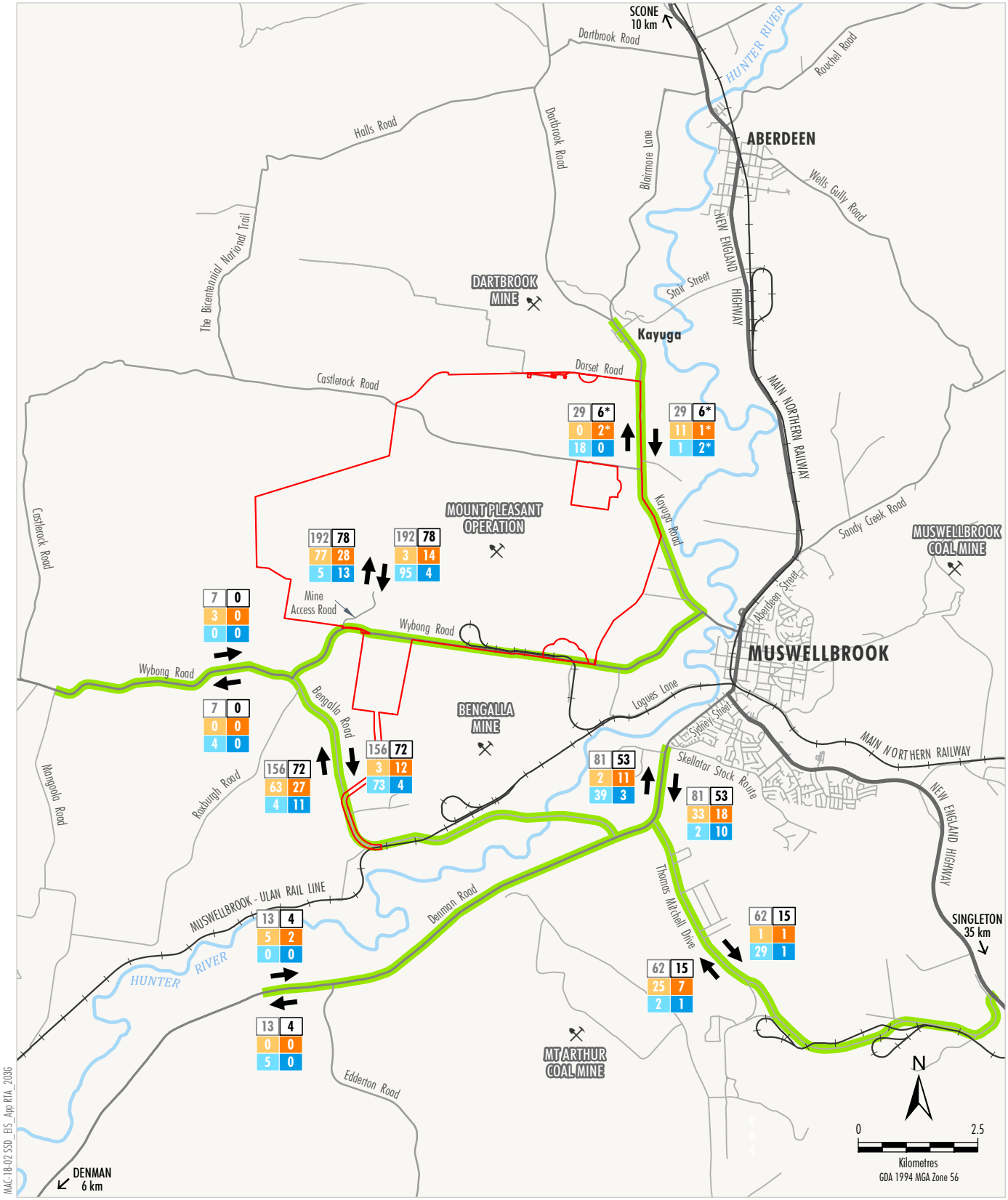
Table 6.3 presents the expected primary sources of construction and operational visitor and delivery trips, and the routes the delivery and visitor vehicles would use to access the Project. These are consistent with the existing SAMP, which requires all heavy vehicles access to and from the Mount Pleasant Operation to be via Bengalla Road.

Table 6.3: Construction and Operational Visitor and Delivery Sources and Travel Routes

Location	Percent	Travel Route
Muswellbrook	50	Wybong Road – Bengalla Road – Denman Road (East)
Singleton and Lower Hunter	40	Wybong Road – Bengalla Road – Denman Road – Thomas Mitchell Drive – New England Highway (South)
Denman	10	Wybong Road – Bengalla Road – Denman Road (West)

6.2 Total Additional Project Traffic on the Road Network

Taking into consideration the traffic forecast to be generated by the Project (Section 3.3) and its distribution on the road network (Section 6.1), the forecast additional contribution of the Project to future traffic on the road network has been determined and is presented in Figure 6.1 and summarised in Table 6.4 for 2026.



LEGEND

- Mining Operation
- Mining Lease Boundary (Mount Pleasant Operation)
- Visitor (Light Vehicle) and Heavy Vehicle Route

TRAFFIC VOLUMES

Light / Heavy (including buses)

- Daily
- AM Peak (6.00 am to 7.00 am)
- PM Peak (4.00 pm to 5.00 pm)

* All heavy vehicles on this route are construction workforce shuttle buses.

Source: NSW Spatial Services (2020)

MACHEnergy

MOUNT PLEASANT OPTIMISATION PROJECT

Additional Project-generated Traffic 2026

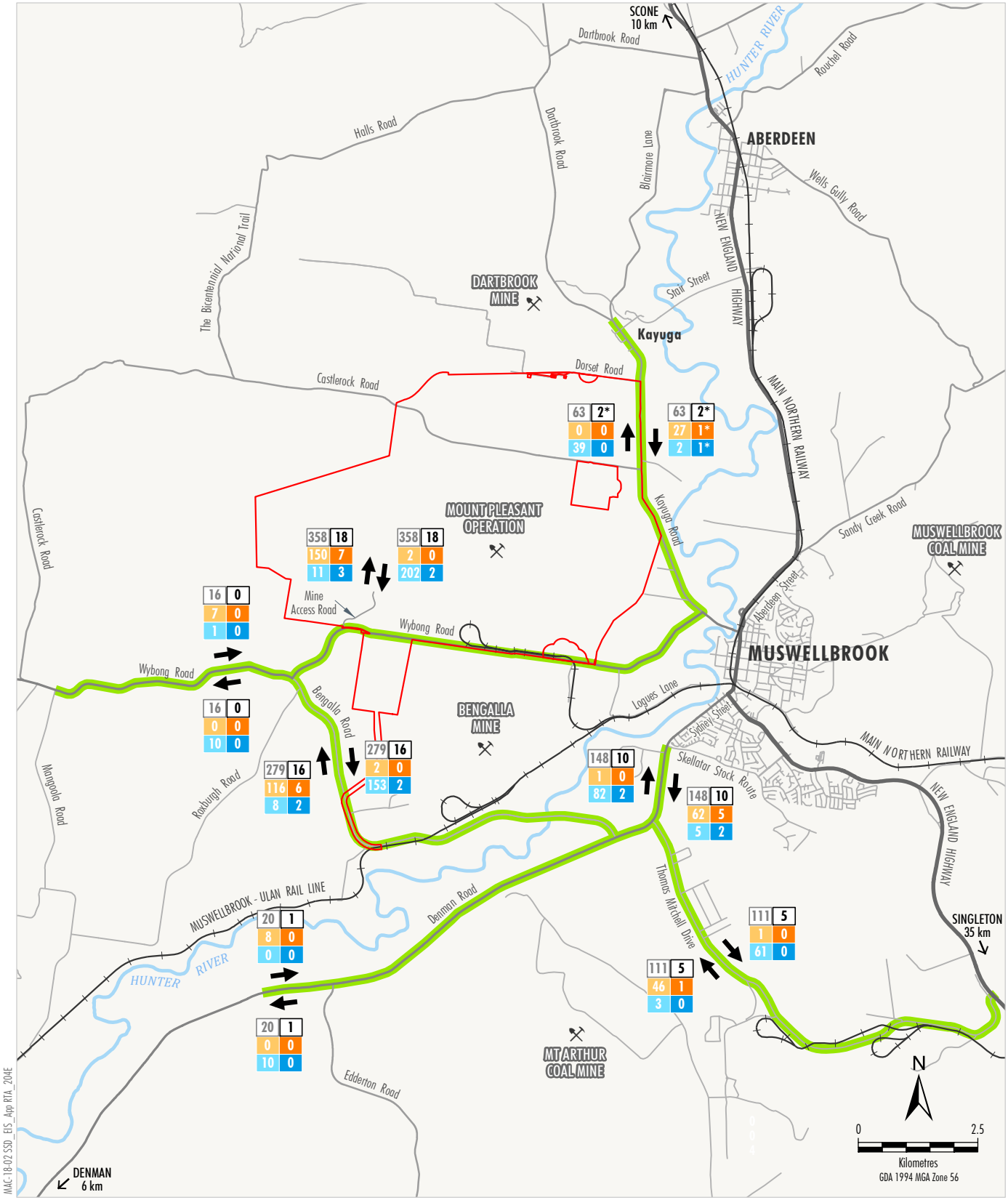
Figure 6.1

Table 6.4: Total Additional[A] Project-Generated Traffic on the Road Network 2026

Road and Location	AM Peak Hour[B]		PM Peak Hour[C]		Daily[D]	
	Light	Heavy	Light	Heavy	Light	Heavy
Mount Pleasant Operation Road	80	42	100	17	384	156
Bengalla Road Wybong Road to Denman Road	66	39	77	15	312	145
Denman Road Golden Highway to Bengalla Road	5	2	5	0	26	8
Denman Road Bengalla Road to Thomas Mitchell Drive	61	37	72	15	286	137
Denman Road Thomas Mitchell Drive to Muswellbrook	35	29	41	13	162	109
Kayuga Road Wybong Road to Kayuga[E]	11	3[F]	19	2[F]	58	11[F]
New England Highway Thomas Mitchell Drive to Singleton	26	8	31	2	124	28
Thomas Mitchell Drive Denman Road to New England Highway	26	8	31	2	124	28
Wybong Road Kayuga Road to Mount Pleasant Operation	11	3	19	2	58	11
Wybong Road Mount Pleasant Operation to Bengalla Road	69	39	81	15	326	145
Wybong Road Bengalla Road to Golden Highway	3	0	4	0	14	0

[A] *Forecast additional traffic above 2020 levels.*
[B] *Vehicles per hour 6:00 am to 7:00 am.*
[C] *Vehicles per hour 4:00 pm to 5:00 pm.*
[D] *Vehicles per day.*
[E] *These vehicles may use either Dartbrook Road or Blairmore Lane between Kayuga and New England Highway.*
[F] *Construction workforce shuttle buses.*

Taking into consideration the traffic forecast to be generated by the Project (Section 3.3) and its distribution on the road network (Section 6.1), the forecast contribution of the Project to future traffic on the road network has been determined and is presented in Figure 6.2 and summarised in Table 6.5 for 2036.



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LEGEND

- Mining Operation
- Mining Lease Boundary (Mount Pleasant Operation)
- Visitor (Light Vehicle) and Heavy Vehicle Route

TRAFFIC VOLUMES

Light / Heavy (including buses)

- Daily
- AM Peak (5.00 am to 6.00 am)
- PM Peak (4.00 pm to 5.00 pm)

* All heavy vehicles on this route are construction workforce shuttle buses.

Source: NSW Spatial Services (2020)

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MOUNT PLEASANT OPTIMISATION PROJECT

Additional Project-generated Traffic 2036

Figure 6.2

Table 6.5: Total Additional[A] Project-Generated Traffic on the Road Network 2036

Road and Location	AM Peak Hour[B]		PM Peak Hour[C]		Daily[D]	
	Light	Heavy	Light	Heavy	Light	Heavy
Mount Pleasant Operation Road	152	7	213	5	716	36
Bengalla Road Wybong Road to Denman Road	118	6	161	4	558	32
Denman Road Golden Highway to Bengalla Road	8	0	10	0	40	2
Denman Road Bengalla Road to Thomas Mitchell Drive	110	6	151	4	518	30
Denman Road Thomas Mitchell Drive to Muswellbrook	63	5	87	4	296	20
Kayuga Road Wybong Road to Kayuga[E]	27	1[F]	41	1[F]	126	4[F]
New England Highway Thomas Mitchell Drive to Singleton	47	1	64	0	222	10
Thomas Mitchell Drive Denman Road to New England Highway	47	1	64	0	222	10
Wybong Road Kayuga Road to Mount Pleasant Operation	27	1	41	1	126	4
Wybong Road Mount Pleasant Operation to Bengalla Road	125	6	172	4	590	32
Wybong Road Bengalla Road to Golden Highway	7	0	11	0	32	0

[A] *Forecast additional traffic above 2020 levels.*
[B] *Vehicles per hour 5:00 am to 6:00 am.*
[C] *Vehicles per hour 4:00 pm to 5:00 pm.*
[D] *Vehicles per day.*
[E] *These vehicles may use either Dartbrook Road or Blairmore Lane between Kayuga and New England Highway.*
[F] *Construction workforce shuttle buses.*

6.3 Future Traffic Volumes

The future two-way peak hourly and daily traffic volumes on the average weekday have been forecast for 2026 with and without the Project. These forecasts are presented in Table 6.6 for the surveyed ATC locations, and include the cumulative impacts of expected changes at the other major developments in the region (Section 5.1), and background traffic growth (Section 5.3). Table 6.6 also presents the surveyed traffic volumes on those roads for ease of comparison against existing conditions.

Table 6.6: Peak Hour and Daily Traffic Volumes with and without the Project in 2026

Site[A]	Road	AM Peak[B]		PM Peak[C]		Daily[D]	
		Light	Heavy	Light	Heavy	Light	Heavy
2020 – Surveyed							
A	Mount Pleasant Operation Road	109	19	70	7	734	154
B	Bengalla Road south-east of Wybong Road	186	36	152	27	1,635	375
C	Wybong Road north of Bengalla Road	145	19	95	14	1,146	203
2026 – Without Project							
A	Mount Pleasant Operation Road	109	19	70	7	734	154
B	Bengalla Road south-east of Wybong Road	211	38	175	29	1,764	398
C	Wybong Road north of Bengalla Road	168	20	115	15	1,245	216
2026 – With Project							
A	Mount Pleasant Operation Road	189	61	170	24	1,118	310
B	Bengalla Road south-east of Wybong Road	277	77	252	44	2,076	543
C	Wybong Road north of Bengalla Road	237	59	196	30	1,571	361

[A] *Refer to Figure 4.1.*
[B] *AM Project Peak 6:00 am to 7:00 am (vehicles per hour).*
[C] *PM Project Peak 4:00 pm to 5:00 pm (vehicles per hour).*
[D] *Daily (vehicles per day).*

The future two-way peak hourly and daily traffic volumes on the average weekday have been forecast for 2036 with and without the Project. These forecasts are presented in Table 6.7 for the surveyed ATC locations, and include the cumulative impacts of expected changes at the other major developments in the region (Section 5.1), and background traffic growth (Section 5.3). Table 6.7 also presents the surveyed traffic volumes on those roads for ease of comparison against existing conditions.

Table 6.7: Peak Hour and Daily Traffic Volumes with and without the Project in 2036

Site[A]	Road	AM Peak[B]		PM Peak[C]		Daily[D]	
		Light	Heavy	Light	Heavy	Light	Heavy
2020 – Surveyed							
A	Mount Pleasant Operation Road	109	19	70	7	734	154
B	Bengalla Road south-east of Wybong Road	186	36	152	27	1,635	375
C	Wybong Road north of Bengalla Road	145	19	95	14	1,146	203
2036 – No Project							
A	Mount Pleasant Operation Road (cessation of activity)	0	0	0	0	0	0
B	Bengalla Road south-east of Wybong Road	156	23	143	25	1,438	286
C	Wybong Road north of Bengalla Road	101	3	72	10	818	84
2036 – With Project							
A	Mount Pleasant Operation Road	266	26	84	12	1,450	190
B	Bengalla Road south-east of Wybong Road	350	48	353	36	2,503	472
C	Wybong Road north of Bengalla Road	255	17	297	21	1,962	270

[A] *Refer to Figure 4.1.*
[B] *AM Project Peak 6:00 am to 7:00 am (vehicles per hour).*
[C] *PM Project Peak 4:00 pm to 5:00 pm (vehicles per hour).*
[D] *Daily (vehicles per day).*

6.4 Road Network Efficiency

The capacity of a road is the number of vehicles that can be accommodated on the road infrastructure before it fails to function as it was intended. Austroads (2020a) defines capacity as the maximum sustainable hourly rate at which vehicles can reasonably be expected to traverse a point or uniform section of a lane or roadway during a given time period under the prevailing roadway, traffic and control conditions. The capacity of a single traffic lane is affected by factors such as the pavement width and restricted lateral clearances, the presence of heavy vehicles and grades.

Austroads (2020a) provides guidelines for the assessment of the capacity and performance of two-lane, two-way rural roads that, in turn, refer to the *Highway Capacity Manual* (HCM) (Transportation Research Board, 2016). Level of Service (LoS) represents road users' perceptions of the quality of service provided by a road link, and describes operational conditions in terms of factors such as speed and travel time, freedom to manoeuvre, traffic interruptions, comfort, convenience and safety. Levels of Service are designated A through F, with LoS A providing the best traffic conditions, with no restriction on desired travel speed or overtaking. LoS B to D describes progressively worse traffic conditions. LoS E occurs when traffic conditions are at or close to capacity, and there is virtually no freedom to select desired speeds or to manoeuvre in the traffic stream. The service flow rate for LoS E is taken as the capacity of a lane or roadway. In rural situations, LoS C is generally considered to be acceptable. At LoS C, most vehicles are travelling in platoons, and travel speeds are curtailed. At LoS D, platooning increases significantly, and the demand for passing is high, but the capacity to do so is low. The LoS experienced by drivers on two-way rural roads is dependent on the drivers' expectations regarding the road. The target for acceptable conditions is generally accepted as LoS D.

The LoS experienced by drivers on two-way rural roads is dependent on the drivers' expectations regarding the road, and three classes of road are defined in the HCM. Class I roads are those on which motorists expect to travel at relatively high speeds, and most often serve long-distance trips or provide connecting links between facilities that serve long-distance trips. Class II roads are those on which motorists do not necessarily expect to travel at high speeds, and may function as access routes to Class I facilities, serve as scenic or recreational routes or pass through rugged terrain. Class III roads serve moderately developed areas, and may be portions of a Class I or Class II highway that pass through small towns or developed recreational areas, where local traffic mixes with through traffic, and the density of unsignalised roadside access points increases.

On Class I roads, LoS is defined in terms of Percent Time Spent Following (PTSF) and Average Travel Speed (ATS), with the worst of these criteria being adopted as the LoS. On Class II roads, LoS is defined only in terms of PTSF. The PTSF is a measure of the level of opportunities to overtake, and is estimated from the demand traffic volumes, the directional distribution of that traffic, and the percentage of no-passing zones. On Class III roads, LoS is defined in terms of Percent of Free-Flow Speed (PFFS), which is the ratio of ATS to the free-flow speed, representing the ability of vehicles to travel at or near the posted speed limit. The LoS criteria for two-lane roads are as shown in Table 6.8.

Table 6.8: Level of Service Criteria for Two-Lane, Two-Way Roads

Level of Service	Class I		Class II	Class III
	Average Travel Speed (km/h)	PTSF (percent)	PTSF (percent)	PFFS (percent)
A	> 90	≤ 35	≤ 40	> 91.7
B	> 80 – 90	> 35 – 50	> 40 – 55	> 83.3 – 91.7
C	> 70 – 80	> 50 – 65	> 55 – 70	> 75.0 – 83.3
D	> 60 – 70	> 65 – 80	> 70 – 85	> 66.7 – 75.0
E	≤ 60	≥ 80	≥ 85	≤ 66.7

Source: Austroads (2020a).

For the purpose of this review, the surveyed Project access routes have been considered as Class II routes. It is noted that this assessment assumes a speed limit of 70 km/h applies on the Mount Pleasant Access Road. Table 6.9 summarises the LoS during the AM and PM peak hours respectively in 2026 with and without the Project.

Table 6.9: Project Peak Hour Midblock Levels of Service in 2026

Site[A]	Road	Inbound to Project		Outbound from Project	
		AM Peak	PM Peak	AM Peak	PM Peak
2026 – Without Project					
A	Mount Pleasant Operation Access Road	B	A	A	B
B	Bengalla Road south-east of Wybong Road	B	A	A	B
C	Wybong Road north of Bengalla Road	B	A	A	B
2026 – With Project					
A	Mount Pleasant Operation Access Road	C	A	A	C
B	Bengalla Road south-east of Wybong Road	C	A	A	C
C	Wybong Road north of Bengalla Road	C	A	A	C

[A] *Refer to Figure 4.1.*
AM Project Peak 6:00 am to 7:00 am (vehicles per hour).
PM Project Peak 4:00 pm to 5:00 pm (vehicles per hour).

Table 6.9 demonstrates that the midblock LoS would be satisfactory in 2026 with the additional Project-generated traffic.

Table 6.10 summarises the Levels of Service during the AM and PM peak hours in 2036 with and without the Project, respectively, noting that without the Project, the Mount Pleasant Operation would cease operating and there would be no traffic on the Mount Pleasant Operation Access Road.

Table 6.10: Project Peak Hour Midblock Levels of Service in 2036

Site[A]	Road	Inbound to Project		Outbound from Project	
		AM Peak	PM Peak	AM Peak	PM Peak
2036 – Without Project					
A	Mount Pleasant Operation Access Road	-	-	-	-
B	Bengalla Road south-east of Wybong Road	A	A	A	A
C	Wybong Road north of Bengalla Road	A	A	A	A
2036 – With Project					
A	Mount Pleasant Operation Access Road	C	A	A	B
B	Bengalla Road south-east of Wybong Road	C	A	A	C
C	Wybong Road north of Bengalla Road	C	A	A	C

[A] *Refer to Figure 4.1.*
AM Project Peak 6:00 am to 7:00 am (vehicles per hour).
PM Project Peak 4:00 pm to 5:00 pm (vehicles per hour).

Table 6.10 demonstrates that the midblock LoS on the key access roads would be satisfactory in 2036 with the Project.

The surveyed and forecast peak hourly traffic on Kayuga Road north of Wybong Road are sufficiently low that formal assessment of midblock LoS is not warranted. Drivers on Kayuga Road would experience negligible interaction with other vehicles on those roads. Similarly, volumes on Blairmore Lane and Dartbrook Roads are expected to be sufficiently low that the midblock LoS would remain satisfactory throughout the life of the Project.

6.5 Intersection Performance

The operating characteristics of the surveyed intersections have been assessed using SIDRA INTERSECTION 9, an analysis program that determines characteristics of intersection operating conditions including the degree of saturation, average delays, and intersection LoS. The degree of saturation, or x-value, is the ratio of the arrival rate of vehicles to the capacity. The average delay, expressed in seconds per vehicle, is measured over all movements at signalised intersections, and over the movement with the highest average delay at roundabout and priority intersections. Average vehicle delay is the commonly used measure of intersection performance defined by TfNSW. Table 6.11 shows the criteria adopted by TfNSW for assessing the intersection LoS.

Table 6.11: Intersection Level of Service Criteria

Level of Service	Average Delay per Vehicle (seconds per vehicle)	Traffic Signals, Roundabout	Give Way & Stop Sign
A	Less than 14	Good operation	Good operation
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	Near capacity	Near capacity, accident study required
E	57 to 70	At capacity, at signals incidents will cause excessive delays	At capacity, requires other control mode
F	Greater than 70	Extra capacity required	Extreme delay, major treatment required

As the intersections are under priority control, the reported average delay is for the movement with the highest average delay per vehicle.

Table 6.12 presents a summary of the peak hour operating characteristics of the surveyed intersections in 2020. Detailed results, including 95th percentile vehicle queues per movement are presented in Appendix D. The table also presents indicative results for the intersections of Thomas Mitchell Drive with Denman Road and New England Highway, based on the results of the 2018 surveys of those intersections (Table 4.7). The surveyed volumes on Denman Road east of Thomas Mitchell Drive in 2018 were compared with those surveyed on Denman Road west of Bengalla Road in 2020 during the same hours. The comparison found that between 6:15 am and 7:15 am, the westbound flows on Denman Road were similar in both 2018 and 2020, while eastbound flows were lower during 2018 than 2020. The assessment has therefore increased the morning peak hour eastbound flows approaching the intersection to reflect the surveyed 2020 conditions. The comparison also found that between 4:00 pm and 5:00 pm, there was a good match between both eastbound and westbound flows along Denman Road at Bengalla Road and at Thomas Mitchell Drive. The surveyed 2018 volumes at the intersection of Denman Road with Thomas Mitchell Drive are therefore considered to be reasonably indicative of 2020 conditions, and no adjustments to those flows were made to reflect 2020 conditions.

In the absence of comparative data, the surveyed 2018 volumes at the intersection of Thomas Mitchell Drive with New England Highway have been assumed to have increased at a rate of 1 percent per annum between 2018 and 2020, consistent with the background growth rate assumptions described in Section 5.3.

Table 6.12: Intersection Operating Conditions in 2020

Site[A]	Intersection	AM Peak			PM Peak		
		X-Value	Average Delay[B]	LoS	X-Value	Average Delay[B]	LoS
D	Mount Pleasant Operation Road and Wybong Road	0.04	8.0	A	0.08	8.5	A
E	Wybong Road and Kayuga Road	0.02	7.1	A	0.04	7.1	A
F	Wybong Road and Bengalla Road	0.07	9.4	A	0.08	8.5	A
G	Bengalla Road and Denman Road	0.15	13.2	A	0.18	12.3	A
-	Denman Road and Thomas Mitchell Drive	0.26	13.1	A	0.52	15.8	B
-	Thomas Mitchell Drive and New England Highway	0.18	12.3	A	0.29	13.0	A

[A] *Refer to Figure 4.1.*
[B] *Seconds per vehicle for movement with the highest average delay per vehicle.*

Table 6.13 presents a summary of the peak hour operating characteristics of the surveyed intersections in 2026 with and without the Project-generated traffic. The 2026 forecast turning movements at the intersections include the combined effects of the changes from 2020 conditions resulting from non-Project developments described in Section 5.1, and background traffic growth described in Section 5.3. These changes have been applied to the surveyed turning movements at the intersections during the busiest hours identified for traffic generated at the intersection of the Mount Pleasant Operation Access Road and Wybong Road (Section 0). Detailed results, including 95th percentile vehicle queues per movement are presented in Appendix D.

Table 6.13: Intersection Operating Conditions in 2026

Site[A]	Intersection	AM Peak			PM Peak		
		X-Value	Average Delay[B]	LoS	X-Value	Average Delay[B]	LoS
2026 Baseline – Without Project							
D	Mount Pleasant Operation Road and Wybong Road	0.04	8.0	A	0.08	8.5	A
E	Wybong Road and Kayuga Road	0.03	7.1	A	0.05	7.1	A
F	Wybong Road and Bengalla Road	0.07	9.5	A	0.09	8.6	A
G	Bengalla Road and Denman Road	0.18	14.1	A	0.22	12.7	A
-	Denman Road and Thomas Mitchell Drive	0.28	14.3	A	0.58	18.1	B
-	Thomas Mitchell Drive and New England Highway	0.22	13.3	A	0.39	14.1	A
2026 With Project							
D	Mount Pleasant Operation Road and Wybong Road	0.11	8.5	A	0.17	9.5	A
E	Wybong Road and Kayuga Road	0.04	7.2	A	0.06	7.2	A
F	Wybong Road and Bengalla Road	0.15	10.6	A	0.16	8.9	A
G	Bengalla Road and Denman Road	0.27	16.7	B	0.30	12.9	A
-	Denman Road and Thomas Mitchell Drive	0.32	16.5	B	0.68	22.9	B
-	Thomas Mitchell Drive and New England Highway	0.23	13.5	A	0.44	14.5	B

[A] *Refer to Figure 4.1.*
[B] *Seconds per vehicle for movement with the highest average delay per vehicle.*

Review of the results in Table 6.13 indicate that in 2026, the intersections can be expected to operate at satisfactory levels of service during the Project peak hours, with spare capacity and acceptable delays to vehicles.

Table 6.14 presents a summary of the peak hour operating characteristics of the surveyed intersections in 2036 with and without the Project-generated traffic. Detailed results, including vehicle queues are presented in Appendix D. The table also presents indicative results for the intersections of Thomas Mitchell Drive with Denman Road and New England Highway, based on the results of the 2018 surveys of those intersections, with adjustments made as described above.

Table 6.14: Intersection Operating Conditions in 2036

Site[A]	Intersection	AM Peak			PM Peak		
		X-Value	Average Delay[B]	LoS	X-Value	Average Delay[B]	LoS
2036 Baseline – Without Project							
D	Mount Pleasant Operation Road and Wybong Road	-	-	-	-	-	-
E	Wybong Road and Kayuga Road	0.03	7.1	A	0.05	7.1	A
F	Wybong Road and Bengalla Road	0.05	9.0	A	0.05	8.6	A
G	Bengalla Road and Denman Road	0.15	13.3	A	0.19	11.7	A
-	Denman Road and Thomas Mitchell Drive	0.22	13.0	A	0.53	17.3	B
-	Thomas Mitchell Drive and New England Highway	0.19	13.2	A	0.36	14.4	A
2036 With Project							
D	Mount Pleasant Operation Road and Wybong Road	0.12	8.6	A	0.27	8.4	A
E	Wybong Road and Kayuga Road	0.05	7.1	A	0.08	7.1	A
F	Wybong Road and Bengalla Road	0.18	11.1	A	0.24	9.1	A
G	Bengalla Road and Denman Road	0.31	18.0	B	0.41	14.1	A
-	Denman Road and Thomas Mitchell Drive	0.28	16.5	B	0.73	29.3	C
-	Thomas Mitchell Drive and New England Highway	0.22	13.7	A	0.49	15.5	B

[A] *Refer to Figure 4.1.*
[B] *Seconds per vehicle for movement with the highest average delay per vehicle.*

Review of the results in Table 6.14 indicate that in 2036, the intersections can be expected to operate at satisfactory levels of service during the Project peak hours, with spare capacity and acceptable delays to vehicles. The exception to this is the intersection of Denman Road with Thomas Mitchell Drive, which has previously been identified as requiring upgrading to accommodate future demands.

The results of the sensitivity analysis of the potential cumulative traffic volumes in 2036 if the Mt Arthur Coal Mine was to receive approval to extend operations until at least 2036 (Section 6.11) are consistent with previous assessments, indicating the intersection of Thomas Mitchell Drive and Denman Road would require an upgrade in the future.

It is expected that upgrading of this intersection, which is the subject of Condition 47(c) of the Project Approval for the Mt Arthur Coal Mine Open Cut Consolidation Project, would also be required under any extension of the Mt Arthur Coal Mine Project Approval.

6.6 Intersection Designs

The forecast long-term peak hour traffic demands at the key intersections have been compared against the major road treatments required by Austroads (2020b).

The general minimum preferred treatment at rural road intersections in greenfields developments are Basic Left-turn (BAL) and Basic Right-turn (BAR) treatments. The rural BAL treatment on the major road has a widened shoulder, which assists turning vehicles to move further off the through carriageway, making it easier for through vehicles to pass. The rural BAR treatment features a widened shoulder on the major road that allows through vehicles, having slowed, to pass to the left of turning vehicles. The BAL treatment on the minor road allows turning movements to occur from a single lane, with a shoulder that is too narrow to be used by left-turning vehicles, so as to prevent vehicles from standing two abreast at the holding line. These design features are preferred to safely manage the movement of vehicles in the high-speed rural environment.

Auxiliary lane treatments have short lengths of auxiliary lane provided to improve safety, especially on high speed roads. The Auxiliary Right-turn (AUR) treatment on the major road is created by the use of a short lane with standard painted stripes, where the median lane is shared between through and right-turning vehicles, and the auxiliary kerbside lane allows through vehicles to pass a vehicle which has slowed to turn right. AUR treatments are not used in NSW, rather a channelised right-turn treatment with a short turn bay known as a Channelised Right-turn (Short Lane Type) (CHR[S]) treatment may be used. This is a modification of the channelised treatment described below.

Auxiliary Left-turn (AUL) treatments on the major and minor road are normal indented turn lanes, used only by vehicles turning left. The auxiliary lane treatment on the major road is safer than a basic treatment, however the channelised treatment described below is preferred where practicable, as the risk of collisions is lower. Consequently, Austroads (2020b) indicates that a Channelised Left-turn (CHL) treatment should be used wherever practicable. The AUL treatment on the minor road is less safe than a basic or channelised treatment, and while it is included in the warrants, it is not recommended. Austroads (2020b) indicates that a BAL or CHL treatment should be used wherever practicable.

Channelised treatments on the major road are CHL and Channelised Right-turn (CHR) treatments for left and right turns from the major road respectively. The channelised "CH" treatments separate conflicting vehicle paths by raised or painted medians and/or islands, and often use auxiliary lanes in conjunction with channelisation. The CHR treatment on the major road provides a continuous lane for through vehicles only, and an auxiliary turn lane for right-turning vehicles only. CHL treatments on the major or minor road provide a separate left-turn "slip" lane, separated from the adjacent lane by a painted or raised island. Channelised treatments are preferred over auxiliary lane treatments where practicable, as the risk of collisions is lower.

The existing treatments at the key intersections expected to be used by Project-generated traffic have been compared against those treatments warranted for the forecast long-term demands as set out in Austroads (2020b) for greenfields developments. The results are summarised in Table 6.15.

Table 6.15: Intersection Major Road Turn Treatment Warrants 2036 with Project

Site[A]	Intersection	Existing Treatment	AM Warrant Treatment	PM Warrant Treatment
D	Mount Pleasant Operation Road and Wybong Road	AUL BAR	BAL BAR	BAL BAR
E	Wybong Road and Kayuga Road	- -	BAL BAR	BAL BAR
F	Wybong Road and Bengalla Road	AUL CHR	BAL CHR(S)	BAL BAR
G	Bengalla Road and Denman Road	AUL(S) CHR	BAL CHR	BAL CHR

[A] *Refer to Figure 4.1.*

Table 6.15 indicates that the existing main road treatments at the intersections generally meet or exceed those required by application of the Austroads (2020b) warrants. The existing layout of the intersection of Kayuga Road with Wybong Road does not include formalised widened shoulders on either side of Kayuga Road. These minimum desirable treatments are warranted by the existing traffic demands at the intersection, not as a direct result of Project traffic.

Design or timing details regarding the planned upgrade of the intersection of Thomas Mitchell Drive with Denman Road are not known. However, it is anticipated that the intersection would be designed in accordance with current guidelines, and is therefore expected to provide a safe environment for all users, but notably for drivers turning right from Thomas Mitchell Drive by reducing delays to those vehicles.

The intersections of New England Highway with Blairmore Lane and Dartbrook Road are both constructed to a similar standard, with wide sealed shoulders on New England Highway, and no auxiliary lanes. Sight distances at both intersections are satisfactory, and the wide shoulders on New England Highway are generally consistent with the Austroads BAL and BAR treatments, which assist turning vehicles to move further off the through carriageway, making it easier for through vehicles to pass. The main difference between the two intersections is that at the Blairmore Lane intersection, the speed limit on New England Highway is 50 km/h, but it is 80 km/h at the Dartbrook Road intersection. The lower speed at the Blairmore Lane intersection means it can sustain higher turning volumes before higher level treatments may be warranted on safety grounds.

Excluding the possible shuttle buses, the Project would contribute peaks of 11 and 27 light vehicles entering both Dartbrook Road and Blairmore Lane from New England Highway during the AM peak hour in 2026 and 2036, respectively. These trips are likely to be distributed across the movements turning right into Dartbrook Road, and turning both right and left into Blairmore Lane. Excluding the possible shuttle buses, the Project would contribute peaks of 18 and 39 light vehicles exiting both Dartbrook Road and Blairmore Lane to New England Highway during the PM peak hour in 2026 and 2036, respectively. These trips are likely to be distributed across the movements turning left from Dartbrook Road, and turning both left and right from Blairmore Lane.

Overall, considering the spread of Project traffic across the movements at the two intersections, it is considered that the existing intersection layouts are satisfactory, with the Blairmore Lane intersection being somewhat preferred for Project access over that of Dartbrook Road due to the lower speeds on New England Highway.

6.7 Oversize and Overmass Vehicles

Consistent with the existing SAMP for the Mount Pleasant Operation, the movement of any oversize or overmass vehicles associated with the Project will conform with the relevant permits obtained in accordance with *Additional Access Conditions Oversize and overmass heavy vehicles and loads* (RMS, 2020), and any other licences and escorts as required by the regulatory authorities.

6.8 Railway Level Crossings

As a component of the Project, the increase in transport of product coal would require an increase in the annual train movements. Daily train movements would increase from a maximum of nine laden trains per day for the approved Mount Pleasant Operation to a maximum of 10 laden trains per day with the Project.

Between the Mount Pleasant Operation and the Main Northern Railway, all road and rail crossings are grade separated, so there is no potential for increased rail traffic to impact road network operations. Once Project-generated trains are on the Main Northern Railway to Newcastle, the Project's additional contribution to total rail traffic would not be significant, thus the potential impacts on delays experienced by road-based traffic would be negligible.

Furthermore, there is a very limited number of railway level crossings between Muswellbrook and Newcastle, and with only one exception (on Shamrock Street which provides access only to the Hunter Wetlands National Park), all those crossings are actively-controlled, with boom gates and flashing lights for the road traffic. These active controls warn motorists that a train is approaching the level crossing and the boom gates prevent vehicles from entering the crossing when a train is approaching, and so offer the highest level of safety at level crossings. The addition of one laden train per day at maximum production generated by the Project is therefore expected to have minimal impact on both delays to road traffic and safety at railway levels crossings.

6.9 Road Safety Implications

The road crash history of the roads serving the Project (Section 4.7) did not identify any causation factors associated with the existing road network that may be exacerbated by increased traffic demands.

The Road Safety Audit of existing conditions on the Project access routes (Appendix C) did not highlight any particular road safety concerns regarding the basic road alignment or width characteristics of the routes. No high risk items were identified. The majority of the medium risk and low risk items identified in the audit relate to a lack of road linemarking, signage or guide posts and protection barriers to roadside structures, together with some need for pavement or drainage improvements.

6.10 Mitigation Measures

The foregoing assessment suggests that the existing road network can satisfactorily accommodate the forecast traffic demands resulting from the Project without any specific additional road upgrade requirements. Upgrading of the intersection of Thomas Mitchell Drive with Denman Road is the subject of Condition 47(c) of the Project Approval for the Mt Arthur Coal Mine Open Cut Consolidation Project.

The existing SAMP for the Mount Pleasant Operation appropriately identifies those routes that may and may not be used by all traffic travelling to and from the Mount Pleasant Operation. All Project vehicular access would be consistent with the SAMP requirements, which will be reviewed and amended from time to time. The effectiveness of the SAMP would continue to be reviewed and monitored by MACH, with more appropriate procedures implemented if the original traffic management practices are proven to not be adequate.

The existing layout of the intersection of Wybong Road with Kayuga Road does not meet current Austroads standards with regard to major road treatments that would be provided for a greenfields rural road intersection. Based on Austroads (2020b), the existing demands at the intersection warrant its upgrading to include BAR and BAL treatments in Kayuga Road, i.e., widened shoulders. In the long term with the Project traffic, the forecast demands would

also warrant BAR and BAL treatments in Kayuga Road, thus the Project itself would not trigger a need for further upgrading of the intersection.

6.11 Implications of Road Network Changes

As discussed in Section 5.2, future changes to the road network in the region may include construction of the Bypass, and changes to local access roads suggested by the *Muswellbrook Mine Affected Roads Network Review Plan*. Detailed forecasts of the potential implications of these possible changes are not available at the time of writing, however the broad implications of the possible changes on the findings of this report have been considered and are discussed below.

Should these road network changes occur, all roads and intersections would be designed to accommodate the anticipated traffic demands resulting from those road network changes.

6.11.1 Muswellbrook Bypass

The Bypass is not expected to have a significant direct impact on the routes used by Project-generated traffic. Those Project vehicles assumed herein to travel to and from New England Highway north of Muswellbrook (i.e., Scone and Aberdeen) would continue to use Kayuga Road and Blairmore Lane or Dartbrook Road, with the northern end of the Bypass expected to join New England Highway south of Aberdeen. Similarly, those Project vehicles assumed herein to travel to and from New England Highway south of Muswellbrook (i.e. Singleton and Lower Hunter) would continue to use Thomas Mitchell Drive, with the southern end of the Bypass expected to join New England Highway north of Thomas Mitchell Drive.

As the Bypass would primarily serve those vehicles currently travelling through Muswellbrook along New England Highway, and is expected to pass to the east of Muswellbrook, its impact on general traffic conditions to the west of Muswellbrook would likely be minimal.

6.11.2 Mount Pleasant Northern Link Road

Mount Pleasant Northern Link Road will provide an east-west link to Dorset Road to the north of the Mount Pleasant Operation, and be constructed prior to closure of Castlerock Road. This road link would not be used by existing Mount Pleasant Operation traffic, nor by Project-generated traffic. It would provide a local access function for lands to the north of the Mount Pleasant Operation, replacing the function currently served by Castlerock Road. It is therefore not expected to have a significant impact on traffic conditions on those roads currently used by Mount Pleasant Operation traffic or expected to be used by Project traffic.

6.11.3 Muswellbrook Mine Affected Roads Network Plan

Considering the high-level nature of these strategies, and assuming that the constraints on their construction are able to be overcome, the potential implications of construction of the recommended strategy envisaged in the *Muswellbrook Mine Affected Roads Network Plan Review* (Bitzios, 2020) (primarily the Western Corridor and Inner West Link) are broadly expected to be as described below.

The Western Corridor and Inner West Link are intended to form a western bypass route around Muswellbrook for traffic between Golden Highway at Jerrys Plains, and New England Highway north of Muswellbrook. In the immediate vicinity of the Mount Pleasant Operation, the recommended plan includes a new link between Denman Road and Bengalla Road, a new link between Bengalla Road and Wybong Road via Overton Road, and a new link between Wybong Road near Overton Road to New England Highway to the east of the Mount Pleasant Operation via a new bridge over the Hunter River and an upgraded Burtons Lane (Bitzios, 2020).

The review's key network recommendations refer to a link north from Wybong Road to Dorset Road as part of the Western Corridor, however this is not reflected in the road network plan, or triggers and priorities contained in the report, and appears to relate to a previously proposed route which is no longer being considered.

It is unclear from the review what preferred route the Western Corridor traffic would follow between the intersection of the new link at Bengalla Road (northern end of Option W1) and the new link from Wybong Road near Overton Road (southern end of Option W7). Between these points, traffic may follow either Bengalla Road and the Inner West Link (Option 2B) or the existing (and longer-term realigned) Bengalla Road and Wybong Road past the Mount Pleasant Operation. The review states (Bitzios, 2020) "there is the potential to utilise the realigned Bengalla Link Road as part of a western corridor linking Denman Road to New England Highway" however the preferred route is not clarified.

The Western Corridor and Inner West Link would form an alternative route for traffic currently using Wybong Road and Kayuga Road to travel between New England Highway north of Muswellbrook (e.g., Scone and Aberdeen) and destinations to the west and south-west, including to and from Mangoola Coal, Bengalla Mine, Mount Pleasant Operation, Denman, and locations farther west along Golden Highway.

Bitzios (2020) indicates that the Inner West Link between Bengalla Road and Wybong Road would reduce traffic demands on Wybong Road west of Overton Road. Although not stated in the review, it is assumed that this is due to the likely diversion of traffic travelling between Bengalla Mine and New England Highway north of Muswellbrook currently using Aberdeen Street – Kayuga Road – Wybong Road – Bengalla Road. That traffic may divert to the Inner West Link and Bengalla Road to Bengalla Mine, which would likely offer reduced travel time. It is unlikely that vehicles currently using Wybong Road west of Overton Road to access Mangoola Coal and destinations farther to the west would divert from Wybong Road as the Inner West Link would be less direct. Mount Pleasant Operation and Project traffic would also continue to use that part of Wybong Road west of Overton Road should the Inner West Link be constructed.

Construction of the Inner West Link has the potential to increase the use of Wybong Road west of Overton Road by existing Mount Pleasant Operation traffic from Muswellbrook that is currently using Bengalla Road to avoid use of Kayuga Bridge. The extent to which this occurs would depend on the travel time savings offered by the new route, which may vary between those employees who reside in the northern part of Muswellbrook and those who reside in the south.

The overall impact of the Inner West Link would be to alter the forecast traffic volumes on Wybong Road to the east and west of the Mount Pleasant Operation from those anticipated in this assessment, with some increased demand from some sources, and decreased demand from other sources. If the Inner West Link were to be constructed, a portion of the Project-generated traffic assumed herein to use Kayuga Road would likely use the Inner West Link instead to travel between the Project and New England Highway. The Project's traffic on Kayuga Road, Blairmore Lane and Dartbrook Road would be reduced in that scenario.

Similarly, the portion of the Inner West Link envisaged between Wybong Road and Denman Road via Overton Road has the potential to form an alternative route for Mount Pleasant Operation and Project traffic travelling to and from the southern parts of the town of Muswellbrook. This assessment assumes that these vehicles would use Wybong Road – Bengalla Road – Denman Road to access Muswellbrook. The net effect of this would be to reduce the Project-generated traffic volumes on Bengalla Road between Wybong Road and the Inner West Link Road below those forecast herein, and increase traffic on Wybong Road between the Mount Pleasant Operation access and the Inner West Link.

Traffic would also likely be reduced on Bengalla Road west of Denman Road, and on Denman Road between the new link road opposite the proposed Edderton Road northern deviation and Bengalla Road.

Some traffic currently using Thomas Mitchell Drive to travel between destinations to the south along New England Highway south and the western region of Muswellbrook (including Mangoola Coal and Bengalla Mine) may instead use the Western Corridor (realigned Edderton Road) to travel to and from the south via Golden Highway. This would result in some reduction of traffic using Thomas Mitchell Drive below that forecast in this assessment.

Should the Inner West Link proceed, it is therefore likely that a higher proportion of traffic travelling to and from the Mount Pleasant Operation would use Wybong Road east of the Mount Pleasant Operation access road. It is expected the final design of the Inner West Link would be based on assessment of such potential changes to traffic flows and would identify any road and intersection upgrades required to support the Inner West Link.

Overall, this assessment has demonstrated that the existing road network can adequately accommodate the Mount Pleasant Operation and Project traffic without implementation of the recommended road network changes presented in the *Muswellbrook Mine Affected Roads Network Plan Review* (Bitzios, 2020). Aspects of that plan require further investigation, and would generally result in dispersion of traffic on to more routes than assumed herein. The Project is not reliant upon implementation of any of the road changes, so should further investigation of the feasibility of several aspects of those changes determine that they cannot proceed, no changes to the Project as proposed would be required.

6.12 Sensitivity Assessment

The foregoing assessment of 2036 conditions assumes that the Mt Arthur Coal Mine would cease operating before 2036, based on its current approvals (Section 5.1.6). To consider the future traffic conditions should the Mt Arthur Coal Mine extend its mine life beyond its current approved limits, a sensitivity assessment has been undertaken and is discussed below.

The sensitivity assessment assumes that in 2036, the Mt Arthur Coal Mine continues to operate with an estimated workforce of 1,500 people. On this basis, the change in traffic generated by the Mt Arthur Coal Mine from 2020 to 2036 would be the same as that reported in Table 5.7 for 2026. Vehicles travelling to and from the Mt Arthur Coal Mine would be expected to use:

- Denman Road;
- Edderton Road;
- Thomas Mitchell Drive; and
- New England Highway south of Thomas Mitchell Drive.

The operating conditions of the key intersections along those routes and relevant to the Project have been reanalysed using SIDRA INTERSECTION 9 assuming that the Mt Arthur Coal Mine continues to operate as described above, together with the Project. As Wybong Road would not be used by the Mt Arthur Coal Mine traffic, the intersections along Wybong Road are not included in this sensitivity assessment. The results of the analyses are summarised in Table 6.16.

Table 6.16: Sensitivity – Intersection Operation with Mt Arthur Coal Mine and the Project 2036

Site[A]	Intersection	AM Peak			PM Peak		
		X-Value	Average Delay[B]	LoS	X-Value	Average Delay[B]	LoS
G	Bengalla Road and Denman Road	0.31	18.2	B	0.41	14.3	B
-	Denman Road and Thomas Mitchell Drive	0.39	18.6	B	0.93	53.2	D
-	Thomas Mitchell Drive and New England Highway	0.26	14.2	B	0.55	16.2	B

[A] *Refer to Figure 4.1.*
[B] *Seconds per vehicle for movement with the highest average delay per vehicle.*

The results in Table 6.16 indicate that should the Mt Arthur Coal Mine continue operating to 2036, the operation of the intersection of Denman Road with Thomas Mitchell Drive would decline to LoS D during the PM peak hour, with long delays and limited capacity for vehicles turning right from Thomas Mitchell Drive in to Denman Road. The AM peak hour operation would be acceptable.

That intersection has previously been identified as requiring upgrading to accommodate future demands, and upgrading of the intersection is the subject of Condition 47(c) of the Project Approval for the Mt Arthur Coal Mine Open Cut Consolidation Project. It is understood the intersection upgrade will be completed by December 2026 (DPIE, 2020).

The other key intersections used by both the Mt Arthur Coal Mine traffic and Project traffic would operate at good levels of service.

7 Conclusions

This study has examined the likely road transport implications of the Mount Pleasant Optimisation Project. It is concluded that no specific measures or upgrades are required to mitigate the impacts of the development on the capacity, safety and efficiency of the road network as a result of the changed road traffic conditions associated with the Project. The existing SAMP for the Mount Pleasant Operation provides appropriate guidance for all vehicles accessing the site and would apply to Project-generated traffic. With the Project, the SAMP would continue to be reviewed and more appropriate procedures implemented if the existing practices are proven not to be efficient.

With the forecast changes in traffic in the region related to the cumulative effects of the Project, other developments and background growth, future midblock levels of service experienced by drivers on the key access roads for the Project would remain satisfactory, and the key intersections which would be used by Project traffic are expected to operate at good levels of service with short delays and spare capacity without requiring upgrading. The operation of the intersection of Denman Road and Thomas Mitchell Drive is expected to decline in the future, however is planned to be upgraded by others regardless of the Project.

The main road treatments at the existing intersections expected to be used by Project-generated traffic generally meet or exceed those required by application of the Austroads warrants for greenfields intersection design. The intersection of Kayuga Road with Wybong Road does not include formalised widened shoulders on either side of Kayuga Road, which would be warranted under existing traffic demands.

The Road Safety Audit on the Project access routes did not identify any high risk items. Most medium and low risk items identified in the audit relate to a lack of road linemarking, signage or guide posts and protection barriers to roadside structures, together with some need for pavement or drainage improvements to improve existing road safety conditions.

The planned construction of the Bypass to the east of Muswellbrook would primarily serve those vehicles currently travelling through Muswellbrook along New England Highway and is not expected to make a significant impact to general traffic conditions on the Project access routes to the west of Muswellbrook. The Mount Pleasant Northern Link Road would generally not be used by Mount Pleasant Operation or Project-related traffic and would have negligible impact on general traffic conditions on the Project access roads, providing only local area access.

This assessment has demonstrated that the existing road network can adequately accommodate the Mount Pleasant Operation and Project traffic without implementation of the recommended road network changes presented in the *Muswellbrook Mine Affected Roads Network Plan Review* (Bitzios, 2020). Aspects of that plan require further investigation, and would generally result in dispersion of traffic on to more routes than assumed in this assessment. The Project is not reliant upon implementation of any of the road changes, so should further investigation of the feasibility of several aspects of those changes determine that they cannot proceed, no changes to the Project as proposed would be required.

Appendix A

Traffic Survey Results

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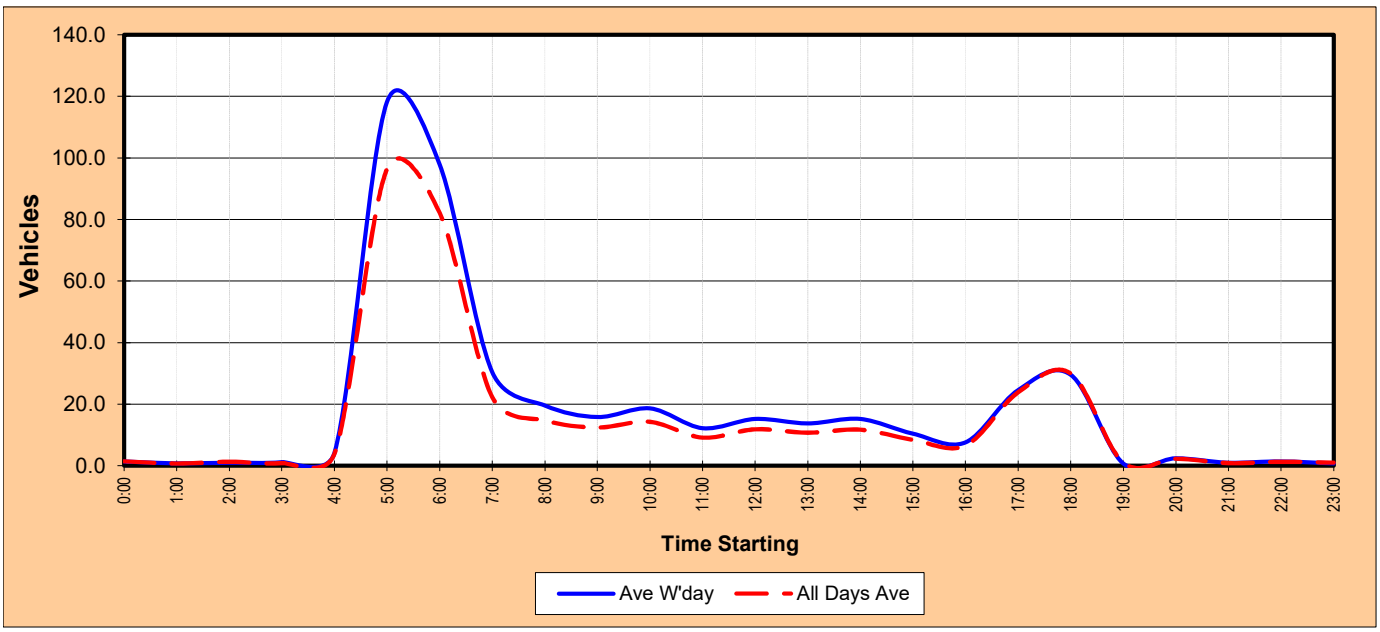
Road	Mt Pleasant Operation Main Access Rd
Location	Off Wybong Rd
Suburb	Muswellbrook
Site No.	8552_1
Start Date	Tuesday 11/02/2020
Direction	Northbound

Average Weekday	444
All Day Average	369
Weekday Heavy's	19.6%
All Day Heavy's	19.3%

Starting Time	Day of Week							Ave W'day	All Days Ave
	Mon	Tue	Wed	Thu	Fri	Sat	Sun		
	17-Feb	11-Feb	12-Feb	13-Feb	14-Feb	15-Feb	16-Feb		
AM Peak	**109**	**115**	**130**	**127**	**110**	**47**	**42**		
PM Peak	**27**	**30**	**30**	**29**	**32**	**30**	**32**		
0:00	1	3	1	1	1	1	2	1	1
1:00	0	1	0	2	1	1	0	1	1
2:00	2	0	2	0	1	2	2	1	1
3:00	0	3	0	3	0	0	0	1	1
4:00	3	2	5	5	6	3	3	4	4
5:00	109	115	130	127	110	42	42	118	96
6:00	86	111	110	90	92	47	39	98	82
7:00	35	23	25	38	31	3	1	30	22
8:00	16	15	24	29	14	3	2	20	15
9:00	18	20	18	12	11	5	3	16	12
10:00	14	18	21	21	19	4	3	19	14
11:00	8	13	16	14	10	2	1	12	9
12:00	13	14	22	14	13	4	3	15	12
13:00	11	10	23	12	13	2	4	14	11
14:00	11	16	14	23	12	5	1	15	12
15:00	6	15	9	15	7	4	3	10	8
16:00	5	6	9	9	9	5	3	8	7
17:00	25	26	29	22	21	20	24	25	24
18:00	27	30	30	29	32	30	32	30	30
19:00	1	0	0	0	3	1	2	1	1
20:00	2	2	3	3	2	3	1	2	2
21:00	0	1	2	2	0	0	1	1	1
22:00	1	1	3	0	2	1	1	1	1
23:00	0	2	1	0	1	1	2	1	1
Total	**394**	**447**	**497**	**471**	**411**	**189**	**175**	**444**	**369**
% Heavies	**20.6%**	**20.6%**	**19.9%**	**20.0%**	**17.0%**	**19.0%**	**15.4%**	**19.6%**	**19.3%**



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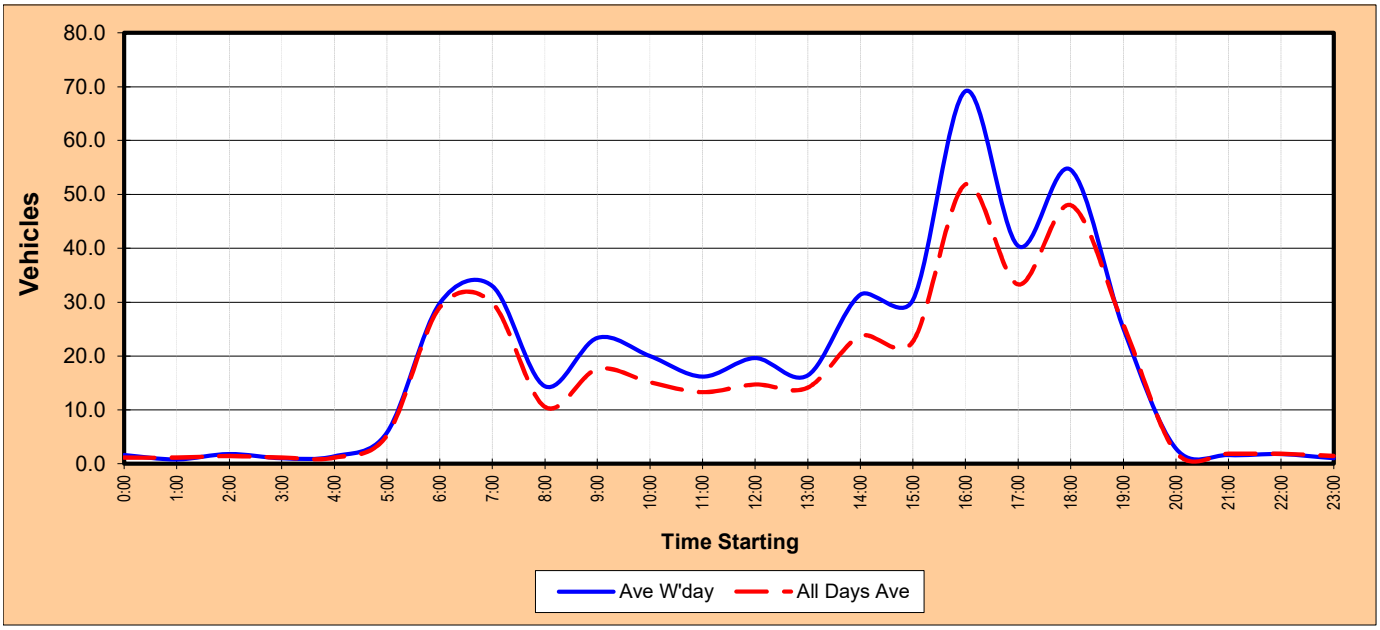
Road	Mt Pleasant Operation Main Access Rd
Location	Off Wybong Rd
Suburb	Muswellbrook
Site No.	8552_1
Start Date	Tuesday 11/02/2020
Direction	Southbound

Average Weekday	444
All Day Average	368
Weekday Heavy's	15.0%
All Day Heavy's	14.2%

Starting Time	Day of Week							Ave W'day	All Days Ave
	Mon	Tue	Wed	Thu	Fri	Sat	Sun		
	17-Feb	11-Feb	12-Feb	13-Feb	14-Feb	15-Feb	16-Feb		
AM Peak	**44**	**39**	**30**	**34**	**37**	**28**	**32**		
PM Peak	**56**	**75**	**80**	**90**	**58**	**32**	**32**		
0:00	1	1	2	1	3	0	0	2	1
1:00	2	1	0	1	0	2	2	1	1
2:00	1	1	2	1	4	1	0	2	1
3:00	1	0	2	1	1	1	2	1	1
4:00	3	0	2	1	1	0	1	1	1
5:00	5	10	7	3	4	6	2	6	5
6:00	38	25	27	34	25	22	32	30	29
7:00	25	39	30	34	37	28	16	33	30
8:00	17	9	18	20	8	0	2	14	11
9:00	44	23	15	14	21	4	2	23	18
10:00	31	13	20	21	15	5	1	20	15
11:00	19	8	19	15	20	7	5	16	13
12:00	13	20	25	24	16	1	4	20	15
13:00	13	8	14	28	19	14	3	16	14
14:00	17	24	35	29	52	6	3	31	24
15:00	29	33	27	33	30	4	3	30	23
16:00	43	75	80	90	58	8	9	69	52
17:00	18	52	64	44	24	12	19	40	33
18:00	56	70	69	48	30	31	32	55	48
19:00	8	30	22	32	34	32	23	25	26
20:00	3	3	4	1	3	0	1	3	2
21:00	1	2	2	2	1	2	3	2	2
22:00	1	1	4	1	2	2	2	2	2
23:00	1	0	1	2	1	3	2	1	1
Total	**390**	**448**	**491**	**480**	**409**	**191**	**169**	**444**	**368**
% Heavies	**16.4%**	**12.3%**	**16.7%**	**15.4%**	**14.2%**	**11.0%**	**6.5%**	**15.0%**	**14.2%**



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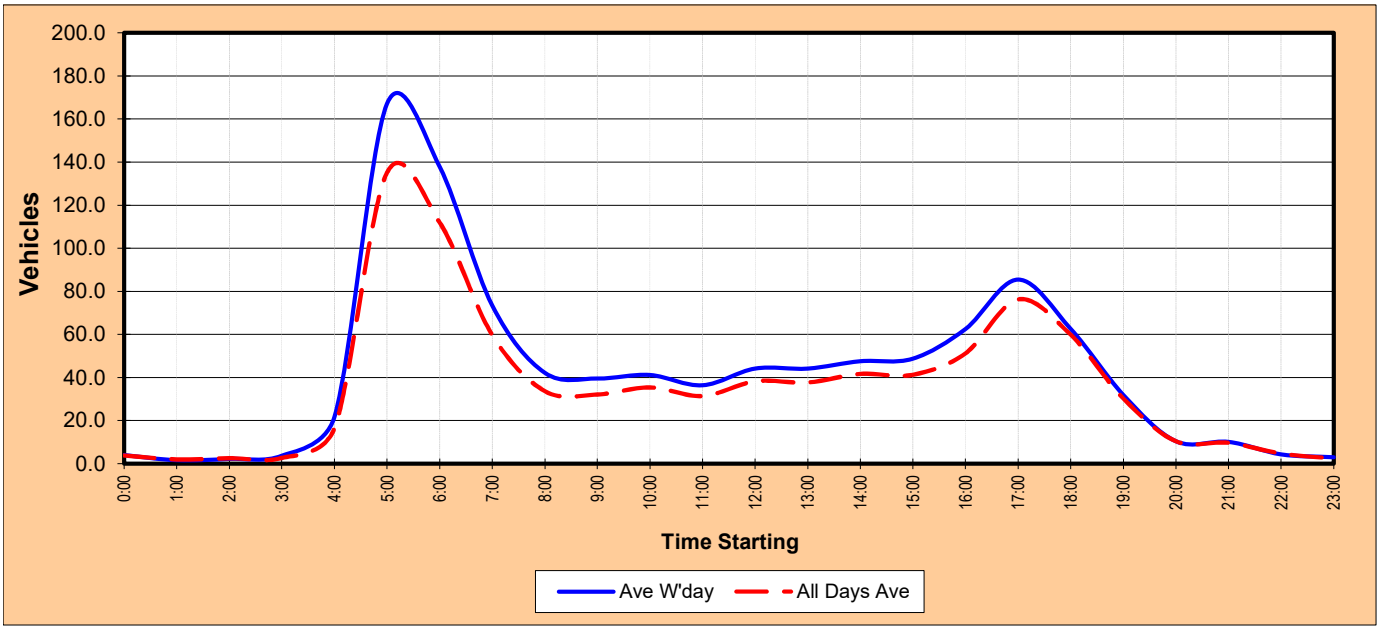
Road	Bengalla Rd
Location	South Of Wybong Rd
Suburb	Muswellbrook
Site No.	8552_3
Start Date	Tuesday 11/02/2020
Direction	Northbound

Average Weekday	1026
All Day Average	871
Weekday Heavy's	19.2%
All Day Heavy's	18.1%

Starting Time	Day of Week							Ave W'day	All Days Ave
	Mon	Tue	Wed	Thu	Fri	Sat	Sun		
	17-Feb	11-Feb	12-Feb	13-Feb	14-Feb	15-Feb	16-Feb		
AM Peak	182	156	179	178	140	53	59		
PM Peak	86	77	95	84	85	57	51		
0:00	1	6	5	4	4	4	3	4	4
1:00	2	1	1	3	1	5	1	2	2
2:00	6	2	2	0	1	4	3	2	3
3:00	5	4	2	6	2	0	0	4	3
4:00	30	19	21	18	21	5	2	22	17
5:00	182	156	179	178	140	52	59	167	135
6:00	153	156	146	113	121	53	42	138	112
7:00	66	72	66	90	73	28	23	73	60
8:00	36	32	51	49	43	13	12	42	34
9:00	32	34	41	52	39	16	11	40	32
10:00	33	44	44	44	41	25	17	41	35
11:00	27	28	47	38	42	16	22	36	31
12:00	37	52	46	50	36	27	20	44	38
13:00	45	47	52	37	40	19	24	44	38
14:00	47	44	51	53	43	29	25	48	42
15:00	38	49	52	55	50	21	24	49	41
16:00	53	62	62	71	65	19	27	63	51
17:00	86	77	95	84	85	56	51	85	76
18:00	55	52	70	69	67	57	49	63	60
19:00	16	31	37	41	35	21	31	32	30
20:00	14	10	8	11	9	10	11	10	10
21:00	1	10	13	15	12	8	9	10	10
22:00	4	2	3	7	6	4	7	4	5
23:00	2	2	4	0	7	1	1	3	2
Total	**971**	**992**	**1098**	**1088**	**983**	**493**	**474**	**1026**	**871**
% Heavies	**19.2%**	**19.8%**	**19.0%**	**19.4%**	**18.5%**	**12.4%**	**12.0%**	**19.2%**	**18.1%**



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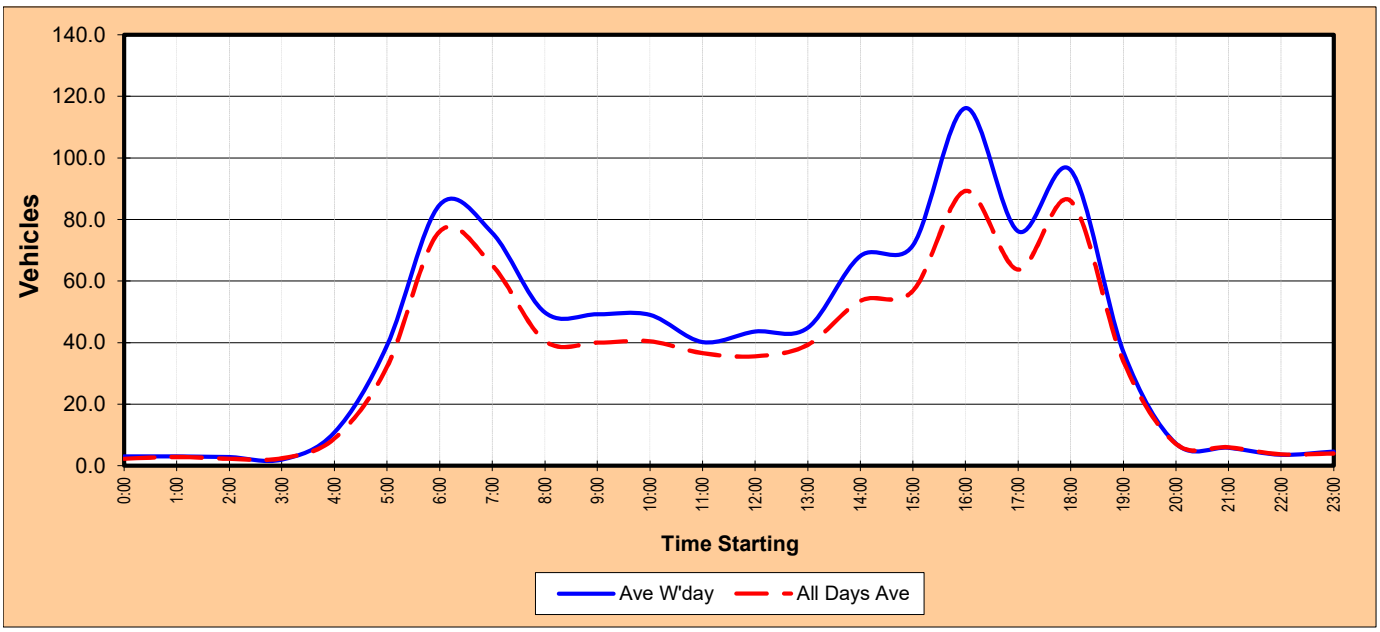
Road	Bengalla Rd
Location	South Of Wybong Rd
Suburb	Muswellbrook
Site No.	8552_3
Start Date	Tuesday 11/02/2020
Direction	Southbound

Average Weekday	984
All Day Average	829
Weekday Heavy's	18.1%
All Day Heavy's	17.2%

Starting Time	Day of Week							Ave W'day	All Days Ave
	Mon	Tue	Wed	Thu	Fri	Sat	Sun		
	17-Feb	11-Feb	12-Feb	13-Feb	14-Feb	15-Feb	16-Feb		
AM Peak	**82**	**81**	**86**	**99**	**84**	**52**	**57**		
PM Peak	**101**	**125**	**136**	**126**	**101**	**66**	**56**		
0:00	1	3	4	3	4	1	0	3	2
1:00	4	2	3	5	1	4	1	3	3
2:00	3	2	2	2	5	2	0	3	2
3:00	2	0	4	2	2	3	4	2	2
4:00	15	8	11	9	11	5	3	11	9
5:00	35	31	52	42	35	15	15	39	32
6:00	82	73	86	99	84	52	57	85	76
7:00	67	81	68	81	81	48	30	76	65
8:00	51	39	45	60	54	25	10	50	41
9:00	64	47	43	40	52	14	20	49	40
10:00	61	48	30	62	44	25	13	49	40
11:00	46	30	33	43	49	28	27	40	37
12:00	46	41	45	45	41	14	17	44	36
13:00	37	29	39	62	57	35	16	45	39
14:00	55	53	76	67	90	21	13	68	54
15:00	64	67	70	69	88	16	24	72	57
16:00	93	125	136	126	101	18	26	116	89
17:00	73	93	91	73	51	22	43	76	64
18:00	101	113	109	90	67	66	56	96	86
19:00	25	43	43	38	37	25	27	37	34
20:00	6	8	7	8	7	2	12	7	7
21:00	4	10	4	5	6	6	7	6	6
22:00	2	2	6	3	5	4	4	4	4
23:00	5	3	6	6	3	4	1	5	4
Total	**942**	**951**	**1013**	**1040**	**975**	**455**	**426**	**984**	**829**
% Heavies	**18.2%**	**16.8%**	**18.7%**	**19.7%**	**17.2%**	**12.3%**	**11.5%**	**18.1%**	**17.2%**

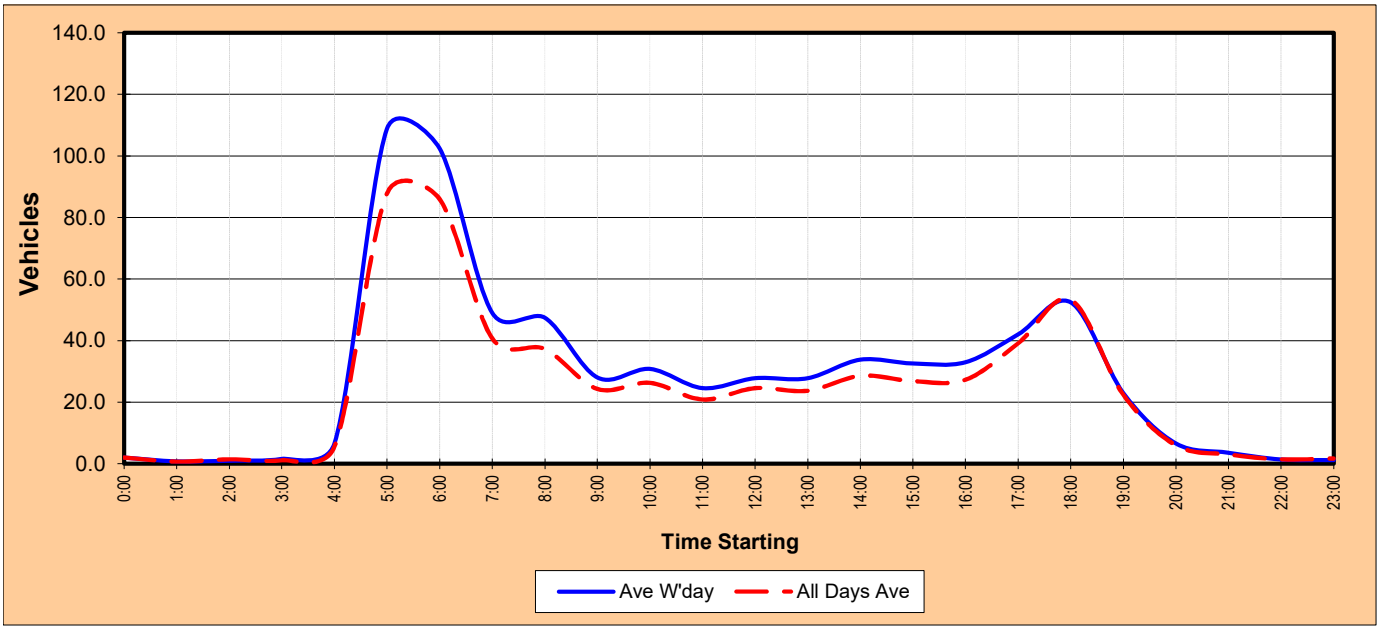


austraffic

Road	Wybong Rd
Location	Btw Bengalla Rd & Mt Pl Acess
Suburb	Muswellbrook
Site No.	8552_2
Start Date	Tuesday 11/02/2020
Direction	Eastbound

Average Weekday	688
All Day Average	592
Weekday Heavy's	11.3%
All Day Heavy's	10.5%

Starting Time	Day of Week							Ave W'day	All Days Ave
	Mon	Tue	Wed	Thu	Fri	Sat	Sun		
	17-Feb	11-Feb	12-Feb	13-Feb	14-Feb	15-Feb	16-Feb		
AM Peak	**100**	**111**	**121**	**120**	**98**	**45**	**45**		
PM Peak	**56**	**56**	**47**	**55**	**55**	**57**	**54**		
0:00	1	4	2	2	1	1	3	2	2
1:00	0	1	1	1	1	1	0	1	1
2:00	1	1	2	0	1	3	2	1	1
3:00	0	3	1	4	0	0	0	2	1
4:00	6	4	10	7	6	3	3	7	6
5:00	100	105	121	120	98	36	35	109	88
6:00	91	111	113	99	98	45	45	102	86
7:00	43	51	48	56	47	21	19	49	41
8:00	37	46	54	59	41	16	8	47	37
9:00	32	28	24	33	23	16	14	28	24
10:00	25	37	30	34	28	20	10	31	26
11:00	20	19	24	28	32	11	12	25	21
12:00	22	32	39	25	21	18	15	28	25
13:00	32	22	29	26	30	15	12	28	24
14:00	23	34	38	39	35	13	18	34	29
15:00	22	36	35	38	32	9	16	33	27
16:00	23	31	31	46	34	13	13	33	27
17:00	34	56	45	37	38	37	27	42	39
18:00	56	49	47	55	55	57	54	52	53
19:00	12	15	35	25	28	15	27	23	22
20:00	5	4	5	9	10	4	5	7	6
21:00	1	7	5	4	1	1	2	4	3
22:00	0	3	2	1	1	1	2	1	1
23:00	0	1	2	0	3	3	3	1	2
Total	**586**	**700**	**743**	**748**	**664**	**359**	**345**	**688**	**592**
% Heavies	**10.4%**	**10.1%**	**12.1%**	**12.3%**	**11.4%**	**6.7%**	**6.1%**	**11.3%**	**10.5%**

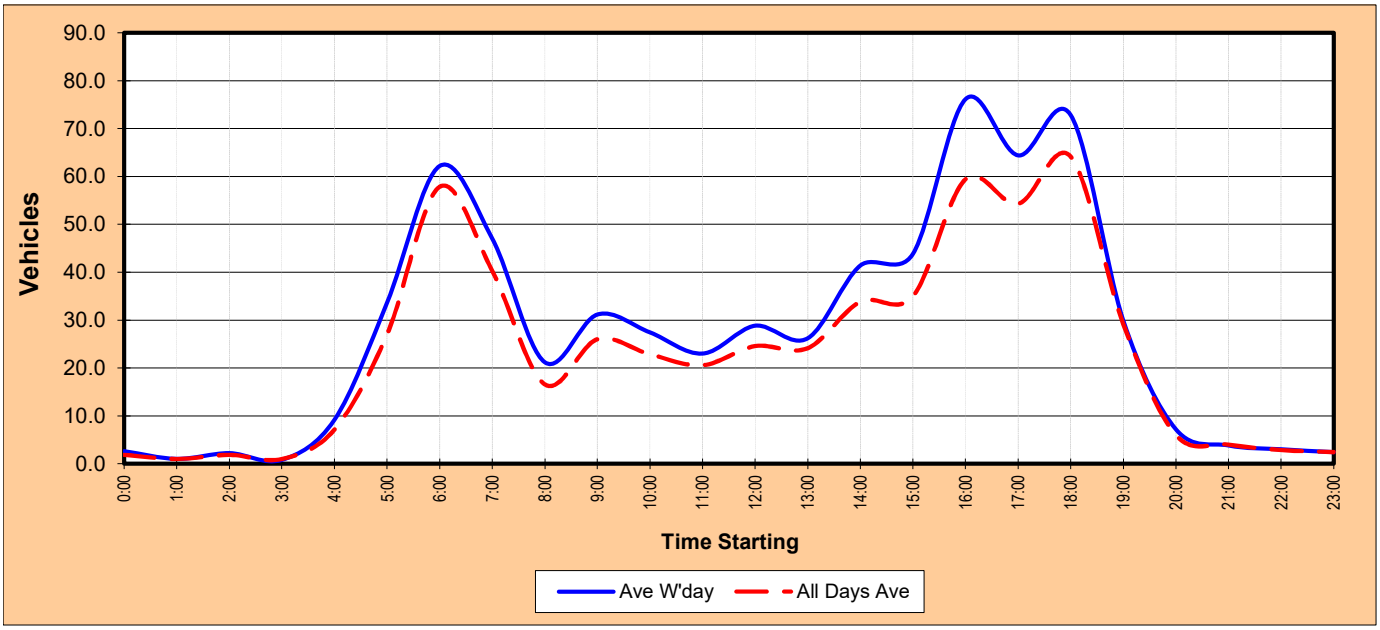


austraffic

Road	Wybong Rd
Location	Btw Bengalla Rd & Mt Pl Acess
Suburb	Muswellbrook
Site No.	8552_2
Start Date	Tuesday 11/02/2020
Direction	Westbound

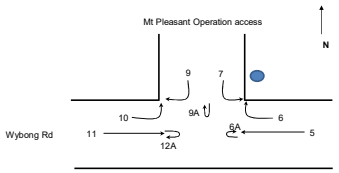
Average Weekday	661
All Day Average	564
Weekday Heavy's	18.9%
All Day Heavy's	17.3%

Starting Time	Day of Week							Ave W'day	All Days Ave
	Mon	Tue	Wed	Thu	Fri	Sat	Sun		
	17-Feb	11-Feb	12-Feb	13-Feb	14-Feb	15-Feb	16-Feb		
AM Peak	**65**	**59**	**58**	**68**	**61**	**49**	**45**		
PM Peak	**71**	**94**	**100**	**88**	**69**	**45**	**40**		
0:00	2	4	2	1	4	0	0	3	2
1:00	2	2	0	1	0	1	1	1	1
2:00	2	1	2	2	4	2	0	2	2
3:00	0	0	2	1	1	1	2	1	1
4:00	9	9	10	8	10	2	2	9	7
5:00	38	28	40	31	31	12	9	34	27
6:00	65	59	58	68	61	49	45	62	58
7:00	43	51	44	48	49	25	22	47	40
8:00	19	15	25	30	17	5	5	21	17
9:00	45	28	25	23	35	14	12	31	26
10:00	40	22	28	25	22	12	11	27	23
11:00	24	13	25	19	34	15	14	23	21
12:00	21	34	35	33	21	13	15	29	25
13:00	24	18	20	43	26	27	11	26	24
14:00	25	32	44	43	63	14	16	41	34
15:00	38	45	36	47	53	13	13	44	35
16:00	52	80	92	88	69	15	20	76	59
17:00	37	69	100	66	50	24	34	64	54
18:00	71	94	87	72	40	45	40	73	64
19:00	10	41	26	35	38	24	30	30	29
20:00	5	11	6	5	9	2	4	7	6
21:00	2	5	2	5	5	4	5	4	4
22:00	1	1	4	3	6	2	3	3	3
23:00	3	0	4	3	2	3	2	2	2
Total	**578**	**662**	**717**	**700**	**650**	**324**	**316**	**661**	**564**
% Heavies	**17.3%**	**16.8%**	**20.2%**	**22.6%**	**17.2%**	**9.6%**	**8.5%**	**18.9%**	**17.3%**



austraffic

Client : TTPP
Job : Muswellbrook ATC
Day/Date : Wednesday, 27 November 2019
Survey Location : Mount Pleasant Operation access & Wybong Road
Weather : Fine

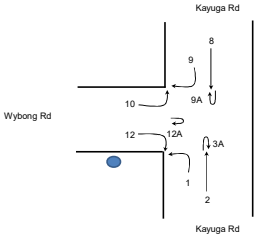


Time Period	Movement 5			Movement 6			Movement 6A			Movement 7			Movement 9			Movement 9A			Movement 10			Movement 11			Movement 12A			Total of all Movements
	Light	Heavy	Total	Light	Heavy	Total	Light	Heavy	Total	Light	Heavy	Total	Light	Heavy	Total	Light	Heavy	Total	Light	Heavy	Total	Light	Heavy	Total	Light	Heavy	Total	
6:00 - 6:15	15	0	15	1	0	1	0	0	0	2	0	2	6	0	6	0	0	0	18	2	20	1	0	1	0	0	0	45
6:15 - 6:30	9	0	9	3	0	3	0	0	0	1	0	1	5	0	5	0	0	0	26	3	29	1	0	1	0	0	0	48
6:30 - 6:45	5	0	5	5	0	5	0	0	0	0	0	0	1	0	1	0	0	0	25	0	25	2	0	2	0	0	0	38
6:45 - 7:00	2	1	3	2	0	2	0	0	0	1	0	1	6	0	6	0	0	0	14	1	15	14	1	15	0	0	0	42
7:00 - 7:15	6	0	6	2	0	2	0	0	0	9	0	9	17	1	18	0	0	0	5	0	5	13	0	13	0	0	0	53
7:15 - 7:30	5	0	5	1	0	1	0	0	0	1	0	1	5	0	5	0	0	0	4	0	4	8	2	10	0	0	0	26
7:30 - 7:45	5	1	6	1	0	1	0	0	0	0	0	0	2	0	2	0	0	0	6	1	7	5	0	5	0	0	0	21
7:45 - 8:00	5	1	6	1	0	1	0	0	0	1	0	1	1	0	1	0	0	0	3	4	7	6	1	7	0	0	0	23
8:00 - 8:15	2	0	2	1	0	1	0	0	0	1	0	1	1	1	2	0	0	0	5	1	6	4	1	5	0	0	0	17
8:15 - 8:30	2	0	2	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	1	0	1	8	2	10	0	0	0	14
8:30 - 8:45	3	0	3	0	0	0	0	0	0	1	0	1	4	0	4	0	0	0	3	0	3	9	1	10	0	0	0	21
8:45 - 9:00	2	1	3	1	0	1	0	0	0	1	1	2	2	5	7	0	0	0	3	0	3	2	1	3	0	0	0	19
9:00 - 9:15	8	0	8	2	0	2	0	0	0	2	0	2	2	1	3	0	0	0	2	2	4	4	0	4	0	0	0	23
9:15 - 9:30	3	0	3	1	0	1	0	0	0	0	0	0	4	1	5	0	0	0	7	0	7	5	0	5	0	0	0	21
9:30 - 9:45	6	0	6	3	0	3	0	0	0	1	0	1	6	0	6	0	0	0	5	1	6	4	2	6	0	0	0	28
9:45 - 10:00	2	0	2	2	0	2	0	0	0	2	0	2	1	0	1	0	0	0	6	4	10	10	1	11	0	0	0	28
10:00 - 10:15	2	0	2	2	0	2	0	0	0	0	0	0	4	0	4	0	0	0	4	1	5	1	0	1	0	0	0	14
10:15 - 10:30	1	1	2	2	0	2	0	0	0	3	1	4	2	2	4	0	0	0	2	1	3	5	0	5	0	0	0	20
10:30 - 10:45	1	0	1	0	0	0	0	0	0	3	0	3	2	0	2	0	0	0	6	1	7	2	0	2	0	0	0	15
10:45 - 11:00	3	0	3	3	0	3	0	0	0	0	0	0	1	2	3	0	0	0	4	0	4	4	0	4	0	0	0	17
11:00 - 11:15	4	1	5	1	0	1	0	0	0	0	0	0	5	1	6	0	0	0	3	2	5	5	0	5	0	0	0	22
11:15 - 11:30	4	2	6	0	1	1	0	0	0	0	0	0	1	1	2	0	0	0	2	0	2	4	0	4	0	0	0	15
11:30 - 11:45	3	1	4	0	0	0	0	0	0	3	0	3	5	1	6	0	0	0	2	0	2	3	0	3	0	0	0	18
11:45 - 12:00	3	0	3	1	0	1	0	0	0	2	0	2	2	1	3	0	0	0	4	2	6	2	0	2	0	0	0	17
12:00 - 12:15	1	0	1	0	0	0	0	0	0	3	0	3	3	2	5	0	0	0	2	1	3	3	0	3	0	0	0	15
12:15 - 12:30	6	0	6	1	0	1	0	0	0	2	0	2	5	1	6	0	0	0	3	2	5	3	1	4	0	0	0	24
12:30 - 12:45	10	0	10	0	0	0	0	0	0	0	0	0	4	2	6	0	0	0	4	0	4	3	3	6	0	0	0	26
12:45 - 13:00	2	0	2	0	0	0	0	0	0	1	1	2	5	0	5	0	0	0	0	0	0	4	0	4	0	0	0	13
13:00 - 13:15	3	2	5	1	0	1	0	0	0	2	1	3	3	2	5	0	0	0	5	2	7	0	1	1	0	0	0	22
13:15 - 13:30	5	0	5	0	0	0	0	0	0	1	0	1	6	1	7	0	0	0	2	1	3	4	0	4	0	0	0	20
13:30 - 13:45	2	1	3	1	0	1	0	0	0	2	2	4	4	0	4	0	0	0	3	2	5	7	0	7	0	0	0	24
13:45 - 14:00	4	0	4	2	0	2	0	0	0	2	0	2	2	0	2	0	0	0	2	1	3	5	0	5	0	0	0	18
14:00 - 14:15	3	1	4	2	0	2	0	0	0	1	0	1	2	1	3	0	0	0	3	0	3	5	0	5	0	0	0	18
14:15 - 14:30	6	0	6	1	0	1	0	0	0	0	0	0	2	2	4	0	0	0	4	2	6	4	0	4	0	0	0	21
14:30 - 14:45	3	0	3	2	0	2	0	0	0	0	1	1	6	2	8	0	0	0	4	3	7	3	1	4	0	0	0	25
14:45 - 15:00	1	3	4	0	0	0	0	2	2	2	0	2	2	1	3	0	0	0	2	1	3	7	0	7	0	0	0	21
15:00 - 15:15	3	1	4	2	0	2	0	0	0	2	0	2	6	1	7	0	0	0	0	0	0	8	0	8	0	0	0	23
15:15 - 15:30	4	2	6	0	0	0	0	0	0	3	0	3	5	0	5	0	0	0	1	0	1	6	0	6	0	0	0	21
15:30 - 15:45	4	0	4	1	0	1	0	0	0	0	0	0	3	0	3	0	0	0	1	0	1	11	0	11	0	0	0	20
15:45 - 16:00	4	2	6	0	0	0	0	0	0	1	0	1	5	0	5	0	0	0	5	1	6	6	0	6	0	0	0	24
16:00 - 16:15	6	0	6	1	0	1	0	0	0	6	0	6	19	2	21	0	0	0	0	0	0	3	0	3	0	0	0	37
16:15 - 16:30	2	0	2	0	0	0	0	0	0	4	0	4	15	1	16	0	0	0	1	1	2	10	0	10	0	0	0	34
16:30 - 16:45	5	0	5	0	0	0	0	0	0	4	0	4	13	2	15	0	0	0	1	0	1	7	0	7	0	0	0	32
16:45 - 17:00	6	0	6	1	0	1	0	0	0	2	0	2	15	1	16	0	0	0	1	0	1	9	0	9	0	0	0	35
17:00 - 17:15	6	0	6	1	0	1	0	0	0	3	0	3	18	1	19	0	0	0	3	0	3	2	0	2	0	0	0	34
17:15 - 17:30	6	0	6	1	0	1	0	0	0	0	0	0	5	0	5	0	0	0	3	0	3	6	1	7	0	0	0	22
17:30 - 17:45	8	0	8	1	0	1	0	0	0	0	0	0	9	2	11	0	0	0	14	0	14	2	0	2	0	0	0	36
17:45 - 18:00	8	1	9	1	0	1	0	0	0	0	0	0	8	0	8	0	0	0	4	0	4	5	0	5	0	0	0	27
Total	209	22	231	54	1	55	0	2	2	76	7	83	250	41	291	0	0	0	228	43	271	245	19	264	0	0	0	1197
AM Peak	22	1	23	12	0	12	0	0	0	11	0	11	29	1	30	0	0	0	70	4	74	30	1	31	0	0	0	181
PM Peak	19	0	19	2	0	2	0	0	0	16	0	16	62	6	68	0	0	0	3	1	4	29	0	29	0	0	0	138

Peak Hour Volume Determination	
6:00 - 7:00	173
6:15 - 7:15	181
6:30 - 7:30	159
6:45 - 7:45	142
7:00 - 8:00	123
7:15 - 8:15	87
7:30 - 8:30	75
7:45 - 8:45	75
8:00 - 9:00	71
8:15 - 9:15	77
8:30 - 9:30	84
8:45 - 9:45	91
9:00 - 10:00	100
9:15 - 10:15	91
9:30 - 10:30	90
9:45 - 10:45	77
10:00 - 11:00	66
10:15 - 11:15	74
10:30 - 11:30	69
10:45 - 11:45	72
11:00 - 12:00	72
11:15 - 12:15	65
11:30 - 12:30	74
11:45 - 12:45	82
12:00 - 13:00	78
12:15 - 13:15	85
12:30 - 13:30	81
12:45 - 13:45	79
13:00 - 14:00	84
13:15 - 14:15	80
13:30 - 14:30	81
13:45 - 14:45	82
14:00 - 15:00	85
14:15 - 15:15	90
14:30 - 15:30	90
14:45 - 15:45	85
15:00 - 16:00	88
15:15 - 16:15	102
15:30 - 16:30	115
15:45 - 16:45	127
16:00 - 17:00	138
16:15 - 17:15	135
16:30 - 17:30	123
16:45 - 17:45	127
17:00 - 18:00	119
AM Peak	181
PM Peak	138

austraffic

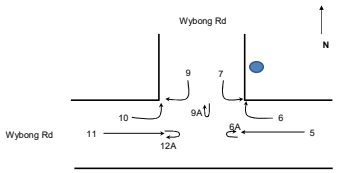
Client : TTPP
Job : Muswellbrook ATC
Day/Date : Wednesday, 27 November 2019
Survey Location : Wybong Road & Kayuga Road
Weather : Fine



Time Period	Movement 1			Movement 2			Movement 3A			Movement 8			Movement 9			Movement 9A			Movement 10			Movement 12			Movement 12A			Total of all Movements	Peak Hour Volume Determination	
	Light	Heavy	Total	Light	Heavy	Total	Light	Heavy	Total	Light	Heavy	Total	Light	Heavy	Total	Light	Heavy	Total	Light	Heavy	Total	Light	Heavy	Total	Light	Heavy	Total			
6:00 - 6:15	8	0	8	2	0	2	0	0	0	2	0	2	7	0	7	0	0	0	3	0	3	1	0	1	0	0	0	23	6:00 - 7:00	95
6:15 - 6:30	6	0	6	4	0	4	0	0	0	7	0	7	6	0	6	0	0	0	2	0	2	3	0	3	0	0	0	28	6:15 - 7:15	102
6:30 - 6:45	4	0	4	2	0	2	0	0	0	7	0	7	6	0	6	0	0	0	0	0	0	3	0	3	0	0	0	22	6:30 - 7:30	100
6:45 - 7:00	1	1	2	3	0	3	0	0	0	8	0	8	3	0	3	0	0	0	0	0	0	6	0	6	0	0	0	22	6:45 - 7:45	100
7:00 - 7:15	3	0	3	4	3	7	0	0	0	3	0	3	2	0	2	0	0	0	7	0	7	8	0	8	0	0	0	30	7:00 - 8:00	98
7:15 - 7:30	3	0	3	1	0	1	0	0	0	7	1	8	1	1	2	0	0	0	8	0	8	4	0	4	0	0	0	26	7:15 - 8:15	97
7:30 - 7:45	4	0	4	4	0	4	0	0	0	6	0	6	2	0	2	0	0	0	5	0	5	1	0	1	0	0	0	22	7:30 - 8:30	95
7:45 - 8:00	2	0	2	2	0	2	0	0	0	6	0	6	3	0	3	0	0	0	2	0	2	5	0	5	0	0	0	20	7:45 - 8:45	93
8:00 - 8:15	3	0	3	5	1	6	0	0	0	9	1	10	0	0	0	0	0	0	0	0	0	8	2	10	0	0	0	29	8:00 - 9:00	104
8:15 - 8:30	1	0	1	3	1	4	0	0	0	8	0	8	1	0	1	0	0	0	3	0	3	6	1	7	0	0	0	24	8:15 - 9:15	98
8:30 - 8:45	2	0	2	2	0	2	0	0	0	6	0	6	2	0	2	0	0	0	2	0	2	5	1	6	0	0	0	20	8:30 - 9:30	94
8:45 - 9:00	4	0	4	4	0	4	0	0	0	12	1	13	1	0	1	0	0	0	0	0	0	8	1	9	0	0	0	31	8:45 - 9:45	105
9:00 - 9:15	3	0	3	5	0	5	0	0	0	9	0	9	1	0	1	0	0	0	2	0	2	3	0	3	0	0	0	23	9:00 - 10:00	102
9:15 - 9:30	4	0	4	1	0	1	0	0	0	6	1	7	3	0	3	0	0	0	1	0	1	4	0	4	0	0	0	20	9:15 - 10:15	93
9:30 - 9:45	8	0	8	5	0	5	0	0	0	10	0	10	2	0	2	0	0	0	2	0	2	4	0	4	0	0	0	31	9:30 - 10:30	85
9:45 - 10:00	2	0	2	1	2	3	0	0	0	2	0	2	3	0	3	0	0	0	3	1	4	12	2	14	0	0	0	28	9:45 - 10:45	73
10:00 - 10:15	6	0	6	2	0	2	0	0	0	2	0	2	0	0	0	0	0	0	1	0	1	3	0	3	0	0	0	14	10:00 - 11:00	58
10:15 - 10:30	2	0	2	2	0	2	0	0	0	4	1	5	0	0	0	0	0	0	1	0	1	2	0	2	0	0	0	12	10:15 - 11:15	61
10:30 - 10:45	4	0	4	3	0	3	0	0	0	7	0	7	1	0	1	0	0	0	1	0	1	3	0	3	0	0	0	19	10:30 - 11:30	72
10:45 - 11:00	1	0	1	0	0	0	0	0	0	4	0	4	1	0	1	0	0	0	0	0	0	7	0	7	0	0	0	13	10:45 - 11:45	71
11:00 - 11:15	3	2	5	5	2	7	0	0	0	3	1	4	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	17	11:00 - 12:00	74
11:15 - 11:30	1	0	1	7	0	7	0	0	0	6	1	7	2	1	3	0	0	0	0	0	0	5	0	5	0	0	0	23	11:15 - 12:15	77
11:30 - 11:45	2	1	3	2	0	2	0	0	0	7	1	8	1	0	1	0	0	0	3	0	3	1	0	1	0	0	0	18	11:30 - 12:30	76
11:45 - 12:00	1	1	2	5	0	5	0	0	0	4	0	4	0	0	0	0	0	0	1	0	1	4	0	4	0	0	0	16	11:45 - 12:45	90
12:00 - 12:15	3	0	3	2	3	5	0	0	0	5	1	6	0	0	0	0	0	0	2	0	2	4	0	4	0	0	0	20	12:00 - 13:00	95
12:15 - 12:30	6	0	6	4	0	4	0	0	0	7	0	7	0	0	0	0	0	0	0	0	0	5	0	5	0	0	0	22	12:15 - 13:15	92
12:30 - 12:45	9	0	9	8	0	8	0	0	0	4	4	8	1	0	1	0	0	0	0	2	2	3	1	4	0	0	0	32	12:30 - 13:30	88
12:45 - 13:00	3	0	3	7	0	7	0	0	0	5	0	5	0	0	0	0	0	0	2	0	2	2	2	4	0	0	0	21	12:45 - 13:45	77
13:00 - 13:15	6	0	6	2	0	2	0	0	0	4	0	4	1	0	1	0	0	0	0	0	0	4	0	4	0	0	0	17	13:00 - 14:00	83
13:15 - 13:30	5	0	5	2	0	2	0	0	0	6	0	6	0	1	1	0	0	0	2	0	2	1	1	2	0	0	0	18	13:15 - 14:15	89
13:30 - 13:45	4	0	4	3	1	4	0	0	0	7	0	7	0	0	0	0	0	0	1	1	2	3	1	4	0	0	0	21	13:30 - 14:30	98
13:45 - 14:00	3	0	3	6	1	7	0	0	0	5	1	6	0	0	0	0	0	0	2	0	2	9	0	9	0	0	0	27	13:45 - 14:45	99
14:00 - 14:15	3	0	3	9	1	10	0	0	0	3	1	4	2	0	2	0	0	0	1	0	1	3	0	3	0	0	0	23	14:00 - 15:00	95
14:15 - 14:30	2	0	2	8	1	9	0	0	0	3	1	4	2	1	3	0	0	0	3	0	3	6	0	6	0	0	0	27	14:15 - 15:15	106
14:30 - 14:45	2	0	2	4	1	5	0	0	0	6	1	7	3	0	3	0	0	0	0	0	0	4	1	5	0	0	0	22	14:30 - 15:30	110
14:45 - 15:00	3	0	3	6	1	7	0	0	0	2	0	2	1	0	1	0	0	0	3	1	4	6	0	6	0	0	0	23	14:45 - 15:45	119
15:00 - 15:15	4	2	6	6	0	6	0	0	0	11	1	12	1	0	1	0	0	0	3	0	3	6	0	6	0	0	0	34	15:00 - 16:00	127
15:15 - 15:30	5	2	7	7	0	7	0	0	0	7	0	7	0	1	1	0	0	0	5	0	5	4	0	4	0	0	0	31	15:15 - 16:15	122
15:30 - 15:45	3	0	3	16	1	17	0	0	0	3	0	3	0	0	0	0	0	0	4	0	4	4	0	4	0	0	0	31	15:30 - 16:30	132
15:45 - 16:00	5	2	7	7	0	7	0	0	0	4	1	5	1	0	1	0	0	0	3	1	4	7	0	7	0	0	0	31	15:45 - 16:45	137
16:00 - 16:15	0	0	0	9	0	9	0	0	0	4	0	4	2	0	2	0	0	0	5	0	5	8	1	9	0	0	0	29	16:00 - 17:00	144
16:15 - 16:30	3	0	3	12	0	12	0	0	0	8	1	9	1	1	2	0	0	0	6	0	6	9	0	9	0	0	0	41	16:15 - 17:15	153
16:30 - 16:45	7	0	7	9	0	9	0	0	0	7	1	8	3	0	3	0	0	0	5	0	5	4	0	4	0	0	0	36	16:30 - 17:30	142
16:45 - 17:00	8	0	8	7	0	7	0	0	0	6	0	6	1	0	1	0	0	0	8	0	8	8	0	8	0	0	0	38	16:45 - 17:45	133
17:00 - 17:15	7	0	7	15	0	15	0	0	0	5	0	5	1	0	1	0	0	0	2	0	2	8	0	8	0	0	0	38	17:00 - 18:00	126
17:15 - 17:30	6	0	6	10	0	10	0	0	0	2	0	2	4	0	4	0	0	0	4	0	4	4	0	4	0	0	0	30	AM Peak	105
17:30 - 17:45	7	0	7	8	0	8	0	0	0	4	0	4	4	0	4	0	0	0	1	0	1	3	0	3	0	0	0	27	PM Peak	153
17:45 - 18:00	7	0	7	9	1	10	0	0	0	5	0	5	4	0	4	0	0	0	2	0	2	3	0	3	0	0	0	31		
Total	189	11	200	250	20	270	0	0	0	268	21	289	80	6	86	0	0	0	112	6	118	224	14	238	0	0	0	1201		
AM Peak	19	0	19	15	0	15	0	0	0	37	2	39	7	0	7	0	0	0	5	0	5	19	1	20	0	0	0	105		
PM Peak	25	0	25	43	0	43	0	0	0	26	2	28	6	1	7	0	0	0	21	0	21	29	0	29	0	0	0	153		

austraffic

Client : TTPP
Job : Muswellbrook ATC
Day/Date : Wednesday, 27 November 2019
Survey Location : Wybong Road & Bengalla Road
Weather : Fine

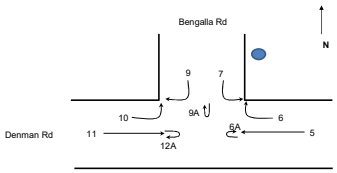


Time Period	Movement 5			Movement 6			Movement 6A			Movement 7			Movement 9			Movement 9A			Movement 10			Movement 11			Movement 12A			Total of all Movements
	Light	Heavy	Total	Light	Heavy	Total	Light	Heavy	Total	Light	Heavy	Total	Light	Heavy	Total	Light	Heavy	Total	Light	Heavy	Total	Light	Heavy	Total	Light	Heavy	Total	
6:00 - 6:15	18	0	18	18	3	21	0	0	0	10	0	10	10	0	10	0	0	0	6	0	6	4	0	4	0	0	0	69
6:15 - 6:30	9	0	9	26	2	28	0	0	0	9	0	9	5	0	5	0	0	0	0	0	0	12	0	12	0	0	0	63
6:30 - 6:45	4	1	5	27	0	27	0	0	0	4	0	4	2	0	2	0	0	0	2	0	2	7	0	7	0	0	0	47
6:45 - 7:00	7	1	8	13	2	15	0	0	0	5	0	5	2	1	3	0	0	0	12	0	12	31	1	32	0	0	0	75
7:00 - 7:15	6	0	6	9	1	10	0	0	0	18	0	18	5	1	6	0	0	0	4	0	4	18	1	19	0	0	0	63
7:15 - 7:30	11	0	11	11	1	12	0	0	0	8	0	8	3	0	3	0	0	0	3	0	3	10	0	10	0	0	0	47
7:30 - 7:45	7	3	10	7	1	8	0	0	0	3	0	3	4	1	5	0	0	0	3	0	3	8	1	9	0	0	0	38
7:45 - 8:00	7	2	9	6	5	11	0	0	0	4	1	5	3	0	3	0	0	0	4	0	4	7	0	7	0	0	0	39
8:00 - 8:15	3	7	10	5	1	6	0	0	0	1	1	2	2	0	2	0	0	0	3	1	4	4	0	4	0	0	0	28
8:15 - 8:30	6	0	6	2	0	2	0	0	0	0	0	0	2	0	2	0	0	0	7	1	8	9	0	9	0	0	0	27
8:30 - 8:45	4	1	5	5	1	6	0	0	0	5	0	5	2	0	2	0	0	0	7	0	7	7	1	8	0	0	0	33
8:45 - 9:00	6	3	9	4	0	4	0	0	0	4	4	8	1	0	1	0	0	0	2	1	3	4	0	4	0	0	0	29
9:00 - 9:15	5	1	6	2	2	4	0	0	0	4	3	7	4	0	4	0	0	0	4	0	4	6	4	10	0	0	0	35
9:15 - 9:30	5	2	7	8	0	8	0	0	0	5	0	5	3	1	4	0	0	0	3	0	3	9	1	10	0	0	0	37
9:30 - 9:45	4	2	6	5	1	6	0	0	0	5	0	5	5	0	5	0	0	0	6	2	8	6	0	6	0	0	0	36
9:45 - 10:00	3	2	5	10	3	13	0	0	0	3	0	3	2	0	2	0	0	0	4	2	6	10	3	13	0	0	0	42
10:00 - 10:15	6	1	7	5	1	6	0	0	0	3	0	3	3	0	3	0	0	0	2	0	2	6	0	6	0	0	0	27
10:15 - 10:30	3	3	6	6	1	7	0	0	0	1	3	4	2	0	2	0	0	0	1	0	1	6	1	7	0	0	0	27
10:30 - 10:45	5	1	6	5	1	6	0	0	0	2	0	2	1	0	1	0	0	0	2	0	2	4	0	4	0	0	0	21
10:45 - 11:00	5	1	6	4	0	4	0	0	0	2	2	4	0	0	0	0	0	0	4	0	4	10	3	13	0	0	0	31
11:00 - 11:15	4	1	5	4	2	6	0	0	0	7	0	7	3	1	4	0	0	0	3	0	3	4	1	5	0	0	0	30
11:15 - 11:30	9	5	14	3	0	3	0	0	0	2	3	5	2	1	3	0	0	0	4	0	4	10	3	13	0	0	0	42
11:30 - 11:45	1	0	1	4	0	4	0	0	0	8	1	9	1	1	2	0	0	0	1	0	1	5	0	5	0	0	0	22
11:45 - 12:00	3	2	5	4	3	7	0	0	0	0	1	1	3	0	3	0	0	0	3	0	3	8	0	8	0	0	0	27
12:00 - 12:15	4	2	6	3	0	3	0	0	0	5	2	7	1	0	1	0	0	0	2	0	2	4	3	7	0	0	0	26
12:15 - 12:30	12	0	12	4	3	7	0	0	0	3	1	4	6	0	6	0	0	0	3	1	4	4	2	6	0	0	0	39
12:30 - 12:45	12	1	13	4	1	5	0	0	0	10	2	12	6	0	6	0	0	0	2	1	3	6	2	8	0	0	0	47
12:45 - 13:00	7	4	11	2	0	2	0	0	0	5	0	5	1	0	1	0	0	0	2	0	2	3	0	3	0	0	0	24
13:00 - 13:15	5	0	5	5	2	7	0	0	0	5	4	9	2	0	2	0	0	0	0	1	1	3	2	5	0	0	0	29
13:15 - 13:30	8	1	9	6	1	7	0	0	0	7	1	8	4	0	4	0	0	0	0	1	1	7	2	9	0	0	0	38
13:30 - 13:45	7	1	8	7	1	8	0	0	0	3	1	4	2	0	2	0	0	0	4	1	5	9	1	10	0	0	0	37
13:45 - 14:00	6	2	8	2	1	3	0	0	0	5	0	5	1	0	1	0	0	0	2	0	2	3	0	3	0	0	0	22
14:00 - 14:15	8	0	8	8	0	8	0	0	0	3	2	5	3	0	3	0	0	0	2	0	2	7	2	9	0	0	0	35
14:15 - 14:30	5	0	5	4	1	5	0	0	0	7	2	9	1	0	1	0	0	0	3	3	6	11	1	12	0	0	0	38
14:30 - 14:45	6	0	6	3	2	5	0	0	0	7	2	9	0	0	0	0	0	0	2	0	2	9	2	11	0	0	0	33
14:45 - 15:00	6	1	7	4	1	5	0	0	0	2	5	7	0	0	0	0	0	0	3	1	4	14	4	18	0	0	0	41
15:00 - 15:15	11	1	12	4	0	4	0	0	0	8	1	9	2	0	2	0	0	0	4	0	4	8	3	11	0	0	0	42
15:15 - 15:30	5	1	6	3	0	3	0	0	0	8	1	9	2	2	4	0	0	0	4	0	4	7	4	11	0	0	0	37
15:30 - 15:45	11	1	12	7	0	7	0	0	0	3	0	3	4	0	4	0	0	0	8	0	8	6	0	6	0	0	0	40
15:45 - 16:00	4	0	4	4	1	5	0	0	0	4	0	4	4	1	5	0	0	0	4	0	4	6	0	6	0	0	0	28
16:00 - 16:15	14	1	15	0	0	0	0	0	0	21	3	24	3	0	3	0	0	0	4	0	4	6	0	6	0	0	0	52
16:15 - 16:30	9	0	9	2	1	3	0	0	0	15	1	16	2	0	2	0	0	0	9	0	9	15	1	16	0	0	0	55
16:30 - 16:45	9	0	9	4	0	4	0	0	0	9	2	11	7	0	7	0	0	0	4	0	4	12	1	13	0	0	0	48
16:45 - 17:00	14	0	14	1	0	1	0	0	0	17	1	18	7	0	7	0	0	0	9	0	9	14	1	15	0	0	0	64
17:00 - 17:15	10	0	10	3	0	3	0	0	0	19	1	20	5	0	5	0	0	0	2	0	2	6	0	6	0	0	0	46
17:15 - 17:30	13	2	15	8	0	8	0	0	0	6	0	6	5	0	5	0	0	0	3	1	4	4	2	6	0	0	0	44
17:30 - 17:45	9	0	9	14	0	14	0	0	0	7	2	9	11	0	11	0	0	0	0	0	0	5	0	5	0	0	0	48
17:45 - 18:00	11	0	11	5	0	5	0	0	0	7	0	7	9	0	9	0	0	0	3	0	3	10	0	10	0	0	0	45
Total	347	57	404	300	46	346	0	0	0	299	53	352	158	10	168	0	0	0	169	17	186	384	53	437	0	0	0	1893
AM Peak	38	2	40	84	7	91	0	0	0	28	0	28	19	1	20	0	0	0	20	0	20	54	1	55	0	0	0	254
PM Peak	46	1	47	7	1	8	0	0	0	62	7	69	19	0	19	0	0	0	26	0	26	47	3	50	0	0	0	219

Peak Hour Volume Determination	
6:00 - 7:00	254
6:15 - 7:15	248
6:30 - 7:30	232
6:45 - 7:45	223
7:00 - 8:00	187
7:15 - 8:15	152
7:30 - 8:30	132
7:45 - 8:45	127
8:00 - 9:00	117
8:15 - 9:15	124
8:30 - 9:30	134
8:45 - 9:45	137
9:00 - 10:00	150
9:15 - 10:15	142
9:30 - 10:30	132
9:45 - 10:45	117
10:00 - 11:00	106
10:15 - 11:15	109
10:30 - 11:30	124
10:45 - 11:45	125
11:00 - 12:00	121
11:15 - 12:15	117
11:30 - 12:30	114
11:45 - 12:45	139
12:00 - 13:00	136
12:15 - 13:15	139
12:30 - 13:30	138
12:45 - 13:45	128
13:00 - 14:00	126
13:15 - 14:15	132
13:30 - 14:30	132
13:45 - 14:45	128
14:00 - 15:00	147
14:15 - 15:15	154
14:30 - 15:30	153
14:45 - 15:45	160
15:00 - 16:00	147
15:15 - 16:15	157
15:30 - 16:30	175
15:45 - 16:45	183
16:00 - 17:00	219
16:15 - 17:15	213
16:30 - 17:30	202
16:45 - 17:45	202
17:00 - 18:00	183
AM Peak	254
PM Peak	219

austraffic

Client : TTPP
Job : Muswellbrook ATC
Day/Date : Wednesday, 27 November 2019
Survey Location : Bengalla Road & Denman Road
Weather : Fine



Time Period	Movement 5			Movement 6			Movement 6A			Movement 7			Movement 9			Movement 9A			Movement 10			Movement 11			Movement 12A			Total of all Movements	Peak Hour Volume Determination	
	Light	Heavy	Total	Light	Heavy	Total	Light	Heavy	Total	Light	Heavy	Total	Light	Heavy	Total	Light	Heavy	Total	Light	Heavy	Total	Light	Heavy	Total	Light	Heavy	Total			
6:00 - 6:15	30	4	34	102	6	108	0	0	0	16	3	19	0	0	0	0	0	0	10	0	10	28	0	28	0	0	0	199	6:00 - 7:00	670
6:15 - 6:30	49	4	53	67	3	70	0	0	0	15	2	17	1	0	1	0	0	0	7	0	7	32	2	34	0	0	0	182	6:15 - 7:15	594
6:30 - 6:45	34	9	43	46	4	50	0	0	0	22	1	23	0	0	0	0	0	0	1	0	1	34	1	35	0	0	0	152	6:30 - 7:30	565
6:45 - 7:00	27	4	31	16	3	19	0	0	0	47	0	47	0	0	0	0	0	0	4	0	4	34	2	36	0	0	0	137	6:45 - 7:45	512
7:00 - 7:15	16	4	20	21	6	27	0	0	0	46	2	48	2	1	3	0	0	0	1	0	1	19	5	24	0	0	0	123	7:00 - 8:00	486
7:15 - 7:30	19	10	29	23	4	27	0	0	0	51	1	52	4	0	4	0	0	0	2	1	3	33	5	38	0	0	0	153	7:15 - 8:15	465
7:30 - 7:45	11	6	17	20	5	25	0	0	0	21	0	21	0	0	0	0	0	0	2	0	2	32	2	34	0	0	0	99	7:30 - 8:30	390
7:45 - 8:00	23	6	29	13	7	20	0	0	0	13	1	14	0	0	0	0	0	0	2	2	4	38	6	44	0	0	0	111	7:45 - 8:45	394
8:00 - 8:15	28	2	30	20	3	23	0	0	0	6	1	7	2	0	2	0	0	0	0	0	0	33	7	40	0	0	0	102	8:00 - 9:00	366
8:15 - 8:30	15	5	20	13	1	14	0	0	0	15	1	16	0	0	0	0	0	0	1	0	1	25	2	27	0	0	0	78	8:15 - 9:15	377
8:30 - 8:45	19	4	23	18	3	21	0	0	0	17	2	19	1	0	1	0	0	0	0	1	1	35	3	38	0	0	0	103	8:30 - 9:30	399
8:45 - 9:00	15	1	16	7	4	11	0	0	0	15	6	21	1	0	1	0	0	0	1	0	1	27	6	33	0	0	0	83	8:45 - 9:45	397
9:00 - 9:15	14	3	17	18	4	22	0	0	0	13	10	23	1	0	1	0	0	0	2	0	2	44	4	48	0	0	0	113	9:00 - 10:00	405
9:15 - 9:30	23	8	31	17	5	22	0	0	0	19	0	19	0	0	0	0	0	0	0	0	0	27	1	28	0	0	0	100	9:15 - 10:15	363
9:30 - 9:45	20	4	24	18	8	26	0	0	0	16	1	17	0	0	0	0	0	0	2	0	2	29	3	32	0	0	0	101	9:30 - 10:30	340
9:45 - 10:00	22	6	28	23	2	25	0	0	0	15	4	19	0	0	0	0	0	0	0	1	1	17	1	18	0	0	0	91	9:45 - 10:45	322
10:00 - 10:15	16	4	20	8	5	13	0	0	0	10	2	12	1	0	1	0	0	0	0	0	0	18	7	25	0	0	0	71	10:00 - 11:00	305
10:15 - 10:30	26	3	29	13	3	16	0	0	0	9	6	15	0	0	0	0	0	0	0	0	0	16	1	17	0	0	0	77	10:15 - 11:15	319
10:30 - 10:45	24	5	29	11	0	11	0	0	0	8	0	8	0	0	0	0	0	0	0	0	0	30	5	35	0	0	0	83	10:30 - 11:30	334
10:45 - 11:00	17	3	20	13	3	16	0	0	0	16	7	23	0	0	0	0	0	0	0	0	0	12	3	15	0	0	0	74	10:45 - 11:45	342
11:00 - 11:15	22	5	27	11	5	16	0	0	0	11	4	15	2	1	3	0	0	0	0	2	2	19	3	22	0	0	0	85	11:00 - 12:00	366
11:15 - 11:30	31	4	35	10	2	12	0	0	0	20	4	24	1	1	2	0	0	0	0	0	0	15	4	19	0	0	0	92	11:15 - 12:15	380
11:30 - 11:45	27	1	28	11	6	17	1	0	1	13	1	14	0	0	0	0	0	0	0	0	0	23	8	31	0	0	0	91	11:30 - 12:30	403
11:45 - 12:00	19	5	24	18	2	20	0	0	0	13	6	19	0	0	0	0	0	0	2	0	2	25	8	33	0	0	0	98	11:45 - 12:45	423
12:00 - 12:15	26	1	27	18	5	23	0	0	0	12	4	16	0	2	2	0	0	0	2	0	2	29	0	29	0	0	0	99	12:00 - 13:00	407
12:15 - 12:30	21	3	24	19	2	21	0	0	0	24	2	26	0	0	0	0	0	0	6	0	6	34	4	38	0	0	0	115	12:15 - 13:15	390
12:30 - 12:45	27	7	34	19	4	23	0	0	0	23	6	29	1	0	1	0	0	0	1	0	1	22	1	23	0	0	0	111	12:30 - 13:30	345
12:45 - 13:00	19	0	19	14	4	18	0	0	0	13	0	13	1	0	1	0	0	0	0	0	0	29	2	31	0	0	0	82	12:45 - 13:45	330
13:00 - 13:15	24	2	26	15	2	17	0	0	0	14	8	22	0	0	0	0	0	0	0	0	0	14	3	17	0	0	0	82	13:00 - 14:00	332
13:15 - 13:30	15	1	16	11	3	14	0	0	0	15	3	18	1	0	1	0	0	0	2	0	2	16	3	19	0	0	0	70	13:15 - 14:15	356
13:30 - 13:45	21	4	25	11	3	14	1	0	1	20	3	23	0	0	0	0	0	0	1	0	1	27	5	32	0	0	0	96	13:30 - 14:30	380
13:45 - 14:00	24	4	28	12	1	13	0	0	0	9	4	13	3	1	4	0	0	0	0	0	0	22	4	26	0	0	0	84	13:45 - 14:45	381
14:00 - 14:15	22	5	27	11	2	13	0	0	0	14	5	19	1	0	1	0	0	0	0	0	0	39	7	46	0	0	0	106	14:00 - 15:00	413
14:15 - 14:30	22	5	27	11	3	14	0	0	0	23	5	28	0	0	0	0	0	0	3	0	3	20	2	22	0	0	0	94	14:15 - 15:15	421
14:30 - 14:45	22	5	27	17	2	19	0	0	0	15	6	21	2	0	2	0	0	0	1	0	1	23	4	27	0	0	0	97	14:30 - 15:30	446
14:45 - 15:00	29	4	33	10	2	12	0	0	0	25	7	32	2	0	2	0	0	0	0	0	0	35	2	37	0	0	0	116	14:45 - 15:45	471
15:00 - 15:15	32	2	34	8	2	10	0	0	0	33	6	39	1	0	1	0	0	0	0	0	0	25	5	30	0	0	0	114	15:00 - 16:00	483
15:15 - 15:30	41	5	46	15	1	16	0	0	0	20	5	25	1	0	1	0	0	0	0	0	0	27	4	31	0	0	0	119	15:15 - 16:15	507
15:30 - 15:45	47	6	53	9	2	11	0	0	0	17	3	20	1	0	1	0	0	0	0	0	0	32	5	37	0	0	0	122	15:30 - 16:30	533
15:45 - 16:00	31	7	38	15	3	18	0	0	0	27	1	28	2	0	2	0	0	0	1	0	1	38	3	41	0	0	0	128	15:45 - 16:45	556
16:00 - 16:15	30	2	32	14	2	16	0	0	0	39	2	41	2	0	2	0	0	0	1	0	1	38	8	46	0	0	0	138	16:00 - 17:00	573
16:15 - 16:30	36	3	39	10	0	10	0	0	0	57	1	58	1	1	2	0	0	0	0	0	0	31	5	36	0	0	0	145	16:15 - 17:15	591
16:30 - 16:45	51	4	55	17	0	17	0	0	0	30	4	34	1	0	1	0	0	0	0	0	0	32	6	38	0	0	0	145	16:30 - 17:30	575
16:45 - 17:00	34	1	35	16	0	16	0	0	0	46	2	48	5	0	5	0	0	0	1	0	1	32	8	40	0	0	0	145	16:45 - 17:45	560
17:00 - 17:15	52	0	52	13	3	16	0	0	0	49	6	55	0	0	0	0	0	0	0	0	0	28	5	33	0	0	0	156	17:00 - 18:00	544
17:15 - 17:30	37	3	40	28	0	28	0	0	0	23	2	25	1	0	1	0	0	0	1	0	1	33	1	34	0	0	0	129	AM Peak	670
17:30 - 17:45	38	3	41	23	0	23	0	0	0	19	3	22	0	0	0	0	0	0	2	0	2	39	3	42	0	0	0	130	PM Peak	591
17:45 - 18:00	45	3	48	27	0	27	0	0	0	33	4	37	1	0	1	0	0	0	2	0	2	13	1	14	0	0	0	129		
Total	1293	190	1483	900	140	1040	2	0	2	1047	157	1204	43	7	50	0	0	0	61	7	68	1323	180	1503	0	0	0	5350		
AM Peak	140	21	161	231	16	247	0	0	0	100	6	106	1	0	1	0	0	0	22	0	22	128	5	133	0	0	0	670		
PM Peak	173	8	181	56	3	59	0	0	0	182	13	195	7	1	8	0	0	0	1	0	1	123	24	147	0	0	0	591		

Appendix B

Road Crash History Summary

Wybong Road Crash Summary (1 July 2014 to 30 June 2019)

Route	Pedestrian	Adjacent Approaches	Opposing Directions	Same Direction	U-turn/Parking	Overtaking	On Path	Off Path on Straight	Off Path on Curve	Total
Total Crashes	-	2	1	-	-	-	3	2	8	16
Crash Location										
2-way undivided road	-	-	-	-	-	-	3	2	5	10
T-intersection	-	2	1	-	-	-	-	-	3	6
Road Surface Condition										
Dry	-	2	-	-	-	-	3	2	6	13
Wet	-	-	1	-	-	-	-	-	2	3
Weather										
Fine	-	2	-	-	-	-	2	2	6	12
Raining	-	-	-	-	-	-	-	-	1	1
Fog or mist	-	-	1	-	-	-	1	-	1	2
Natural Lighting										
Daylight	-	-	1	-	-	-	-	1	7	9
Darkness	-	2	-	-	-	-	3	1	1	7
Severity of Crash										
Fatal	-	1	-	-	-	-	-	-	-	1
Serious injury	-	-	-	-	-	-	-	1	4	5
Moderate injury	-	1	1	-	-	-	2	-	2	6
Non-casualty (towaway)	-	-	-	-	-	-	1	1	2	4
Vehicle Types Involved										
Motorcycle	-	-	-	-	-	-	-	-	1	1
Car, 4WD, station wagon, utility	-	3	2	-	-	-	3	2	6	16
Rigid truck	-	-	-	-	-	-	-	-	1	1
Unknown	-	1	-	-	-	-	-	-	-	1
Contributing Factors										
Speeding	-	-	-	-	-	-	-	-	6	6
Fatigue	-	-	-	-	-	-	-	1	1	2
None	-	2	1	-	-	-	3	1	1	8

Bengalla Road Crash Summary (1 July 2014 to 30 June 2019)

Route	Pedestrian	Adjacent Approaches	Opposing Directions	Same Direction	U-turn/Parking	Overtaking	On Path	Off Path on Straight	Off Path on Curve	Total
Total Crashes	-	-	-	1	-	-	3	-	-	4
Crash Location										
2-way undivided road	-	-	-	-	-	-	3	-	-	3
T-intersection	-	-	-	1	-	-	-	-	-	1
Road Surface Condition										
Dry	-	-	-	1	-	-	3	-	-	4
Weather										
Fine	-	-	-	1	-	-	2	-	-	3
Overcast	-	-	-	-	-	-	1	-	-	1
Natural Lighting										
Daylight	-	-	-	1	-	-	1	-	-	2
Darkness	-	-	-	-	-	-	2	-	-	2
Severity of Crash										
Serious injury	-	-	-	1	-	-	1	-	-	2
Non-casualty (towaway)	-	-	-	-	-	-	2	-	-	2
Vehicle Types Involved										
Motorcycle	-	-	-	-	-	-	1	-	-	1
Car, 4WD, station wagon, utility	-	-	-	2	-	-	3	-	-	5
Rigid truck	-	-	-	1	-	-	-	-	-	1
Contributing Factors										
Speeding	-	-	-	1	-	-	-	-	-	1
None	-	-	-	-	-	-	3	-	-	3

Denman Road Crash Summary (1 July 2014 to 30 June 2019)

Route	Pedestrian	Adjacent Approaches	Opposing Directions	Same Direction	U-turn/Parking	Overtaking	On Path	Off Path on Straight	Off Path on Curve	Total
Total Crashes	-	1	3	2	2	1	1	9	8	27
Crash Location										
2-way undivided road	-	-	2	1	1	-	1	6	7	18
Cross intersection	-	-	-	-	-	1	-	2	1	4
T-intersection	-	1	1	1	1	-	-	1	-	5
Road Surface Condition										
Dry	-	1	3	2	2	1	-	8	6	23
Wet	-	-	-	-	-	-	1	-	2	3
Unknown	-	-	-	-	-	-	-	1	-	1
Weather										
Fine	-	1	3	2	2	1	-	8	6	23
Raining	-	-	-	-	-	-	-	-	2	2
Fog or mist	-	-	-	-	-	-	1	-	-	1
Other	-	-	-	-	-	-	-	1	-	1
Natural Lighting										
Daylight	-	1	1	2	1	1	-	4	4	14
Darkness	-	-	2	-	1	-	1	5	3	12
Dusk	-	-	-	-	-	-	-	-	1	1
Severity of Crash										
Fatal	-	-	1	-	-	-	-	-	-	1
Serious injury	-	-	1	1	1	-	-	-	-	3
Moderate injury	-	1	1	-	1	-	1	6	5	15
Minor injury	-	-	-	1	-	-	-	1	2	4
Non-casualty (towaway)	-	-	-	-	-	1	-	2	1	4
Vehicle Types Involved										
Motorcycle	-	-	-	1	2	-	-	-	-	3
Car, 4WD, station wagon, utility	-	1	5	3	2	2	1	10	6	30
Rigid truck	-	-	1	-	-	-	-	-	1	2
Articulated	-	-	-	-	-	-	-	-	2	2
Other	-	-	-	-	-	-	-	1	-	1
Contributing Factors										
Speeding	-	-	1	-	-	-	-	1	8	10
Fatigue	-	-	1	-	-	-	-	3	-	4
None	-	1	2	2	2	1	1	5	-	14

Thomas Mitchell Drive Crash Summary (1 July 2014 to 30 June 2019)

Route	Pedestrian	Adjacent Approaches	Opposing Directions	Same Direction	U-turn/Parking	Overtaking	On Path	Off Path on Straight	Off Path on Curve	Total
Total Crashes	-	-	-	1	1	-	-	4	2	8
Crash Location										
2-way undivided road	-	-	-	-	1	-	-	1	2	4
T-intersection	-	-	-	1	-	-	-	3	-	4
Road Surface Condition										
Dry	-	-	-	1	1	-	-	4	2	8
Weather										
Fine	-	-	-	1	1	-	-	3	2	7
Overcast	-	-	-	-	-	-	-	1	-	1
Natural Lighting										
Daylight	-	-	-	-	1	-	-	3	-	4
Darkness	-	-	-	1	-	-	-	1	2	4
Severity of Crash										
Serious injury	-	-	-	-	-	-	-	2	-	2
Moderate injury	-	-	-	1	-	-	-	1	1	3
Non-casualty (towaway)	-	-	-	-	1	-	-	1	1	3
Vehicle Types Involved										
Car, 4WD, station wagon, utility	-	-	-	2	2	-	-	5	1	10
Articulated	-	-	-	-	-	-	-	-	1	1
Contributing Factors										
Speeding	-	-	-	1	-	-	-	1	2	4
Fatigue	-	-	-	-	-	-	-	-	1	1
None	-	-	-	-	1	-	-	3	-	4

Kayuga Road Crash Summary (1 July 2014 to 30 June 2019)

Route	Pedestrian	Adjacent Approaches	Opposing Directions	Same Direction	U-turn/Parking	Overtaking	On Path	Off Path on Straight	Off Path on Curve	Total
Total Crashes	-	-	1	-	-	-	1	2	-	4
Crash Location										
2-way undivided road	-	-	1	-	-	-	1	2	-	4
Road Surface Condition										
Dry	-	-	-	-	-	-	1	2	-	3
Wet	-	-	1	-	-	-	-	-	-	1
Weather										
Fine	-	-	-	-	-	-	1	1	-	3
Raining	-	-	1	-	-	-	-	-	-	1
Natural Lighting										
Daylight	-	-	1	-	-	-	-	-	-	1
Darkness	-	-	-	-	-	-	-	2	-	2
Dusk	-	-	-	-	-	-	1	-	-	1
Severity of Crash										
Serious injury	-	-	-	-	-	-	-	1	-	1
Moderate injury	-	-	1	-	-	-	1	-	-	2
Non-casualty (towaway)	-	-	-	-	-	-	-	1	-	1
Vehicle Types Involved										
Motorcycle	-	-	1	-	-	-	-	-	-	1
Car, 4WD, station wagon, utility	-	-	1	-	-	-	1	2	-	4
Contributing Factors										
Speeding	-	-	-	-	-	-	1	-	-	1
None	-	-	1	-	-	-	-	2	-	3

Appendix C

Road Safety Audit

Mount Pleasant Optimisation Project
Existing Roads - Road Safety Audit

Prepared for:

MACH Energy Australia Pty Ltd

29 September 2020

The Transport Planning Partnership

E: info@ttpp.net.au

Mount Pleasant Optimisation Project
Existing Roads - Road Safety Audit

Client: MACH Energy Australia Pty Ltd

Version: Draft 04

Date: 29 September 2020

TTPP Reference: 18466

Quality Record

Version	Date	Prepared by	Reviewed by	Approved by	Signature
Draft 04	29/09/2020	Stephen Read	Doris Lee	Ken Hollyoak	

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1 Road Safety Audit Summary

Audited project:	Mount Pleasant Optimisation Project
Client:	MACH Energy Australia Pty Ltd
Project manager:	Chris Lauritzen – MACH Energy Australia Pty Ltd
Audit Team:	Stephen Read (level 3 lead road safety auditor) Doris Lee (level 3 road safety auditor)
Audit type:	Existing Roads
Commencement meeting:	N/A
Audit date:	2 April 2020
Completion meeting:	Not required

The objective of this Road Safety Audit (RSA) is to examine and identify road safety concerns regarding the road network west of Muswellbrook associated with the proposed Mount Pleasant Optimisation Project (the Project) access routes.

The findings of the RSA are detailed in Section 4.3 of this report.

2 Introduction

2.1 Background

This report has been prepared on behalf of MACH Energy Australia Pty Ltd to present RSA findings that have been identified for the existing roads west of Muswellbrook. The scope of the audit included those roads expected to be used by traffic generated by the proposed Project, which is described in *Mount Pleasant Optimisation Project Road Transport Assessment* (The Transport and Planning Partnership [TTPP], 2020):

- Wybong Road between Kayuga Road and Mangoola Road;
- Bengalla Road between Wybong Road and Denman Road;
- Denman Road between Skellatar Stock Route Road and approximately 2 km west of Edderton Road;
- Thomas Mitchell Drive between Denman Road and New England Highway; and
- Kayuga Road/Invermein Street between Wybong Road and Kayuga.

These roads are shown in Figure 2.1.

Figure 2.1: Audit Area

It is noted that during the site inspections, the eastern end of Wybong Road was closed between Logues Lane and Mount Pleasant Operation Road as shown in Figure 2.2 and Figure 2.3.

Figure 2.2: Eastern End of Wybong Road Closure near Logues Lane

Figure 2.3: Western End of Wybong Road Closure near Mount Pleasant Operation Road

A review of dashcam photography from August 2019 was used instead and may not reflect the road's current condition.

2.2 Audit Objective

The objectives of this RSA for existing road conditions are to:

- identify unsafe situations and features which do not make acceptable levels of safety; and
- identify, primarily from road users' perspective, those issues and features that give misleading or confusing messages or that may catch users unaware.

2.3 Procedures and Reference Material

The procedures used are described in the following guidelines:

- New South Wales (NSW) Roads and Maritime Services (2011), *Guidelines for Road Safety Audit Practices;*
- Austroads (2019a), *Guide to Road Safety Part 6: Managing Road Safety Audits;* and
- Austroads (2019b), *Guide to Road Safety Part 6A: Implementing Road Safety Audits.*

The Austroads checklist was used by the audit team as a reference in this road safety audit. Key elements examined included:

- road alignment and cross-section;
- auxiliary lanes;
- intersections;
- signs and lighting;
- markings and delineation;
- crash barriers and clear zones;
- bridges and culverts;
- pavement;
- provision of heavy vehicles;
- floodways and causeways; and
- miscellaneous.

2.4 Audit Team

The RSA was carried out by the following team:

- Stephen Read (RSA-02-0652) – level 3 road safety auditor (lead auditor); and
- Doris Lee (RSA-02-0128) – level 3 road safety auditor (team member).

Stephen and Doris are registered road safety auditors with the NSW Centre for Road Safety and are experienced in traffic engineering and road safety engineering.

3 Road Safety Audit Program

3.1 Commencement Meeting

A formal meeting was not held.

3.2 Site and Field Audit

Site inspections were carried out on Thursday 2 April 2020 in wet weather conditions during both day time and night time. The roads were driven in each direction to identify possible road safety concerns. Several photographs and video footage were taken.

3.3 Completion Meeting

Not required.

4 Road Safety Audit Findings

4.1 Introduction

Table 4.2 provides specific details of the audit findings and a risk rating as high, medium or low. The risk ratings have been based on the risk matrix presented in Table 4.1, which has been adopted from the standard Austroads Risk Matrix.

Table 4.1: Risk Matrix

Severity \ Likelihood	Highly Probable	Occasional	Improbable
Major	High	High	Medium
Moderate	High	Medium	Low
Minor	Medium	Low	Low

The terms in Table 4.1 are described below.

Likelihood

- *Highly Probable* – it is likely that more than one crash of this type could occur within a five-year period.
- *Occasional* – it is likely that less than one crash of this type could occur within a five-year period.
- *Improbable* – less than one crash of this type could occur within a 10-year period.

Severity

- *Major* – the crash is likely to result in a fatality or serious injuries, e.g., high/medium speed vehicle collision, high/medium speed collision with a fixed object, pedestrian struck at high speed, and cyclist hit by car.
- *Moderate* – the crash is likely to result in minor injuries or large-scale property damage, e.g., some slow-speed vehicle collisions, cyclist falls, and rear end crashes.
- *Minor* – the crash is likely to result in minor property damage or many near-miss crash events, e.g., some slow-speed collisions, pedestrian walks into object (no head injury), and car reverses into post.

Priority

- *High* – very important, and needs to be addressed urgently.
- *Medium* – important, and needs to be addressed as soon as possible.
- *Low* – needs to be considered as part of regular maintenance/planning program.

4.2 Responding to the Audit Report

As set out in the road safety audit guidelines, the responsibility for the road rests with the project manager, not with the auditor. The project manager is under no obligation to accept the audit findings. Neither is it the role of the auditor to agree to, or approve, the project manager's responses to the audit.

The audit provides the opportunity to highlight potential road safety problems and have them formally considered by the project manager in conjunction with all other project considerations.

4.3 Road Safety Audit Findings

The audit findings are documented in Table 4.2 which provides:

- specific details of the road safety issues identified during the audit; and
- a risk level rating for each of the road safety audit findings.

The locations of the findings are shown on the key map in Figure 4.1.

It should be acknowledged that positive attributes of the audited road section have not been discussed. Deficiencies that do not cause a safety problem are also not listed.

Consistent with Transport for NSW (formerly NSW Roads and Maritime Services) best practice, recommendations have not been included in the road safety audit findings.

Figure 4.1: Locations of RSA Findings

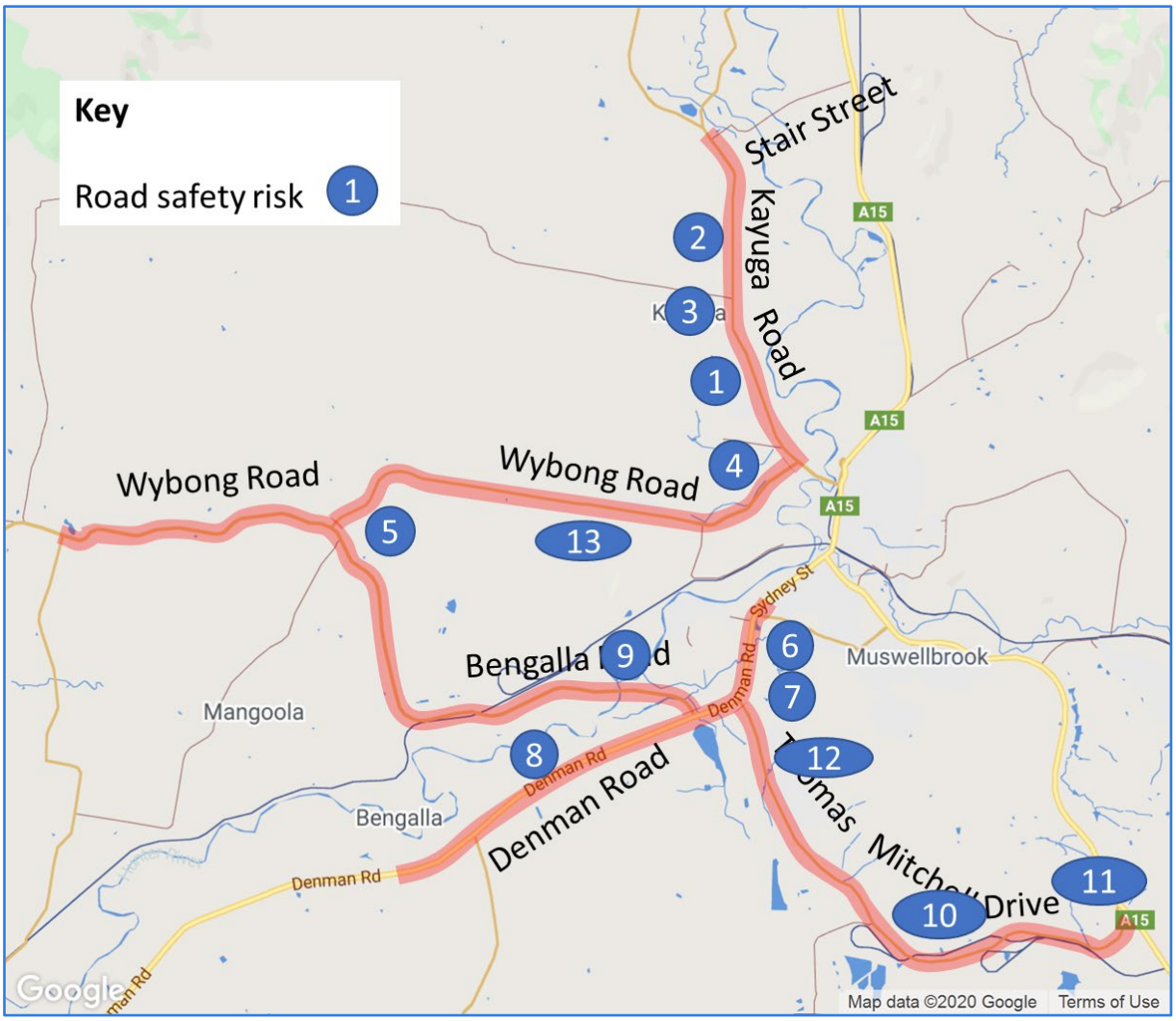


Table 4.2: Road Safety Audit Findings

Item No.	Location	Descriptions of Findings	Photograph	Likelihood	Severity	Risk Rating
		Kayuga Road				
1	Kayuga Road, south of Castlerock Road 32°14'7"S 150°52'18"E	There is an unmarked crest in the road with no advance warning. Sight distance to oncoming traffic is limited. Furthermore, there is no line marking to prevent overtaking and the reflectors are worn with little or no retro-reflectivity. There is a risk of a head on crash driving over the crest of the hill resulting in serious injury.	 	Improbable	Major	Medium

Item No.	Location	Descriptions of Findings	Photograph	Likelihood	Severity	Risk Rating
2	Kayuga Road, south of Stair Street 32°12'9"S 150°52'3"E	There is an unmarked crest in the road with no advance warning. Sight distance to oncoming traffic is limited. Furthermore, there is no line marking to prevent overtaking and the reflectors are worn with little or no retro-reflectivity. There is a risk of a head on crash driving over the crest of the hill resulting in serious injury.		Improbable	Major	Medium
3	Kayuga Road 32°12'9"S 150°52'3"E	There is little line marking along Kayuga Road in general. This increases the risk of off-road crashes.		Occasional	Moderate	Medium
		Wybong Road				
4	Wybong Road 32°15'15"S 150°52'41"E	Water was pooling on the road 300m south of Kayuga Road. The water on the road may cause vehicles to aquaplane leading to run off the road type crashes.		Improbable	Moderate	Low

Item No.	Location	Descriptions of Findings	Photograph	Likelihood	Severity	Risk Rating
5	Wybong Road 32°15'44"S 150°47'27"E	Line marking near the intersection with Bengalla Road was not clear. Edgelines and centre lines were difficult to see even during daylight hours. Poor line marking may increase the risk of crashes between vehicles or off-road type crashes.		Improbable	Minor	Low
		Denman Road				
6	Denman Road 32°16'59"S 150°52'18"E	The 'W' beam guard rails do not appear to be properly connected to the bridge railing. An errant vehicle that crashes into the barrier is likely to be directed into the end of the bridge barrier. Modern designs are tied into the bridge rail with a more rigid connection allowing vehicle to deflect away from the more rigid barrier on the bridge. This may lead to increased severity of crashes as a result of a vehicle hitting the end of the bridge barrier.		Improbable	Major	Medium

Item No.	Location	Descriptions of Findings	Photograph	Likelihood	Severity	Risk Rating
						
7	Denman Road 32°16'59"S 150°52'18"E	The bridge rails appeared to be of a post and rail type construction. This type of rail can separate in crashes and cause spearing incidents where a vehicle strikes the end of the rail and the rail spears into the vehicle causing serious injury or death.		Improbable	Major	Medium

Item No.	Location	Descriptions of Findings	Photograph	Likelihood	Severity	Risk Rating
						
8	Denman Road Eastbound 32°18'10"S 150°50'14"E	Trees on the road side are encroaching on the clear zone and may be a hazard to an errant vehicle. An errant vehicle is likely to strike a tree in an unforgiving environment and result in serious injury crash.		Improbable	Major	Medium

Item No.	Location	Descriptions of Findings	Photograph	Likelihood	Severity	Risk Rating
		Bengalla Road				
9	Bengalla Road 32°17'26.0"S 150°50'43.3"E	The 'W' beam guard rails are not properly connected to the bridge railing. An errant vehicle that crashes into the barrier is likely to be directed into the end of the bridge barrier. Modern designs are tied into the bridge rail with a more rigid connection allowing an errant vehicle to deflect away from the more rigid barrier on the bridge. This may lead to increased severity of crashes as a result of a vehicle hitting the end of the bridge barrier.		Improbable	Major	Medium
		Thomas Mitchell Drive				
10	Thomas Mitchell Drive 32°20'7"S 150°54'21"E to 32°20'7.15"S 150°56'31.7"E	Edge line marking was worn and not visible for a short section of road near an access to a side road at night. Edge line marking can reduce the risk of off-road type crashes.		Improbable	Minor	Low

Item No.	Location	Descriptions of Findings	Photograph	Likelihood	Severity	Risk Rating
11	Thomas Mitchell Drive 32°19'42"S 150°56'40"E	Sight distance to the New England Highway from Thomas Mitchell Drive is restricted by the vertical and horizontal alignment approaching the intersection. There is a risk of late braking resulting in rear end or loss of control type crashes.		Improbable	Moderate	Low
12	Thomas Mitchell Drive 32°17'54.6"S 150°52'24.5"E to 32°17'49.4"S 150°52'22.7"E	The edge of the seal is fretted and broken at various T-junctions and will further deteriorate over time. Motorists may use the pavement edge and unsealed shoulder to overtake a waiting right-turn vehicle, but may have difficulty to merge back to the main carriageway due to the broken seal edge. This may increase the likelihood of rear-end incidents at the intersection.	  	Improbable	Minor	Low

Item No.	Location	Descriptions of Findings	Photograph	Likelihood	Severity	Risk Rating
		Wybong Road (Closed Section, Dashcam from August 2019 Used)				
13	Wybong Road 32°15'22.1"S 150°48'52.3"E 32°15'28.1"S 150°48'34.6"E 32°15'22.1"S 150°48'34.6"E	Culverts located in the clear zone are a hazard to an errant vehicle and prevent an errant vehicle from recovering. This may result in vehicles crashing into steep walls of the swale or pipes leading to injury crashes and large damage to vehicles. Noted that guideposts are provided, and this is standard treatment in NSW for culverts on rural roads.	  	Improbable	Moderate	Low

4.4 Summary of Findings

No items were found with a high risk rating.

The following items with a medium risk rating were identified:

- an unmarked crest on Kayuga Road south of Castlerock Road (Item 1);
- an unmarked crest on Kayuga Road south of Stair Street (Item 2);
- general lack of linemarking along Kayuga Road (Item 3);
- improperly connected W beam guard rails on the Ramrod Creek Bridge on Denman Road (Items 6 and 7);
- trees in the clear zone on Denman Road approximately midway between Bengalla Road and Edderton Road (Item 8); and
- improperly connected W beam guard rails on the Keys Bridge over the Hunter River on Bengalla Road (Item 9).

The following items with a low risk rating were identified:

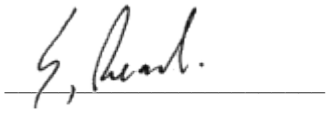
- poor drainage on Wybong Road (Item 4);
- lack of linemarking on Wybong Road (Item 5) and Thomas Mitchell Drive (Item 10);
- no advance warning with reduced sight distance on Thomas Mitchell Drive at New England Highway (Item 11);
- damaged seal at the edge of Thomas Mitchell Drive (Item 12); and
- culverts in the clear zone on Wybong Road (Item 13).

5 Concluding Statement

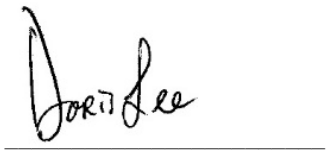
The findings and opinions in the report are based on the examination of the specific road and environs, and might not address all concerns existing at the time of the audit.

The auditors have endeavoured to identify features of the road that could be modified in order to improve safety, although it must be recognised that safety cannot be guaranteed since no road can be regarded as absolutely safe.

While every effort has been made to ensure the accuracy of this report, it is made available strictly on the basis that anyone relying on it does so at their own risk without any liability to the Auditors.



Stephen Read
Level 3 Lead Road Safety Auditor
The Transport Planning Partnership



Doris Lee
Level 3 Road Safety Auditor
The Transport Planning Partnership

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Appendix D

SIDRA INTERSECTION Output Summaries

MOVEMENT SUMMARY

Site: 101 [Ex AM Denman and Bengalla (Site Folder: Denman and Bengalla)]

Denman Road and Bengalla Road
MPO AM Peak
6:15am to 7:15am
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Denman Road East														
5	T1	147	21	155	14.3	0.087	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
6	R2	166	16	175	9.6	0.148	7.5	LOS A	0.6	4.8	0.29	0.63	0.29	60.9
Approach		313	37	329	11.8	0.148	4.0	NA	0.6	4.8	0.15	0.33	0.15	68.5
North: Bengalla Road														
7	L2	135	5	142	3.7	0.133	7.6	LOS A	0.5	3.7	0.26	0.61	0.26	63.0
9	R2	4	1	4	25.0	0.133	13.2	LOS A	0.5	3.7	0.26	0.61	0.26	56.6
Approach		139	6	146	4.3	0.133	7.8	LOS A	0.5	3.7	0.26	0.61	0.26	62.8
West: Denman Road West														
10	L2	13	0	14	0.0	0.007	6.9	LOS A	0.0	0.0	0.00	0.63	0.00	65.4
11	T1	129	10	136	7.8	0.073	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	80.0
Approach		142	10	149	7.0	0.073	0.6	NA	0.0	0.0	0.00	0.06	0.00	78.4
All Vehicles		594	53	625	8.9	0.148	4.1	NA	0.6	4.8	0.14	0.33	0.14	69.1

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.

MOVEMENT SUMMARY

Site: 101 [Ex PM Denman and Bengalla (Site Folder: Denman and Bengalla)]

Denman Road and Bengalla Road
MPO PM Peak
4:00pm to 5:00pm
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Denman Road East														
5	T1	161	10	169	6.2	0.091	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
6	R2	59	2	62	3.4	0.053	7.4	LOS A	0.2	1.5	0.29	0.62	0.29	62.9
Approach		220	12	232	5.5	0.091	2.0	NA	0.2	1.5	0.08	0.17	0.08	74.5
North: Bengalla Road														
7	L2	181	9	191	5.0	0.183	7.9	LOS A	0.7	5.3	0.31	0.63	0.31	62.3
9	R2	4	1	4	25.0	0.183	12.3	LOS A	0.7	5.3	0.31	0.63	0.31	56.4
Approach		185	10	195	5.4	0.183	8.0	LOS A	0.7	5.3	0.31	0.63	0.31	62.2
West: Denman Road West														
10	L2	2	0	2	0.0	0.001	6.9	LOS A	0.0	0.0	0.00	0.63	0.00	65.4
11	T1	160	27	168	16.9	0.096	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
Approach		162	27	171	16.7	0.096	0.1	NA	0.0	0.0	0.00	0.01	0.00	79.7
All Vehicles		567	49	597	8.6	0.183	3.4	NA	0.7	5.3	0.13	0.27	0.13	71.2

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.

MOVEMENT SUMMARY

Site: 101 [2026 AM Base Denman and Bengalla (Site Folder: Denman and Bengalla)]

Denman Road and Bengalla Road
MPO AM Peak
6:15am to 7:15am
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Denman Road East														
5	T1	155	22	163	14.2	0.092	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
6	R2	200	18	211	9.0	0.182	7.6	LOS A	0.8	6.0	0.32	0.63	0.32	61.0
Approach		355	40	374	11.3	0.182	4.3	NA	0.8	6.0	0.18	0.36	0.18	68.0
North: Bengalla Road														
7	L2	154	6	162	3.9	0.155	7.7	LOS A	0.6	4.4	0.28	0.62	0.28	62.8
9	R2	5	1	5	20.0	0.155	14.1	LOS A	0.6	4.4	0.28	0.62	0.28	57.8
Approach		159	7	167	4.4	0.155	7.9	LOS A	0.6	4.4	0.28	0.62	0.28	62.7
West: Denman Road West														
10	L2	16	0	17	0.0	0.009	6.9	LOS A	0.0	0.0	0.00	0.63	0.00	65.4
11	T1	142	11	149	7.7	0.081	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	80.0
Approach		158	11	166	7.0	0.081	0.7	NA	0.0	0.0	0.00	0.06	0.00	78.2
All Vehicles		672	58	707	8.6	0.182	4.3	NA	0.8	6.0	0.16	0.35	0.16	68.7

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.

MOVEMENT SUMMARY

Site: 101 [2026 PM Base Denman and Bengalla (Site Folder: Denman and Bengalla)]

Denman Road and Bengalla Road
MPO PM Peak
2026 No Project
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Denman Road East														
5	T1	177	11	186	6.2	0.100	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
6	R2	74	3	78	4.1	0.067	7.5	LOS A	0.3	1.9	0.31	0.63	0.31	62.6
Approach		251	14	264	5.6	0.100	2.2	NA	0.3	1.9	0.09	0.18	0.09	73.9
North: Bengalla Road														
7	L2	217	11	228	5.1	0.224	8.0	LOS A	0.9	6.8	0.33	0.64	0.33	62.2
9	R2	6	1	6	16.7	0.224	12.7	LOS A	0.9	6.8	0.33	0.64	0.33	58.5
Approach		223	12	235	5.4	0.224	8.1	LOS A	0.9	6.8	0.33	0.64	0.33	62.1
West: Denman Road West														
10	L2	3	0	3	0.0	0.002	6.9	LOS A	0.0	0.0	0.00	0.63	0.00	65.4
11	T1	170	29	179	17.1	0.102	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
Approach		173	29	182	16.8	0.102	0.1	NA	0.0	0.0	0.00	0.01	0.00	79.6
All Vehicles		647	55	681	8.5	0.224	3.7	NA	0.9	6.8	0.15	0.30	0.15	70.6

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 [2036 AM Base Denman and Bengalla (Site Folder: Denman and Bengalla)]

Denman Road and Bengalla Road
MPO AM Peak
2036 No Project
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Denman Road East														
5	T1	169	25	178	14.8	0.101	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
6	R2	150	6	158	4.0	0.133	7.5	LOS A	0.6	4.1	0.30	0.63	0.30	62.6
Approach		319	31	336	9.7	0.133	3.5	NA	0.6	4.1	0.14	0.30	0.14	70.7
North: Bengalla Road														
7	L2	148	3	156	2.0	0.149	7.7	LOS A	0.6	4.1	0.28	0.62	0.28	63.4
9	R2	5	1	5	20.0	0.149	13.3	LOS A	0.6	4.1	0.28	0.62	0.28	57.8
Approach		153	4	161	2.6	0.149	7.9	LOS A	0.6	4.1	0.28	0.62	0.28	63.2
West: Denman Road West														
10	L2	14	0	15	0.0	0.008	6.9	LOS A	0.0	0.0	0.00	0.63	0.00	65.4
11	T1	149	12	157	8.1	0.085	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	80.0
Approach		163	12	172	7.4	0.085	0.6	NA	0.0	0.0	0.00	0.05	0.00	78.4
All Vehicles		635	47	668	7.4	0.149	3.8	NA	0.6	4.1	0.14	0.31	0.14	70.5

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.

MOVEMENT SUMMARY

Site: 101 [2036 PM Base Denman and Bengalla (Site Folder: Denman and Bengalla)]

Denman Road and Bengalla Road
MPO AM Peak
2036 BNo Project
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Denman Road East														
5	T1	188	12	198	6.4	0.107	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
6	R2	74	2	78	2.7	0.068	7.6	LOS A	0.3	1.9	0.32	0.63	0.32	63.0
Approach		262	14	276	5.3	0.107	2.1	NA	0.3	1.9	0.09	0.18	0.09	74.3
North: Bengalla Road														
7	L2	191	7	201	3.7	0.194	8.1	LOS A	0.8	5.6	0.34	0.65	0.34	62.6
9	R2	3	0	3	0.0	0.194	11.7	LOS A	0.8	5.6	0.34	0.65	0.34	63.6
Approach		194	7	204	3.6	0.194	8.1	LOS A	0.8	5.6	0.34	0.65	0.34	62.7
West: Denman Road West														
10	L2	3	0	3	0.0	0.002	6.9	LOS A	0.0	0.0	0.00	0.63	0.00	65.4
11	T1	186	32	196	17.2	0.112	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
Approach		189	32	199	16.9	0.112	0.1	NA	0.0	0.0	0.00	0.01	0.00	79.7
All Vehicles		645	53	679	8.2	0.194	3.4	NA	0.8	5.6	0.14	0.27	0.14	71.7

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.

MOVEMENT SUMMARY

Site: 101 [2026 AM Project Denman and Bengalla (Site Folder: Denman and Bengalla)]

Denman Road and Bengalla Road
MPO AM Peak
With Project
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Denman Road East														
5	T1	155	22	163	14.2	0.092	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
6	R2	283	43	298	15.2	0.268	8.0	LOS A	1.3	10.1	0.36	0.65	0.36	59.0
Approach		438	65	461	14.8	0.268	5.2	NA	1.3	10.1	0.23	0.42	0.23	65.0
North: Bengalla Road														
7	L2	169	18	178	10.7	0.178	7.9	LOS A	0.7	5.4	0.29	0.62	0.29	60.7
9	R2	5	1	5	20.0	0.178	16.7	LOS B	0.7	5.4	0.29	0.62	0.29	57.8
Approach		174	19	183	10.9	0.178	8.2	LOS A	0.7	5.4	0.29	0.62	0.29	60.6
West: Denman Road West														
10	L2	23	2	24	8.7	0.014	7.1	LOS A	0.0	0.0	0.00	0.63	0.00	62.5
11	T1	142	11	149	7.7	0.081	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	80.0
Approach		165	13	174	7.9	0.081	1.0	NA	0.0	0.0	0.00	0.09	0.00	77.0
All Vehicles		777	97	818	12.5	0.268	4.9	NA	1.3	10.1	0.19	0.39	0.19	66.1

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.

MOVEMENT SUMMARY

Site: 101 [2026 PM Project Denman and Bengalla (Site Folder: Denman and Bengalla)]

Denman Road and Bengalla Road
MPO PM Peak
2026 With Project
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Denman Road East														
5	T1	177	11	186	6.2	0.100	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
6	R2	89	14	94	15.7	0.086	7.9	LOS A	0.3	2.8	0.32	0.63	0.32	58.9
Approach		266	25	280	9.4	0.100	2.6	NA	0.3	2.8	0.11	0.21	0.11	71.4
North: Bengalla Road														
7	L2	289	15	304	5.2	0.304	8.1	LOS A	1.3	9.8	0.36	0.65	0.36	62.1
9	R2	11	1	12	9.1	0.304	12.9	LOS A	1.3	9.8	0.36	0.65	0.36	60.6
Approach		300	16	316	5.3	0.304	8.3	LOS A	1.3	9.8	0.36	0.65	0.36	62.0
West: Denman Road West														
10	L2	3	0	3	0.0	0.002	6.9	LOS A	0.0	0.0	0.00	0.63	0.00	65.4
11	T1	170	29	179	17.1	0.102	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
Approach		173	29	182	16.8	0.102	0.1	NA	0.0	0.0	0.00	0.01	0.00	79.6
All Vehicles		739	70	778	9.5	0.304	4.4	NA	1.3	9.8	0.19	0.34	0.19	68.8

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.

MOVEMENT SUMMARY

Site: 101 [2036 AM Project Denman and Bengalla (Site Folder: Denman and Bengalla)]

Denman Road and Bengalla Road
MPO AM Peak
2036 With Project
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Denman Road East														
5	T1	169	25	178	14.8	0.101	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
6	R2	333	26	351	7.8	0.306	7.8	LOS A	1.5	11.2	0.37	0.65	0.37	61.1
Approach		502	51	528	10.2	0.306	5.2	NA	1.5	11.2	0.25	0.43	0.25	66.4
North: Bengalla Road														
7	L2	171	7	180	4.1	0.180	7.8	LOS A	0.7	5.2	0.30	0.63	0.30	62.7
9	R2	6	1	6	16.7	0.180	18.0	LOS B	0.7	5.2	0.30	0.63	0.30	58.7
Approach		177	8	186	4.5	0.180	8.1	LOS A	0.7	5.2	0.30	0.63	0.30	62.6
West: Denman Road West														
10	L2	25	0	26	0.0	0.014	6.9	LOS A	0.0	0.0	0.00	0.63	0.00	65.4
11	T1	149	12	157	8.1	0.085	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	80.0
Approach		174	12	183	6.9	0.085	1.0	NA	0.0	0.0	0.00	0.09	0.00	77.5
All Vehicles		853	71	898	8.3	0.306	5.0	NA	1.5	11.2	0.21	0.40	0.21	67.5

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.

MOVEMENT SUMMARY

Site: 101 [2036 PM Project Denman and Bengalla (Site Folder: Denman and Bengalla)]

Denman Road and Bengalla Road
MPO PM Peak
2036 With Project
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Denman Road East														
5	T1	188	12	198	6.4	0.106	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
6	R2	90	5	95	5.6	0.084	7.7	LOS A	0.3	2.5	0.33	0.64	0.33	62.0
Approach		278	17	293	6.1	0.106	2.5	NA	0.3	2.5	0.11	0.21	0.11	73.1
North: Bengalla Road														
7	L2	382	14	402	3.7	0.411	8.5	LOS A	2.2	16.3	0.42	0.69	0.45	62.2
9	R2	17	1	18	5.9	0.411	14.1	LOS A	2.2	16.3	0.42	0.69	0.45	61.3
Approach		399	15	420	3.8	0.411	8.8	LOS A	2.2	16.3	0.42	0.69	0.45	62.2
West: Denman Road West														
10	L2	3	0	3	0.0	0.002	6.9	LOS A	0.0	0.0	0.00	0.63	0.00	65.4
11	T1	186	32	196	17.2	0.112	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
Approach		189	32	199	16.9	0.112	0.1	NA	0.0	0.0	0.00	0.01	0.00	79.7
All Vehicles		866	64	912	7.4	0.411	4.9	NA	2.2	16.3	0.23	0.38	0.24	68.8

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.

MOVEMENT SUMMARY

Site: 101 [Ex AM Kayuga and Wybong (Site Folder: Kayuga and Wybong)]

Kayuga Road and Wybong Road
MPO AM Peak
6:15am to 7:15am
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Kayuga Road South														
10	L2	15	1	16	6.7	0.019	7.1	LOS A	0.0	0.0	0.00	0.31	0.00	67.0
11	T1	16	3	17	18.8	0.019	0.0	LOS A	0.0	0.0	0.00	0.31	0.00	74.1
Approach		31	4	33	12.9	0.019	3.4	NA	0.0	0.0	0.00	0.31	0.00	70.5
North: Kayuga Road North														
5	T1	25	0	26	0.0	0.024	0.1	LOS A	0.1	0.6	0.08	0.25	0.08	75.0
6	R2	17	0	18	0.0	0.024	6.7	LOS A	0.1	0.6	0.08	0.25	0.08	69.7
Approach		42	0	44	0.0	0.024	2.7	NA	0.1	0.6	0.08	0.25	0.08	72.8
West: Wybong Road														
7	L2	9	0	9	0.0	0.023	7.0	LOS A	0.1	0.5	0.08	0.61	0.08	65.3
9	R2	20	0	21	0.0	0.023	6.8	LOS A	0.1	0.5	0.08	0.61	0.08	64.8
Approach		29	0	31	0.0	0.023	6.9	LOS A	0.1	0.5	0.08	0.61	0.08	64.9
All Vehicles		102	4	107	3.9	0.024	4.1	NA	0.1	0.6	0.06	0.37	0.06	69.7

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.

MOVEMENT SUMMARY

Site: 101 [Ex PM Kayuga and Wybong (Site Folder: Kayuga and Wybong)]

Kayuga Road and Wybong Road
MPO PM Peak
4:00pm to 5:00pm
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Kayuga Road South														
10	L2	18	0	19	0.0	0.030	6.9	LOS A	0.0	0.0	0.00	0.21	0.00	71.3
11	T1	37	0	39	0.0	0.030	0.0	LOS A	0.0	0.0	0.00	0.21	0.00	76.2
Approach		55	0	58	0.0	0.030	2.3	NA	0.0	0.0	0.00	0.21	0.00	74.5
North: Kayuga Road North														
5	T1	27	2	28	7.4	0.021	0.1	LOS A	0.1	0.4	0.07	0.14	0.07	77.0
6	R2	8	1	8	12.5	0.021	7.0	LOS A	0.1	0.4	0.07	0.14	0.07	66.4
Approach		35	3	37	8.6	0.021	1.7	NA	0.1	0.4	0.07	0.14	0.07	74.3
West: Wybong Road														
7	L2	24	0	25	0.0	0.043	7.1	LOS A	0.2	1.1	0.12	0.60	0.12	65.0
9	R2	30	1	32	3.3	0.043	7.0	LOS A	0.2	1.1	0.12	0.60	0.12	63.4
Approach		54	1	57	1.9	0.043	7.0	LOS A	0.2	1.1	0.12	0.60	0.12	64.1
All Vehicles		144	4	152	2.8	0.043	3.9	NA	0.2	1.1	0.06	0.34	0.06	70.2

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.

MOVEMENT SUMMARY

Site: 101 [2026 AM Base Kayuga and Wybong (Site Folder: Kayuga and Wybong)]

Kayuga Road and Wybong Road
MPO AM Peak
2026 No Project
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Kayuga Road South														
10	L2	16	1	17	6.3	0.020	7.1	LOS A	0.0	0.0	0.00	0.31	0.00	67.2
11	T1	17	3	18	17.6	0.020	0.0	LOS A	0.0	0.0	0.00	0.31	0.00	74.1
Approach		33	4	35	12.1	0.020	3.4	NA	0.0	0.0	0.00	0.31	0.00	70.6
North: Kayuga Road North														
5	T1	27	0	28	0.0	0.032	0.1	LOS A	0.1	0.9	0.10	0.32	0.10	73.9
6	R2	28	0	29	0.0	0.032	6.7	LOS A	0.1	0.9	0.10	0.32	0.10	68.7
Approach		55	0	58	0.0	0.032	3.5	NA	0.1	0.9	0.10	0.32	0.10	71.2
West: Wybong Road														
7	L2	14	0	15	0.0	0.028	7.0	LOS A	0.1	0.7	0.08	0.61	0.08	65.2
9	R2	21	0	22	0.0	0.028	6.9	LOS A	0.1	0.7	0.08	0.61	0.08	64.8
Approach		35	0	37	0.0	0.028	6.9	LOS A	0.1	0.7	0.08	0.61	0.08	64.9
All Vehicles		123	4	129	3.3	0.032	4.4	NA	0.1	0.9	0.07	0.40	0.07	69.1

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.

MOVEMENT SUMMARY

Site: 101 [2026 PM Base Kayuga and Wybong (Site Folder: Kayuga and Wybong)]

Kayuga Road and Wybong Road
MPO PM Peak
2026 No Project
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Kayuga Road South														
10	L2	24	0	25	0.0	0.035	6.9	LOS A	0.0	0.0	0.00	0.25	0.00	70.8
11	T1	39	0	41	0.0	0.035	0.0	LOS A	0.0	0.0	0.00	0.25	0.00	75.6
Approach		63	0	66	0.0	0.035	2.7	NA	0.0	0.0	0.00	0.25	0.00	73.7
North: Kayuga Road North														
5	T1	29	2	31	6.9	0.024	0.1	LOS A	0.1	0.5	0.10	0.18	0.10	76.1
6	R2	12	1	13	8.3	0.024	7.0	LOS A	0.1	0.5	0.10	0.18	0.10	67.3
Approach		41	3	43	7.3	0.024	2.1	NA	0.1	0.5	0.10	0.18	0.10	73.3
West: Wybong Road														
7	L2	35	0	37	0.0	0.052	7.1	LOS A	0.2	1.3	0.12	0.60	0.12	65.0
9	R2	32	1	34	3.1	0.052	7.0	LOS A	0.2	1.3	0.12	0.60	0.12	63.4
Approach		67	1	71	1.5	0.052	7.0	LOS A	0.2	1.3	0.12	0.60	0.12	64.3
All Vehicles		171	4	180	2.3	0.052	4.2	NA	0.2	1.3	0.07	0.37	0.07	69.6

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.

MOVEMENT SUMMARY

Site: 101 [2036 AM Base Kayuga and Wybong (Site Folder: Kayuga and Wybong)]

Kayuga Road and Wybong Road
AM Peak Hour
2036 No Project
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Kayuga Road South														
10	L2	17	1	18	5.9	0.022	7.1	LOS A	0.0	0.0	0.00	0.31	0.00	67.3
11	T1	19	4	20	21.1	0.022	0.0	LOS A	0.0	0.0	0.00	0.31	0.00	74.2
Approach		36	5	38	13.9	0.022	3.3	NA	0.0	0.0	0.00	0.31	0.00	70.8
North: Kayuga Road North														
5	T1	29	0	31	0.0	0.022	0.0	LOS A	0.1	0.4	0.06	0.16	0.06	76.7
6	R2	10	0	11	0.0	0.022	6.7	LOS A	0.1	0.4	0.06	0.16	0.06	71.1
Approach		39	0	41	0.0	0.022	1.8	NA	0.1	0.4	0.06	0.16	0.06	75.2
West: Wybong Road														
7	L2	9	0	9	0.0	0.026	7.0	LOS A	0.1	0.6	0.10	0.61	0.10	65.2
9	R2	23	0	24	0.0	0.026	6.8	LOS A	0.1	0.6	0.10	0.61	0.10	64.7
Approach		32	0	34	0.0	0.026	6.9	LOS A	0.1	0.6	0.10	0.61	0.10	64.9
All Vehicles		107	5	113	4.7	0.026	3.8	NA	0.1	0.6	0.05	0.34	0.05	70.4

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.

MOVEMENT SUMMARY

Site: 101 [2036 PM Base Kayuga and Wybong (Site Folder: Kayuga and Wybong)]

Kayuga Road and Wybong Road
MPO PM Peak Hour
2036 No Project
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Kayuga Road South														
10	L2	21	0	22	0.0	0.035	6.9	LOS A	0.0	0.0	0.00	0.21	0.00	71.3
11	T1	43	0	45	0.0	0.035	0.0	LOS A	0.0	0.0	0.00	0.21	0.00	76.2
Approach		64	0	67	0.0	0.035	2.3	NA	0.0	0.0	0.00	0.21	0.00	74.5
North: Kayuga Road North														
5	T1	31	2	33	6.5	0.025	0.1	LOS A	0.1	0.5	0.09	0.17	0.09	76.5
6	R2	11	1	12	9.1	0.025	7.0	LOS A	0.1	0.5	0.09	0.17	0.09	67.3
Approach		42	3	44	7.1	0.025	1.9	NA	0.1	0.5	0.09	0.17	0.09	73.8
West: Wybong Road														
7	L2	23	0	24	0.0	0.047	7.1	LOS A	0.2	1.2	0.13	0.61	0.13	65.0
9	R2	35	1	37	2.9	0.047	7.0	LOS A	0.2	1.2	0.13	0.61	0.13	63.5
Approach		58	1	61	1.7	0.047	7.0	LOS A	0.2	1.2	0.13	0.61	0.13	64.1
All Vehicles		164	4	173	2.4	0.047	3.9	NA	0.2	1.2	0.07	0.34	0.07	70.3

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.

MOVEMENT SUMMARY

Site: 101 [2026 AM Project Kayuga and Wybong (Site Folder: Kayuga and Wybong)]

Kayuga Road and Wybong Road
MPO AM Peak
2026 With Project
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Kayuga Road South														
10	L2	16	1	17	6.3	0.020	7.1	LOS A	0.0	0.0	0.00	0.31	0.00	67.2
11	T1	17	3	18	17.6	0.020	0.0	LOS A	0.0	0.0	0.00	0.31	0.00	74.1
Approach		33	4	35	12.1	0.020	3.4	NA	0.0	0.0	0.00	0.31	0.00	70.6
North: Kayuga Road North														
5	T1	27	0	28	0.0	0.040	0.1	LOS A	0.2	1.2	0.11	0.37	0.11	73.0
6	R2	40	1	42	2.5	0.040	6.8	LOS A	0.2	1.2	0.11	0.37	0.11	67.0
Approach		67	1	71	1.5	0.040	4.1	NA	0.2	1.2	0.11	0.37	0.11	69.3
West: Wybong Road														
7	L2	16	2	17	12.5	0.030	7.2	LOS A	0.1	0.8	0.08	0.62	0.08	61.2
9	R2	21	0	22	0.0	0.030	6.9	LOS A	0.1	0.8	0.08	0.62	0.08	64.8
Approach		37	2	39	5.4	0.030	7.1	LOS A	0.1	0.8	0.08	0.62	0.08	63.2
All Vehicles		137	7	144	5.1	0.040	4.7	NA	0.2	1.2	0.07	0.42	0.07	67.8

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.

MOVEMENT SUMMARY

Site: 101 [2026 PM Project Kayuga and Wybong (Site Folder: Kayuga and Wybong)]

Kayuga Road and Wybong Road
MPO PM Peak
2026 With Project
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Kayuga Road South														
10	L2	24	0	25	0.0	0.035	6.9	LOS A	0.0	0.0	0.00	0.25	0.00	70.8
11	T1	39	0	41	0.0	0.035	0.0	LOS A	0.0	0.0	0.00	0.25	0.00	75.6
Approach		63	0	66	0.0	0.035	2.7	NA	0.0	0.0	0.00	0.25	0.00	73.7
North: Kayuga Road North														
5	T1	29	2	31	6.9	0.027	0.1	LOS A	0.1	0.7	0.11	0.21	0.11	75.8
6	R2	15	3	16	20.0	0.027	7.2	LOS A	0.1	0.7	0.11	0.21	0.11	62.9
Approach		44	5	46	11.4	0.027	2.5	NA	0.1	0.7	0.11	0.21	0.11	70.8
West: Wybong Road														
7	L2	53	0	56	0.0	0.064	7.1	LOS A	0.2	1.7	0.12	0.60	0.12	65.0
9	R2	32	1	34	3.1	0.064	7.0	LOS A	0.2	1.7	0.12	0.60	0.12	63.4
Approach		85	1	89	1.2	0.064	7.1	LOS A	0.2	1.7	0.12	0.60	0.12	64.4
All Vehicles		192	6	202	3.1	0.064	4.6	NA	0.2	1.7	0.08	0.40	0.08	68.7

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.

MOVEMENT SUMMARY

Site: 101 [2036 AM Project Kayuga and Wybong (Site Folder: Kayuga and Wybong)]

Kayuga Road and Wybong Road
AM Peak Hour
2036 With Project
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Kayuga Road South														
10	L2	17	1	18	5.9	0.022	7.1	LOS A	0.0	0.0	0.00	0.31	0.00	67.3
11	T1	19	4	20	21.1	0.022	0.0	LOS A	0.0	0.0	0.00	0.31	0.00	74.2
Approach		36	5	38	13.9	0.022	3.3	NA	0.0	0.0	0.00	0.31	0.00	70.8
North: Kayuga Road North														
5	T1	29	0	31	0.0	0.052	0.1	LOS A	0.2	1.7	0.12	0.41	0.12	72.3
6	R2	58	1	61	1.7	0.052	6.8	LOS A	0.2	1.7	0.12	0.41	0.12	66.7
Approach		87	1	92	1.1	0.052	4.5	NA	0.2	1.7	0.12	0.41	0.12	68.5
West: Wybong Road														
7	L2	15	0	16	0.0	0.031	7.0	LOS A	0.1	0.7	0.09	0.62	0.09	65.2
9	R2	23	0	24	0.0	0.031	7.0	LOS A	0.1	0.7	0.09	0.62	0.09	64.7
Approach		38	0	40	0.0	0.031	7.0	LOS A	0.1	0.7	0.09	0.62	0.09	64.9
All Vehicles		161	6	169	3.7	0.052	4.9	NA	0.2	1.7	0.08	0.43	0.08	68.1

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.

MOVEMENT SUMMARY

Site: 101 [2036 PM Project Kayuga and Wybong (Site Folder: Kayuga and Wybong)]

Kayuga Road and Wybong Road
MPO PM Peak Hour
2036 With Project
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Kayuga Road South														
10	L2	21	0	22	0.0	0.035	6.9	LOS A	0.0	0.0	0.00	0.21	0.00	71.3
11	T1	43	0	45	0.0	0.035	0.0	LOS A	0.0	0.0	0.00	0.21	0.00	76.2
Approach		64	0	67	0.0	0.035	2.3	NA	0.0	0.0	0.00	0.21	0.00	74.5
North: Kayuga Road North														
5	T1	31	2	33	6.5	0.029	0.1	LOS A	0.1	0.7	0.11	0.21	0.11	75.6
6	R2	16	2	17	12.5	0.029	7.1	LOS A	0.1	0.7	0.11	0.21	0.11	65.4
Approach		47	4	49	8.5	0.029	2.5	NA	0.1	0.7	0.11	0.21	0.11	71.8
West: Wybong Road														
7	L2	77	0	81	0.0	0.083	7.1	LOS A	0.3	2.3	0.12	0.60	0.12	64.9
9	R2	35	1	37	2.9	0.083	7.1	LOS A	0.3	2.3	0.12	0.60	0.12	63.5
Approach		112	1	118	0.9	0.083	7.1	LOS A	0.3	2.3	0.12	0.60	0.12	64.5
All Vehicles		223	5	235	2.2	0.083	4.7	NA	0.3	2.3	0.09	0.41	0.09	68.6

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.

MOVEMENT SUMMARY

Site: 101 [Ex AM MPO Road (Site Folder: MPO Access Road)]

Mount Pleasant Operation Access Road and Wybong Road
Surveyed Peak
6:15am to 7:15am
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Wybong Road East														
5	T1	23	1	24	4.3	0.023	0.2	LOS A	0.1	0.6	0.15	0.22	0.15	91.7
6	R2	12	0	13	0.0	0.023	7.8	LOS A	0.1	0.6	0.15	0.22	0.15	67.3
Approach		35	1	37	2.9	0.023	2.8	NA	0.1	0.6	0.15	0.22	0.15	81.5
North: Mount Pleasant Operation Access														
7	L2	11	0	12	0.0	0.037	5.6	LOS A	0.1	1.0	0.15	0.56	0.15	61.2
9	R2	30	1	32	3.3	0.037	6.1	LOS A	0.1	1.0	0.15	0.56	0.15	60.3
Approach		41	1	43	2.4	0.037	6.0	LOS A	0.1	1.0	0.15	0.56	0.15	60.5
West: Wybong Road West														
10	L2	74	4	78	5.4	0.044	8.0	LOS A	0.0	0.0	0.00	0.66	0.00	72.5
11	T1	31	1	33	3.2	0.017	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
Approach		105	5	111	4.8	0.044	5.6	NA	0.0	0.0	0.00	0.46	0.00	78.9
All Vehicles		181	7	191	3.9	0.044	5.2	NA	0.1	1.0	0.06	0.44	0.06	74.2

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.

MOVEMENT SUMMARY

Site: 101 [Ex PM MPO Road (Site Folder: MPO Access Road)]

Mount Pleasant Operation Access Road and Wybong Road
Surveyed Peak
4:00pm to 5:00pm
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Wybong Road East														
5	T1	19	0	20	0.0	0.012	0.0	LOS A	0.0	0.1	0.02	0.06	0.02	97.8
6	R2	2	0	2	0.0	0.012	7.5	LOS A	0.0	0.1	0.02	0.06	0.02	70.5
Approach		21	0	22	0.0	0.012	0.7	NA	0.0	0.1	0.02	0.06	0.02	94.3
North: Mount Pleasant Operation Access														
7	L2	16	0	17	0.0	0.077	5.6	LOS A	0.3	2.3	0.14	0.55	0.14	61.3
9	R2	68	6	72	8.8	0.077	5.9	LOS A	0.3	2.3	0.14	0.55	0.14	58.9
Approach		84	6	88	7.1	0.077	5.9	LOS A	0.3	2.3	0.14	0.55	0.14	59.4
West: Wybong Road West														
10	L2	4	1	4	25.0	0.003	8.5	LOS A	0.0	0.0	0.00	0.66	0.00	66.1
11	T1	29	0	31	0.0	0.016	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
Approach		33	1	35	3.0	0.016	1.0	NA	0.0	0.0	0.00	0.08	0.00	94.1
All Vehicles		138	7	145	5.1	0.077	3.9	NA	0.3	2.3	0.09	0.36	0.09	69.4

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.

MOVEMENT SUMMARY

Site: 101 [2026 AM Base MPO Road (Site Folder: MPO Access Road)]

Mount Pleasant Operation Access Road and Wybong Road
6:15am to 7:15am
2026 No Project
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Wybong Road East														
5	T1	34	1	36	2.9	0.029	0.2	LOS A	0.1	0.6	0.12	0.17	0.12	93.4
6	R2	12	0	13	0.0	0.029	7.8	LOS A	0.1	0.6	0.12	0.17	0.12	68.2
Approach		46	1	48	2.2	0.029	2.2	NA	0.1	0.6	0.12	0.17	0.12	85.2
North: Mount Pleasant Operation Access														
7	L2	11	0	12	0.0	0.038	5.6	LOS A	0.1	1.1	0.17	0.56	0.17	61.2
9	R2	30	1	32	3.3	0.038	6.2	LOS A	0.1	1.1	0.17	0.56	0.17	60.2
Approach		41	1	43	2.4	0.038	6.1	LOS A	0.1	1.1	0.17	0.56	0.17	60.4
West: Wybong Road West														
10	L2	74	4	78	5.4	0.044	8.0	LOS A	0.0	0.0	0.00	0.66	0.00	72.5
11	T1	37	1	39	2.7	0.020	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
Approach		111	5	117	4.5	0.044	5.3	NA	0.0	0.0	0.00	0.44	0.00	79.8
All Vehicles		198	7	208	3.5	0.044	4.7	NA	0.1	1.1	0.06	0.40	0.06	75.9

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.

MOVEMENT SUMMARY

Site: 101 [2026 PM Base MPO Road (Site Folder: MPO Access Road)]

Mount Pleasant Operation Access Road and Wybong Road
4:00pm to 5:00pm
2026 No Project
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Wybong Road East														
5	T1	19	0	20	0.0	0.012	0.0	LOS A	0.0	0.1	0.03	0.06	0.03	97.7
6	R2	2	0	2	0.0	0.012	7.6	LOS A	0.0	0.1	0.03	0.06	0.03	70.5
Approach		21	0	22	0.0	0.012	0.7	NA	0.0	0.1	0.03	0.06	0.03	94.2
North: Mount Pleasant Operation Access														
7	L2	16	0	17	0.0	0.078	5.7	LOS A	0.3	2.3	0.17	0.55	0.17	61.2
9	R2	68	6	72	8.8	0.078	6.0	LOS A	0.3	2.3	0.17	0.55	0.17	58.8
Approach		84	6	88	7.1	0.078	5.9	LOS A	0.3	2.3	0.17	0.55	0.17	59.3
West: Wybong Road West														
10	L2	4	1	4	25.0	0.003	8.5	LOS A	0.0	0.0	0.00	0.66	0.00	66.1
11	T1	41	0	43	0.0	0.022	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
Approach		45	1	47	2.2	0.022	0.8	NA	0.0	0.0	0.00	0.06	0.00	95.6
All Vehicles		150	7	158	4.7	0.078	3.7	NA	0.3	2.3	0.10	0.34	0.10	71.0

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.

MOVEMENT SUMMARY

Site: 101 [2026 AM Project MPO Road (Site Folder: MPO Access Road)]

Mount Pleasant Operation Access Road and Wybong Road
6:15am to 7:15am
2026 With Project
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Wybong Road East														
5	T1	34	1	36	2.9	0.042	0.6	LOS A	0.2	1.2	0.27	0.27	0.27	89.5
6	R2	24	1	25	4.2	0.042	8.5	LOS A	0.2	1.2	0.27	0.27	0.27	65.8
Approach		58	2	61	3.4	0.042	3.9	NA	0.2	1.2	0.27	0.27	0.27	77.9
North: Mount Pleasant Operation Access														
7	L2	13	2	14	15.4	0.067	5.8	LOS A	0.3	2.3	0.21	0.57	0.21	57.0
9	R2	45	13	47	28.9	0.067	7.3	LOS A	0.3	2.3	0.21	0.57	0.21	53.9
Approach		58	15	61	25.9	0.067	7.0	LOS A	0.3	2.3	0.21	0.57	0.21	54.6
West: Wybong Road West														
10	L2	167	31	176	18.6	0.107	8.3	LOS A	0.0	0.0	0.00	0.66	0.00	68.0
11	T1	37	1	39	2.7	0.020	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
Approach		204	32	215	15.7	0.107	6.8	NA	0.0	0.0	0.00	0.54	0.00	72.2
All Vehicles		320	49	337	15.3	0.107	6.3	NA	0.3	2.3	0.09	0.50	0.09	69.1

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.

MOVEMENT SUMMARY

Site: 101 [2026 PM Project MPO Road (Site Folder: MPO Access Road)]

Mount Pleasant Operation Access Road and Wybong Road
4:00pm to 5:00pm
2026 With Project
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Wybong Road East														
5	T1	24	0	25	0.0	0.018	0.1	LOS A	0.0	0.3	0.07	0.11	0.07	96.8
6	R2	5	2	5	40.0	0.018	8.8	LOS A	0.0	0.3	0.07	0.11	0.07	67.0
Approach		29	2	31	6.9	0.018	1.6	NA	0.0	0.3	0.07	0.11	0.07	89.9
North: Mount Pleasant Operation Access														
7	L2	34	0	36	0.0	0.172	5.7	LOS A	0.8	5.5	0.20	0.56	0.20	61.0
9	R2	149	10	157	6.7	0.172	6.1	LOS A	0.8	5.5	0.20	0.56	0.20	59.2
Approach		183	10	193	5.5	0.172	6.1	LOS A	0.8	5.5	0.20	0.56	0.20	59.6
West: Wybong Road West														
10	L2	19	12	20	63.2	0.016	9.5	LOS A	0.0	0.0	0.00	0.66	0.00	56.3
11	T1	41	0	43	0.0	0.022	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
Approach		60	12	63	20.0	0.022	3.0	NA	0.0	0.0	0.00	0.21	0.00	80.2
All Vehicles		272	24	286	8.8	0.172	4.9	NA	0.8	5.5	0.14	0.43	0.14	65.6

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.

MOVEMENT SUMMARY

Site: 101 [2036 AM Project MPO Road (Site Folder: MPO Access Road)]

Mount Pleasant Operation Access Road and Wybong Road
AM Peak Hour
2036 With Project
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Wybong Road East														
5	T1	37	1	39	2.7	0.059	0.9	LOS A	0.3	1.9	0.32	0.35	0.32	87.4
6	R2	40	1	42	2.5	0.059	8.6	LOS A	0.3	1.9	0.32	0.35	0.32	64.8
Approach		77	2	81	2.6	0.059	4.9	NA	0.3	1.9	0.32	0.35	0.32	74.0
North: Mount Pleasant Operation Access														
7	L2	11	0	12	0.0	0.044	5.7	LOS A	0.2	1.2	0.20	0.57	0.20	60.8
9	R2	32	1	34	3.1	0.044	6.9	LOS A	0.2	1.2	0.20	0.57	0.20	59.9
Approach		43	1	45	2.3	0.044	6.6	LOS A	0.2	1.2	0.20	0.57	0.20	60.1
West: Wybong Road West														
10	L2	203	10	214	4.9	0.119	8.0	LOS A	0.0	0.0	0.00	0.66	0.00	72.7
11	T1	40	1	42	2.5	0.022	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
Approach		243	11	256	4.5	0.119	6.7	NA	0.0	0.0	0.00	0.55	0.00	76.1
All Vehicles		363	14	382	3.9	0.119	6.3	NA	0.3	1.9	0.09	0.51	0.09	73.3

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.

MOVEMENT SUMMARY

Site: 101 [2036 PM Project MPO Road (Site Folder: MPO Access Road)]

Mount Pleasant Operation Access Road and Wybong Road
PM Peak Hour
2036 With Project
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Wybong Road East														
5	T1	26	0	27	0.0	0.019	0.1	LOS A	0.0	0.3	0.06	0.11	0.06	96.6
6	R2	5	1	5	20.0	0.019	8.2	LOS A	0.0	0.3	0.06	0.11	0.06	68.3
Approach		31	1	33	3.2	0.019	1.4	NA	0.0	0.3	0.06	0.11	0.06	90.5
North: Mount Pleasant Operation Access														
7	L2	55	0	58	0.0	0.266	5.7	LOS A	1.3	9.3	0.22	0.56	0.22	61.0
9	R2	233	8	245	3.4	0.266	6.2	LOS A	1.3	9.3	0.22	0.56	0.22	60.0
Approach		288	8	303	2.8	0.266	6.1	LOS A	1.3	9.3	0.22	0.56	0.22	60.2
West: Wybong Road West														
10	L2	15	3	16	20.0	0.010	8.4	LOS A	0.0	0.0	0.00	0.66	0.00	67.6
11	T1	44	0	46	0.0	0.024	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
Approach		59	3	62	5.1	0.024	2.1	NA	0.0	0.0	0.00	0.17	0.00	89.1
All Vehicles		378	12	398	3.2	0.266	5.1	NA	1.3	9.3	0.17	0.46	0.17	65.3

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.

MOVEMENT SUMMARY

Site: 101 [Ex AM TM Dr and Denman (Site Folder: TM Dr and Denman)]

Denman Road and Thomas Mitchell Drive
MPO AM Peak
2020 Surveyed (2018 Adjusted to Match Bengalla Rd)
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Thomas Mitchell Dr														
1	L2	113	18	119	15.9	0.121	8.4	LOS A	0.5	3.6	0.33	0.64	0.33	59.0
3	R2	122	6	128	4.9	0.258	13.1	LOS A	1.1	7.9	0.62	0.87	0.67	57.4
Approach		235	24	247	10.2	0.258	10.8	LOS A	1.1	7.9	0.48	0.76	0.51	58.2
East: Denman Rd N														
4	L2	279	1	294	0.4	0.159	7.0	LOS A	0.0	0.0	0.00	0.63	0.00	65.2
5	T1	201	14	212	7.0	0.113	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
Approach		480	15	505	3.1	0.159	4.1	NA	0.0	0.0	0.00	0.37	0.00	70.7
West: Denman Rd S														
11	T1	148	8	156	5.4	0.179	1.2	LOS A	0.9	6.5	0.17	0.18	0.17	75.8
12	R2	117	8	123	6.8	0.179	9.9	LOS A	0.9	6.5	0.54	0.56	0.54	62.0
Approach		265	16	279	6.0	0.179	5.0	NA	0.9	6.5	0.33	0.35	0.33	69.0
All Vehicles		980	55	1032	5.6	0.258	5.9	NA	1.1	7.9	0.21	0.46	0.21	66.8

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.

MOVEMENT SUMMARY

Site: 101 [Ex PM TM Dr and Denman (Site Folder: TM Dr and Denman)]

Denman Road and Thomas Mitchell Drive
MPO PM Peak
2020 Surveyed (2018 compared with Bangalla Rd 2020)
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Thomas Mitchell Dr														
1	L2	53	3	56	5.7	0.050	7.7	LOS A	0.2	1.3	0.26	0.60	0.26	62.4
3	R2	257	9	271	3.5	0.520	15.8	LOS B	3.3	24.1	0.70	1.00	1.10	55.4
Approach		310	12	326	3.9	0.520	14.4	LOS A	3.3	24.1	0.62	0.93	0.96	56.5
East: Denman Rd N														
4	L2	69	12	73	17.4	0.044	7.3	LOS A	0.0	0.0	0.00	0.63	0.00	59.9
5	T1	149	4	157	2.7	0.082	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	80.0
Approach		218	16	229	7.3	0.082	2.3	NA	0.0	0.0	0.00	0.20	0.00	72.3
West: Denman Rd S														
11	T1	239	16	252	6.7	0.175	0.8	LOS A	0.8	6.2	0.18	0.15	0.18	76.1
12	R2	94	12	99	12.8	0.175	8.3	LOS A	0.8	6.2	0.30	0.26	0.30	64.2
Approach		333	28	351	8.4	0.175	3.0	NA	0.8	6.2	0.21	0.18	0.21	72.3
All Vehicles		861	56	906	6.5	0.520	6.9	NA	3.3	24.1	0.31	0.46	0.43	65.7

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.

MOVEMENT SUMMARY

Site: 101 [2026 AM Base TM Dr and Denman (Site Folder: TM Dr and Denman)]

Denman Road and Thomas Mitchell Drive
MPO AM Peak
2026 No Project
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Thomas Mitchell Dr														
1	L2	129	20	136	15.5	0.142	8.6	LOS A	0.5	4.3	0.36	0.66	0.36	59.0
3	R2	120	5	126	4.2	0.278	14.3	LOS A	1.2	8.6	0.65	0.90	0.74	56.5
Approach		249	25	262	10.0	0.278	11.3	LOS A	1.2	8.6	0.50	0.77	0.54	57.8
East: Denman Rd N														
4	L2	282	6	297	2.1	0.162	7.0	LOS A	0.0	0.0	0.00	0.63	0.00	64.6
5	T1	228	15	240	6.6	0.128	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
Approach		510	21	537	4.1	0.162	3.9	NA	0.0	0.0	0.00	0.35	0.00	70.7
West: Denman Rd S														
11	T1	163	8	172	4.9	0.207	1.2	LOS A	1.0	7.5	0.16	0.17	0.16	76.0
12	R2	134	9	141	6.7	0.207	10.3	LOS A	1.0	7.5	0.56	0.60	0.56	61.4
Approach		297	17	313	5.7	0.207	5.3	NA	1.0	7.5	0.34	0.37	0.34	68.6
All Vehicles		1056	63	1112	6.0	0.278	6.0	NA	1.2	8.6	0.21	0.45	0.22	66.6

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.

MOVEMENT SUMMARY

Site: 101 [2026 PM Base TM Dr and Denman (Site Folder: TM Dr and Denman)]

Denman Road and Thomas Mitchell Drive
MPO PM Peak
2026 No Project
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Thomas Mitchell Dr														
1	L2	67	4	71	6.0	0.065	7.8	LOS A	0.2	1.7	0.27	0.61	0.27	62.2
3	R2	259	9	273	3.5	0.580	18.1	LOS B	3.9	27.8	0.75	1.05	1.29	53.5
Approach		326	13	343	4.0	0.580	16.0	LOS B	3.9	27.8	0.65	0.96	1.08	55.1
East: Denman Rd N														
4	L2	71	13	75	18.3	0.045	7.3	LOS A	0.0	0.0	0.00	0.63	0.00	59.6
5	T1	164	4	173	2.4	0.090	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	80.0
Approach		235	17	247	7.2	0.090	2.2	NA	0.0	0.0	0.00	0.19	0.00	72.5
West: Denman Rd S														
11	T1	268	17	282	6.3	0.201	1.0	LOS A	1.0	7.4	0.19	0.16	0.19	76.0
12	R2	110	14	116	12.7	0.201	8.5	LOS A	1.0	7.4	0.33	0.27	0.33	64.0
Approach		378	31	398	8.2	0.201	3.1	NA	1.0	7.4	0.23	0.19	0.23	72.0
All Vehicles		939	61	988	6.5	0.580	7.4	NA	3.9	27.8	0.32	0.46	0.47	65.2

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.

MOVEMENT SUMMARY

Site: 101 [2036 AM Base TM Dr and Denman (Site Folder: TM Dr and Denman)]

Denman Road and Thomas Mitchell Drive
MPO AM Peak
2036 No Project
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Thomas Mitchell Dr														
1	L2	110	16	116	14.5	0.117	8.3	LOS A	0.4	3.4	0.33	0.64	0.33	59.4
3	R2	101	4	106	4.0	0.220	13.0	LOS A	0.9	6.2	0.61	0.86	0.62	57.8
Approach		211	20	222	9.5	0.220	10.6	LOS A	0.9	6.2	0.47	0.75	0.47	58.6
East: Denman Rd N														
4	L2	225	1	237	0.4	0.128	7.0	LOS A	0.0	0.0	0.00	0.63	0.00	65.2
5	T1	208	8	219	3.8	0.115	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
Approach		433	9	456	2.1	0.128	3.6	NA	0.0	0.0	0.00	0.33	0.00	71.5
West: Denman Rd S														
11	T1	167	7	176	4.2	0.191	1.1	LOS A	1.0	7.0	0.18	0.19	0.18	75.7
12	R2	130	8	137	6.2	0.191	9.5	LOS A	1.0	7.0	0.51	0.52	0.51	62.8
Approach		297	15	313	5.1	0.191	4.8	NA	1.0	7.0	0.33	0.33	0.33	69.5
All Vehicles		941	44	991	4.7	0.220	5.5	NA	1.0	7.0	0.21	0.42	0.21	67.6

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.

MOVEMENT SUMMARY

Site: 101 [2036 PM Base TM Dr and Denman (Site Folder: TM Dr and Denman)]

Denman Road and Thomas Mitchell Drive
MPO PM Peak
2036 No Project
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Thomas Mitchell Dr														
1	L2	65	5	68	7.7	0.064	7.9	LOS A	0.2	1.7	0.29	0.62	0.29	61.6
3	R2	233	11	245	4.7	0.525	17.3	LOS B	3.2	23.4	0.73	1.01	1.16	53.9
Approach		298	16	314	5.4	0.525	15.2	LOS B	3.2	23.4	0.63	0.93	0.97	55.4
East: Denman Rd N														
4	L2	64	13	67	20.3	0.042	7.3	LOS A	0.0	0.0	0.00	0.63	0.00	59.1
5	T1	177	4	186	2.3	0.097	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
Approach		241	17	254	7.1	0.097	2.0	NA	0.0	0.0	0.00	0.17	0.00	73.1
West: Denman Rd S														
11	T1	266	16	280	6.0	0.193	0.9	LOS A	0.9	6.9	0.19	0.15	0.19	76.1
12	R2	100	13	105	13.0	0.193	8.5	LOS A	0.9	6.9	0.32	0.26	0.32	64.1
Approach		366	29	385	7.9	0.193	3.0	NA	0.9	6.9	0.23	0.18	0.23	72.4
All Vehicles		905	62	953	6.9	0.525	6.7	NA	3.2	23.4	0.30	0.42	0.41	65.9

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.

MOVEMENT SUMMARY

Site: 101 [2026 AM Project TM Dr and Denman (Site Folder: TM Dr and Denman)]

Denman Road and Thomas Mitchell Drive
MPO AM Peak
2026 With Project
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Thomas Mitchell Dr														
1	L2	161	27	169	16.8	0.193	9.1	LOS A	0.7	6.0	0.42	0.70	0.42	58.3
3	R2	120	5	126	4.2	0.320	16.5	LOS B	1.4	10.2	0.71	0.93	0.87	54.7
Approach		281	32	296	11.4	0.320	12.3	LOS A	1.4	10.2	0.55	0.80	0.62	56.7
East: Denman Rd N														
4	L2	282	6	297	2.1	0.162	7.0	LOS A	0.0	0.0	0.00	0.63	0.00	64.6
5	T1	279	33	294	11.8	0.162	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
Approach		561	39	591	7.0	0.162	3.5	NA	0.0	0.0	0.00	0.32	0.00	71.4
West: Denman Rd S														
11	T1	176	19	185	10.8	0.228	1.4	LOS A	1.1	8.5	0.18	0.18	0.18	75.6
12	R2	135	10	142	7.4	0.228	10.9	LOS A	1.1	8.5	0.59	0.62	0.59	60.7
Approach		311	29	327	9.3	0.228	5.5	NA	1.1	8.5	0.36	0.37	0.36	68.3
All Vehicles		1153	100	1214	8.7	0.320	6.2	NA	1.4	10.2	0.23	0.45	0.25	66.4

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.

MOVEMENT SUMMARY

Site: 101 [2026 PM Project TM Dr and Denman (Site Folder: TM Dr and Denman)]

Denman Road and Thomas Mitchell Drive
MPO PM Peak
2026 With Project
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Thomas Mitchell Dr														
1	L2	70	5	74	7.1	0.069	7.9	LOS A	0.2	1.9	0.29	0.62	0.29	61.8
3	R2	259	9	273	3.5	0.677	22.9	LOS B	4.8	34.8	0.84	1.14	1.67	50.0
Approach		329	14	346	4.3	0.677	19.7	LOS B	4.8	34.8	0.72	1.03	1.38	52.1
East: Denman Rd N														
4	L2	71	13	75	18.3	0.045	7.3	LOS A	0.0	0.0	0.00	0.63	0.00	59.6
5	T1	176	14	185	8.0	0.100	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
Approach		247	27	260	10.9	0.100	2.1	NA	0.0	0.0	0.00	0.18	0.00	72.8
West: Denman Rd S														
11	T1	310	20	326	6.5	0.243	1.1	LOS A	1.3	9.5	0.21	0.17	0.21	75.7
12	R2	140	15	147	10.7	0.243	8.6	LOS A	1.3	9.5	0.37	0.30	0.37	64.2
Approach		450	35	474	7.8	0.243	3.4	NA	1.3	9.5	0.26	0.21	0.26	71.7
All Vehicles		1026	76	1080	7.4	0.677	8.3	NA	4.8	34.8	0.34	0.47	0.55	64.2

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.

MOVEMENT SUMMARY

Site: 101 [2036 AM Project TM Dr and Denman (Site Folder: TM Dr and Denman)]

Denman Road and Thomas Mitchell Drive
MPO AM Peak
2036 With Project
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Thomas Mitchell Dr														
1	L2	185	23	195	12.4	0.225	9.2	LOS A	0.9	6.8	0.45	0.73	0.45	59.3
3	R2	101	4	106	4.0	0.281	16.5	LOS B	1.2	8.4	0.72	0.92	0.83	54.7
Approach		286	27	301	9.4	0.281	11.8	LOS A	1.2	8.4	0.55	0.80	0.59	57.6
East: Denman Rd N														
4	L2	225	1	237	0.4	0.128	7.0	LOS A	0.0	0.0	0.00	0.63	0.00	65.2
5	T1	316	21	333	6.6	0.178	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
Approach		541	22	569	4.1	0.178	2.9	NA	0.0	0.0	0.00	0.26	0.00	73.0
West: Denman Rd S														
11	T1	180	9	189	5.0	0.229	1.2	LOS A	1.1	8.4	0.17	0.18	0.17	75.9
12	R2	140	10	147	7.1	0.229	10.7	LOS A	1.1	8.4	0.58	0.61	0.58	61.0
Approach		320	19	337	5.9	0.229	5.4	NA	1.1	8.4	0.35	0.37	0.35	68.5
All Vehicles		1147	68	1207	5.9	0.281	5.8	NA	1.2	8.4	0.23	0.42	0.24	67.3

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.

MOVEMENT SUMMARY

Site: 101 [2036 PM Project TM Dr and Denman (Site Folder: TM Dr and Denman)]

Denman Road and Thomas Mitchell Drive
MPO PM Peak
2036 With Project
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Thomas Mitchell Dr														
1	L2	70	5	74	7.1	0.070	8.0	LOS A	0.3	1.9	0.30	0.62	0.30	61.7
3	R2	229	7	241	3.1	0.734	29.3	LOS C	5.1	36.8	0.89	1.20	1.95	46.1
Approach		299	12	315	4.0	0.734	24.3	LOS B	5.1	36.8	0.75	1.07	1.56	49.0
East: Denman Rd N														
4	L2	64	13	67	20.3	0.042	7.3	LOS A	0.0	0.0	0.00	0.63	0.00	59.1
5	T1	188	7	198	3.7	0.104	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
Approach		252	20	265	7.9	0.104	1.9	NA	0.0	0.0	0.00	0.16	0.00	73.3
West: Denman Rd S														
11	T1	378	21	398	5.6	0.299	1.2	LOS A	1.7	12.3	0.22	0.18	0.22	75.5
12	R2	179	15	188	8.4	0.299	8.7	LOS A	1.7	12.3	0.39	0.32	0.39	64.7
Approach		557	36	586	6.5	0.299	3.6	NA	1.7	12.3	0.27	0.22	0.27	71.7
All Vehicles		1108	68	1166	6.1	0.734	8.8	NA	5.1	36.8	0.34	0.44	0.56	64.0

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.

MOVEMENT SUMMARY

Site: 101-1 [2020 AM TMD and NEH Stage 1 (Site Folder: TM Dr and NEH)]

Network: N101 [2020 AM (Network Folder: General)]

Thomas Mitchell Drive and New England Highway
MPO AM Peak
2020 Surveyed (2018 plus growth)
Site Category: Existing Geometry
Stop (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: New England Hwy S														
4	L2	203	15.3	203	15.3	0.154	8.8	LOS A	0.3	2.2	0.07	0.61	0.07	64.6
5	T1	271	23.4	271	23.4	0.160	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.9
Approach		474	19.9	474	19.9	0.160	3.8	LOS A	0.3	2.2	0.03	0.26	0.03	80.9
North: New England Hwy N														
12	R2	14	0.0	14	0.0	0.011	8.8	LOS A	0.0	0.1	0.37	0.61	0.37	68.1
Approach		14	0.0	14	0.0	0.011	8.8	NA	0.0	0.1	0.37	0.61	0.37	68.1
West: Thomas Mitchell Drive														
1	L2	10	11.1	10	11.1	0.006	8.2	LOS A	0.0	0.0	0.00	0.60	0.00	62.9
2	T1	137	9.8	137	9.8	0.178	11.4	LOS B	0.3	1.9	0.46	1.01	0.46	56.2
Approach		147	9.8	147	9.8	0.178	11.2	LOS B	0.3	1.9	0.42	0.98	0.42	57.0
All Vehicles		636	17.1	636	17.1	0.178	5.6	NA	0.3	2.2	0.13	0.44	0.13	76.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network 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).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101-2 [2020 AM TMD and NEH Stage 2 (Site Folder: TM Dr and NEH)]

Network: N101 [2020 AM (Network Folder: General)]

Thomas Mitchell Dr and New England Hwy
MPO AM Peak
2020 (2018 Surveyed plus growth)
Site Category: Existing Geometry
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
North: New England Hwy N														
11	T1	392	11.3	392	11.3	0.216	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.9
Approach		392	11.3	392	11.3	0.216	0.0	NA	0.0	0.0	0.00	0.00	0.00	99.9
NorthWest: Merge Movement														
32a	R1	137	9.8	137	9.8	0.106	0.9	LOS A	0.1	1.0	0.34	0.26	0.34	95.1
Approach		137	9.8	137	9.8	0.106	0.9	LOS A	0.1	1.0	0.34	0.26	0.34	95.1
All Vehicles		529	10.9	529	10.9	0.216	0.3	NA	0.1	1.0	0.09	0.07	0.09	99.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network 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).

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

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

ROUTE TRAVEL PERFORMANCE

Route: R101 [2020 AM]

Network: N101 [2020 AM (Network Folder: General)]

New Route
Network Category: (None)

Route Travel Performance			
Performance Measure	**Vehicles**	**Per Unit Distance**	**Persons**
Travel Speed (Average)	73.1 km/h		73.1 km/h
Travel Distance (Average)	1170.0 m		1170.0 m
Travel Time (Average)	57.7 sec	49.3 sec/km	57.7 sec
Desired Speed (Input)	60.0 km/h		
Route Delay (Average)	12.3 sec	10.5 sec/km	12.3 sec
Route Stop Rate	1.27	1.09 per km	1.27
Route Level of Service (LOS)	LOS A		
Speed Efficiency	1.00[3]		
Travel Time Index	10.00		
Congestion Coefficient	1.00		

3 Calculated Average Travel Speed exceeds the specified Desired Speed.

Route Travel Movement Performance											
Mov ID	Turn	Trav Dist m	Trav Time sec	Aver. Speed km/h	Aver. Delay sec	Prop. Queued	Eff. Stop Rate	Aver. No. Cycles	Dem. Flow Rate veh/h	Arv. Flow Rate veh/h	Deg. of Satn
Site ID: 101-1 Site Name: 2020 AM TMD and NEH Stage 1											
West Approach											
2	T1	510.0	32.7	56.2	11.4	0.46	1.01	0.46	137	137	0.178
Site ID: 101-2 Site Name: 2020 AM TMD and NEH Stage 2											
NorthWest Approach											
32a	R1	660.0	25.0	95.1	0.9	0.34	0.26	0.34	137	137	0.106

MOVEMENT SUMMARY

Site: 101-1 [2020 PM TMD and NEH Stage 1 (Site Folder: TM Dr and NEH)]

Network: N101 [2020 PM (Network Folder: General)]

Thomas Mitchell Drive and New England Highway
MPO PM Peak
2020 (2018 Surveyed plus growth)
Site Category: Existing Geometry
Stop (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: New England Hwy S														
4	L2	63	47.4	63	47.4	0.055	9.5	LOS A	0.1	0.9	0.07	0.61	0.07	55.8
5	T1	418	5.9	418	5.9	0.222	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.9
Approach		481	11.3	481	11.3	0.222	1.3	LOS A	0.1	0.9	0.01	0.08	0.01	90.4
North: New England Hwy N														
12	R2	11	20.0	11	20.0	0.011	10.2	LOS B	0.0	0.1	0.47	0.64	0.47	60.9
Approach		11	20.0	11	20.0	0.011	10.2	NA	0.0	0.1	0.47	0.64	0.47	60.9
West: Thomas Mitchell Drive														
1	L2	9	12.5	9	12.5	0.005	8.5	LOS A	0.0	0.0	0.00	0.60	0.00	62.5
2	T1	216	5.7	216	5.7	0.293	12.0	LOS B	0.5	3.5	0.52	1.06	0.57	55.0
Approach		224	5.9	224	5.9	0.293	11.8	LOS B	0.5	3.5	0.50	1.04	0.55	55.5
All Vehicles		717	9.8	717	9.8	0.293	4.7	NA	0.5	3.5	0.17	0.39	0.19	80.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network 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).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101-2 [2020 PM TMD and NEH Stage 2 (Site Folder: TM Dr and NEH)]

Network: N101 [2020 PM (Network Folder: General)]

Thomas Mitchell Dr and New England Hwy
MPO PM Peak
2020 (2018 Surveyed plus growth)
Site Category: Existing Geometry
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
North: New England Hwy N														
11	T1	402	11.6	402	11.6	0.222	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.9
Approach		402	11.6	402	11.6	0.222	0.0	NA	0.0	0.0	0.00	0.00	0.00	99.9
NorthWest: Merge Movement														
32a	R1	216	5.7	216	5.7	0.164	1.0	LOS A	0.2	1.6	0.36	0.28	0.36	94.9
Approach		216	5.7	216	5.7	0.164	1.0	LOS A	0.2	1.6	0.36	0.28	0.36	94.9
All Vehicles		618	9.5	618	9.5	0.222	0.4	NA	0.2	1.6	0.12	0.10	0.12	98.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network 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).
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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ROUTE TRAVEL PERFORMANCE

Route: R101 [2020 PM]

Network: N101 [2020 PM (Network Folder: General)]

New Route
Network Category: (None)

Route Travel Performance						
Performance Measure	**Vehicles**		**Per Unit Distance**		**Persons**	
Travel Speed (Average)	72.1	km/h			72.1	km/h
Travel Distance (Average)	1170.0	m			1170.0	m
Travel Time (Average)	58.4	sec	49.9	sec/km	58.4	sec
Desired Speed (Input)	60.0	km/h				
Route Delay (Average)	13.0	sec	11.1	sec/km	13.0	sec
Route Stop Rate	1.33		1.14	per km	1.33	
Route Level of Service (LOS)	LOS A					
Speed Efficiency	1.00[3]					
Travel Time Index	10.00					
Congestion Coefficient	1.00					

3 Calculated Average Travel Speed exceeds the specified Desired Speed.

Route Travel Movement Performance											
Mov ID	Turn	Trav Dist m	Trav Time sec	Aver. Speed km/h	Aver. Delay sec	Prop. Queued	Eff. Stop Rate	Aver. No. Cycles	Dem. Flow Rate veh/h	Arv. Flow Rate veh/h	Deg. of Satn
Site ID: 101-1 Site Name: 2020 PM TMD and NEH Stage 1											
West Approach											
2	T1	510.0	33.4	55.0	12.0	0.52	1.06	0.57	216	216	0.293
Site ID: 101-2 Site Name: 2020 PM TMD and NEH Stage 2											
NorthWest Approach											
32a	R1	660.0	25.0	94.9	1.0	0.36	0.28	0.36	216	216	0.164

MOVEMENT SUMMARY

Site: 101-1 [2026 AM Base TMD and NEH Stage 1 (Site Folder: TM Dr and NEH)]

Network: N101 [2026 AM Base (Network Folder: General)]

Thomas Mitchell Drive and New England Highway
MPO AM Peak
2026 No Project
Site Category: Existing Geometry
Stop (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: New England Hwy S														
4	L2	262	12.7	262	12.7	0.206	9.0	LOS A	0.4	3.0	0.19	0.60	0.19	64.8
5	T1	289	23.5	289	23.5	0.171	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.9
Approach		551	18.3	551	18.3	0.206	4.3	LOS A	0.4	3.0	0.09	0.29	0.09	79.4
North: New England Hwy N														
12	R2	63	0.0	63	0.0	0.048	8.9	LOS A	0.1	0.6	0.40	0.64	0.40	68.0
Approach		63	0.0	63	0.0	0.048	8.9	NA	0.1	0.6	0.40	0.64	0.40	68.0
West: Thomas Mitchell Drive														
1	L2	12	9.1	12	9.1	0.007	8.2	LOS A	0.0	0.0	0.00	0.60	0.00	63.4
2	T1	149	10.4	149	10.4	0.217	12.2	LOS B	0.3	2.4	0.51	1.04	0.51	55.0
Approach		161	10.3	161	10.3	0.217	11.9	LOS B	0.3	2.4	0.47	1.01	0.47	56.1
All Vehicles		776	15.2	776	15.2	0.217	6.2	NA	0.4	3.0	0.19	0.47	0.19	74.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network 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).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101-2 [2026 AM Base TMD and NEH Stage 2 (Site Folder: TM Dr and NEH)]

Network: N101 [2026 AM Base (Network Folder: General)]

Thomas Mitchell Dr and New England Hwy
MPO AM Peak
2026 No Project
Site Category: Existing Geometry
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
North: New England Hwy N														
11	T1	416	11.2	416	11.2	0.229	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.9
Approach		416	11.2	416	11.2	0.229	0.0	NA	0.0	0.0	0.00	0.00	0.00	99.9
NorthWest: Merge Movement														
32a	R1	149	10.4	149	10.4	0.118	1.0	LOS A	0.1	1.1	0.36	0.28	0.36	94.9
Approach		149	10.4	149	10.4	0.118	1.0	LOS A	0.1	1.1	0.36	0.28	0.36	94.9
All Vehicles		564	11.0	564	11.0	0.229	0.3	NA	0.1	1.1	0.09	0.07	0.09	98.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network 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).

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

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

ROUTE TRAVEL PERFORMANCE

Route: R101 [2026 AM Base]

Network: N101 [2026 AM Base (Network Folder: General)]

New Route
Network Category: (None)

Route Travel Performance						
Performance Measure	**Vehicles**		**Per Unit Distance**		**Persons**	
Travel Speed (Average)	72.1	km/h			72.1	km/h
Travel Distance (Average)	1170.0	m			1170.0	m
Travel Time (Average)	58.4	sec	49.9	sec/km	58.4	sec
Desired Speed (Input)	60.0	km/h				
Route Delay (Average)	13.3	sec	11.3	sec/km	13.3	sec
Route Stop Rate	1.33		1.13	per km	1.33	
Route Level of Service (LOS)	LOS A					
Speed Efficiency	1.00[3]					
Travel Time Index	10.00					
Congestion Coefficient	1.00					

3 Calculated Average Travel Speed exceeds the specified Desired Speed.

Route Travel Movement Performance											
Mov ID	Turn	Trav Dist m	Trav Time sec	Aver. Speed km/h	Aver. Delay sec	Prop. Queued	Eff. Stop Rate	Aver. No. Cycles	Dem. Flow Rate veh/h	Arv. Flow Rate veh/h	Deg. of Satn
Site ID: 101-1 Site Name: 2026 AM Base TMD and NEH Stage 1											
West Approach											
2	T1	510.0	33.4	55.0	12.2	0.51	1.04	0.51	149	149	0.217
Site ID: 101-2 Site Name: 2026 AM Base TMD and NEH Stage 2											
NorthWest Approach											
32a	R1	660.0	25.0	94.9	1.0	0.36	0.28	0.36	149	149	0.118

MOVEMENT SUMMARY

Site: 101-1 [2026 PM Base TMD and NEH Stage 1 (Site Folder: TM Dr and NEH)]

Network: N101 [2026 PM Base (Network Folder: General)]

Thomas Mitchell Drive and New England Highway
MPO AM Peak
2026 No Project
Site Category: Existing Geometry
Stop (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: New England Hwy S														
4	L2	73	47.0	73	47.0	0.064	9.5	LOS A	0.1	1.0	0.08	0.61	0.08	55.8
5	T1	443	5.8	443	5.8	0.236	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.9
Approach		517	11.6	517	11.6	0.236	1.4	LOS A	0.1	1.0	0.01	0.09	0.01	89.7
North: New England Hwy N														
12	R2	13	25.0	13	25.0	0.014	10.6	LOS B	0.0	0.2	0.50	0.66	0.50	59.3
Approach		13	25.0	13	25.0	0.014	10.6	NA	0.0	0.2	0.50	0.66	0.50	59.3
West: Thomas Mitchell Drive														
1	L2	54	6.1	54	6.1	0.031	8.5	LOS A	0.0	0.0	0.00	0.60	0.00	64.3
2	T1	278	5.6	278	5.6	0.394	13.0	LOS B	0.8	5.6	0.57	1.09	0.74	53.6
Approach		332	5.7	332	5.7	0.394	12.3	LOS B	0.8	5.6	0.48	1.01	0.62	56.2
All Vehicles		862	9.5	862	9.5	0.394	5.7	NA	0.8	5.6	0.20	0.45	0.25	76.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network 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).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101-2 [2026 PM Base TMD and NEH Stage 2 (Site Folder: TM Dr and NEH)]

Network: N101 [2026 PM Base (Network Folder: General)]

Thomas Mitchell Dr and New England Hwy
MPO PM Peak
2026 No Project
Site Category: Existing Geometry
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
North: New England Hwy N														
11	T1	428	11.7	428	11.7	0.236	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.9
Approach		428	11.7	428	11.7	0.236	0.0	NA	0.0	0.0	0.00	0.00	0.00	99.9
NorthWest: Merge Movement														
32a	R1	278	5.6	278	5.6	0.216	1.1	LOS A	0.3	2.1	0.38	0.32	0.38	94.6
Approach		278	5.6	278	5.6	0.216	1.1	LOS A	0.3	2.1	0.38	0.32	0.38	94.6
All Vehicles		706	9.3	706	9.3	0.236	0.5	NA	0.3	2.1	0.15	0.12	0.15	98.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network 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).
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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ROUTE TRAVEL PERFORMANCE

Route: R101 [2026 PM Base]

Network: N101 [2026 PM Base (Network Folder: General)]

New Route
Network Category: (None)

Route Travel Performance								
Performance Measure	**Vehicles**			**Per Unit Distance**			**Persons**	
Travel Speed (Average)	70.9	km/h					70.9	km/h
Travel Distance (Average)	1170.0	m					1170.0	m
Travel Time (Average)	59.4	sec		50.8	sec/km		59.4	sec
Desired Speed (Input)	60.0	km/h						
Route Delay (Average)	14.1	sec		12.1	sec/km		14.1	sec
Route Stop Rate	1.40			1.20	per km		1.40	
Route Level of Service (LOS)	LOS A							
Speed Efficiency	1.00[3]							
Travel Time Index	10.00							
Congestion Coefficient	1.00							

3 Calculated Average Travel Speed exceeds the specified Desired Speed.

Route Travel Movement Performance											
Mov ID	Turn	Trav Dist m	Trav Time sec	Aver. Speed km/h	Aver. Delay sec	Prop. Queued	Eff. Stop Rate	Aver. No. Cycles	Dem. Flow Rate veh/h	Arv. Flow Rate veh/h	Deg. of Satn
Site ID: 101-1 Site Name: 2026 PM Base TMD and NEH Stage 1											
West Approach											
2	T1	510.0	34.3	53.6	13.0	0.57	1.09	0.74	278	278	0.394
Site ID: 101-2 Site Name: 2026 PM Base TMD and NEH Stage 2											
NorthWest Approach											
32a	R1	660.0	25.1	94.6	1.1	0.38	0.32	0.38	278	278	0.216

MOVEMENT SUMMARY

Site: 101-1 [2036 AM Base TMD and NEH Stage 1 (Site Folder: TM Dr and NEH)]

Network: N101 [2036 AM Base (Network Folder: General)]

Thomas Mitchell Drive and New England Highway
MPO AM Peak
2036 No Project
Site Category: Existing Geometry
Stop (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: New England Hwy S														
4	L2	191	13.4	191	13.4	0.150	8.9	LOS A	0.3	2.1	0.17	0.60	0.17	64.7
5	T1	318	23.4	318	23.4	0.188	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.9
Approach		509	19.7	509	19.7	0.188	3.4	LOS A	0.3	2.1	0.06	0.23	0.06	82.9
North: New England Hwy N														
12	R2	61	0.0	61	0.0	0.048	9.0	LOS A	0.1	0.6	0.42	0.65	0.42	67.9
Approach		61	0.0	61	0.0	0.048	9.0	NA	0.1	0.6	0.42	0.65	0.42	67.9
West: Thomas Mitchell Drive														
1	L2	13	8.3	13	8.3	0.008	8.3	LOS A	0.0	0.0	0.00	0.60	0.00	63.7
2	T1	130	9.4	130	9.4	0.187	12.0	LOS B	0.3	2.0	0.50	1.04	0.50	55.2
Approach		143	9.3	143	9.3	0.187	11.7	LOS B	0.3	2.0	0.45	1.00	0.45	56.5
All Vehicles		713	15.9	713	15.9	0.188	5.5	NA	0.3	2.1	0.17	0.42	0.17	76.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network 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).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101-2 [2036 AM Base TMD and NEH Stage 2 (Site Folder: TM Dr and NEH)]

Network: N101 [2036 AM Base (Network Folder: General)]

Thomas Mitchell Dr and New England Hwy
MPO AM Peak
2036 No Project
Site Category: Existing Geometry
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
North: New England Hwy N														
11	T1	460	11.4	460	11.4	0.253	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.9
Approach		460	11.4	460	11.4	0.253	0.0	NA	0.0	0.0	0.00	0.00	0.00	99.9
NorthWest: Merge Movement														
32a	R1	130	9.4	130	9.4	0.106	1.1	LOS A	0.1	1.0	0.38	0.31	0.38	94.7
Approach		130	9.4	130	9.4	0.106	1.1	LOS A	0.1	1.0	0.38	0.31	0.38	94.7
All Vehicles		590	10.9	590	10.9	0.253	0.3	NA	0.1	1.0	0.08	0.07	0.08	99.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network 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).

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

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

ROUTE TRAVEL PERFORMANCE

Route: R101 [2036 AM Base]

Network: N101 [2036 AM Base (Network Folder: General)]

New Route
Network Category: (None)

Route Travel Performance								
Performance Measure	**Vehicles**			**Per Unit Distance**			**Persons**	
Travel Speed (Average)	72.2	km/h					72.2	km/h
Travel Distance (Average)	1170.0	m					1170.0	m
Travel Time (Average)	58.3	sec		49.9	sec/km		58.3	sec
Desired Speed (Input)	60.0	km/h						
Route Delay (Average)	13.2	sec		11.3	sec/km		13.2	sec
Route Stop Rate	1.34			1.15	per km		1.34	
Route Level of Service (LOS)	LOS A							
Speed Efficiency	1.00[3]							
Travel Time Index	10.00							
Congestion Coefficient	1.00							

3 Calculated Average Travel Speed exceeds the specified Desired Speed.

Route Travel Movement Performance											
Mov ID	Turn	Trav Dist m	Trav Time sec	Aver. Speed km/h	Aver. Delay sec	Prop. Queued	Eff. Stop Rate	Aver. No. Cycles	Dem. Flow Rate veh/h	Arv. Flow Rate veh/h	Deg. of Satn
Site ID: 101-1 Site Name: 2036 AM Base TMD and NEH Stage 1											
West Approach											
2	T1	510.0	33.3	55.2	12.0	0.50	1.04	0.50	130	130	0.187
Site ID: 101-2 Site Name: 2036 AM Base TMD and NEH Stage 2											
NorthWest Approach											
32a	R1	660.0	25.1	94.7	1.1	0.38	0.31	0.38	130	130	0.106

MOVEMENT SUMMARY

Site: 101-1 [2036 PM Base TMD and NEH Stage 1 (Site Folder: TM Dr and NEH)]

Network: N101 [2036 PM Base (Network Folder: General)]

Thomas Mitchell Drive and New England Highway
MPO PM Peak
2036 No Project
Site Category: Existing Geometry
Stop (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: New England Hwy S														
4	L2	69	53.2	69	53.2	0.062	9.7	LOS A	0.1	1.0	0.08	0.60	0.08	54.4
5	T1	490	5.9	490	5.9	0.261	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.9
Approach		559	11.7	559	11.7	0.261	1.2	LOS A	0.1	1.0	0.01	0.07	0.01	90.5
North: New England Hwy N														
12	R2	14	23.1	14	23.1	0.016	10.8	LOS B	0.0	0.2	0.52	0.68	0.52	59.6
Approach		14	23.1	14	23.1	0.016	10.8	NA	0.0	0.2	0.52	0.68	0.52	59.6
West: Thomas Mitchell Drive														
1	L2	52	4.3	52	4.3	0.029	8.6	LOS A	0.0	0.0	0.00	0.60	0.00	64.9
2	T1	239	4.7	239	4.7	0.358	13.1	LOS B	0.6	4.7	0.57	1.08	0.72	53.3
Approach		291	4.6	291	4.6	0.358	12.3	LOS B	0.6	4.7	0.47	0.99	0.59	56.4
All Vehicles		864	9.5	864	9.5	0.358	5.1	NA	0.6	4.7	0.17	0.39	0.21	78.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network 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).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101-2 [2036 PM Base TMD and NEH Stage 2 (Site Folder: TM Dr and NEH)]

Network: N101 [2036 PM Base (Network Folder: General)]

Thomas Mitchell Dr and New England Hwy
MPO PM Peak
2036 With Project
Site Category: Existing Geometry
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
North: New England Hwy N														
11	T1	471	11.6	471	11.6	0.260	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.9
Approach		471	11.6	471	11.6	0.260	0.0	NA	0.0	0.0	0.00	0.00	0.00	99.9
NorthWest: Merge Movement														
32a	R1	239	4.7	239	4.7	0.191	1.2	LOS A	0.3	1.8	0.40	0.34	0.40	94.4
Approach		239	4.7	239	4.7	0.191	1.2	LOS A	0.3	1.8	0.40	0.34	0.40	94.4
All Vehicles		710	9.2	710	9.2	0.260	0.4	NA	0.3	1.8	0.13	0.12	0.13	98.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network 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).

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

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

ROUTE TRAVEL PERFORMANCE

Route: R101 [2036 PM Base]

Network: N101 [2036 PM Base (Network Folder: General)]

New Route
Network Category: (None)

Route Travel Performance						
Performance Measure	**Vehicles**		**Per Unit Distance**		**Persons**	
Travel Speed (Average)	70.7	km/h			70.7	km/h
Travel Distance (Average)	1170.0	m			1170.0	m
Travel Time (Average)	59.6	sec	51.0	sec/km	59.6	sec
Desired Speed (Input)	60.0	km/h				
Route Delay (Average)	14.4	sec	12.3	sec/km	14.4	sec
Route Stop Rate	1.42		1.22	per km	1.42	
Route Level of Service (LOS)	LOS A					
Speed Efficiency	1.00[3]					
Travel Time Index	10.00					
Congestion Coefficient	1.00					

3 Calculated Average Travel Speed exceeds the specified Desired Speed.

Route Travel Movement Performance											
Mov ID	Turn	Trav Dist m	Trav Time sec	Aver. Speed km/h	Aver. Delay sec	Prop. Queued	Eff. Stop Rate	Aver. No. Cycles	Dem. Flow Rate veh/h	Arv. Flow Rate veh/h	Deg. of Satn
Site ID: 101-1 Site Name: 2036 PM Base TMD and NEH Stage 1											
West Approach											
2	T1	510.0	34.4	53.3	13.1	0.57	1.08	0.72	239	239	0.358
Site ID: 101-2 Site Name: 2036 PM Base TMD and NEH Stage 2											
NorthWest Approach											
32a	R1	660.0	25.2	94.4	1.2	0.40	0.34	0.40	239	239	0.191

MOVEMENT SUMMARY

Site: 101-1 [2026 AM Project TMD and NEH Stage 1 (Site Folder: TM Dr and NEH)]

Network: N101 [2026 AM Project (Network Folder: General)]

Thomas Mitchell Drive and New England Highway
MPO AM Peak
2026 With Project
Site Category: Existing Geometry
Stop (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: New England Hwy S														
4	L2	298	13.8	298	13.8	0.235	9.0	LOS A	0.5	3.6	0.19	0.60	0.19	64.5
5	T1	289	23.5	289	23.5	0.171	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.9
Approach		587	18.6	587	18.6	0.235	4.6	LOS A	0.5	3.6	0.10	0.30	0.10	78.0
North: New England Hwy N														
12	R2	63	0.0	63	0.0	0.048	8.9	LOS A	0.1	0.6	0.40	0.64	0.40	68.0
Approach		63	0.0	63	0.0	0.048	8.9	NA	0.1	0.6	0.40	0.64	0.40	68.0
West: Thomas Mitchell Drive														
1	L2	12	9.1	12	9.1	0.007	8.2	LOS A	0.0	0.0	0.00	0.60	0.00	63.4
2	T1	151	11.0	151	11.0	0.226	12.5	LOS B	0.3	2.5	0.52	1.05	0.52	54.7
Approach		163	10.9	163	10.9	0.226	12.1	LOS B	0.3	2.5	0.48	1.02	0.48	55.8
All Vehicles		813	15.6	813	15.6	0.235	6.4	NA	0.5	3.6	0.20	0.47	0.20	73.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network 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).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101-2 [2026 AM Project TMD and NEH Stage 2 (Site Folder: TM Dr and NEH)]

Network: N101 [2026 AM Project (Network Folder: General)]

Thomas Mitchell Dr and New England Hwy
MPO AM Peak
2026 With Project
Site Category: Existing Geometry
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
North: New England Hwy N														
11	T1	416	11.2	416	11.2	0.229	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.9
Approach		416	11.2	416	11.2	0.229	0.0	NA	0.0	0.0	0.00	0.00	0.00	99.9
NorthWest: Merge Movement														
32a	R1	151	11.0	151	11.0	0.120	1.0	LOS A	0.2	1.2	0.36	0.28	0.36	94.9
Approach		151	11.0	151	11.0	0.120	1.0	LOS A	0.2	1.2	0.36	0.28	0.36	94.9
All Vehicles		567	11.2	567	11.2	0.229	0.3	NA	0.2	1.2	0.10	0.08	0.10	98.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network 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).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

ROUTE TRAVEL PERFORMANCE

Route: R101 [2026 AM Project]

Network: N101 [2026 AM Project (Network Folder: General)]

New Route
Network Category: (None)

Route Travel Performance								
Performance Measure	Vehicles			Per Unit Distance			Persons	
Travel Speed (Average)	71.9	km/h					71.9	km/h
Travel Distance (Average)	1170.0	m					1170.0	m
Travel Time (Average)	58.6	sec		50.1	sec/km		58.6	sec
Desired Speed (Input)	60.0	km/h						
Route Delay (Average)	13.5	sec		11.5	sec/km		13.5	sec
Route Stop Rate	1.34			1.14	per km		1.34	
Route Level of Service (LOS)	LOS A							
Speed Efficiency	1.00[3]							
Travel Time Index	10.00							
Congestion Coefficient	1.00							

3 Calculated Average Travel Speed exceeds the specified Desired Speed.

Route Travel Movement Performance											
Mov ID	Turn	Trav Dist m	Trav Time sec	Aver. Speed km/h	Aver. Delay sec	Prop. Queued	Eff. Stop Rate	Aver. No. Cycles	Dem. Flow Rate veh/h	Arv. Flow Rate veh/h	Deg. of Satn
Site ID: 101-1 Site Name: 2026 AM Project TMD and NEH Stage 1											
West Approach											
2	T1	510.0	33.5	54.7	12.5	0.52	1.05	0.52	151	151	0.226
Site ID: 101-2 Site Name: 2026 AM Project TMD and NEH Stage 2											
NorthWest Approach											
32a	R1	660.0	25.0	94.9	1.0	0.36	0.28	0.36	151	151	0.120

MOVEMENT SUMMARY

Site: 101-1 [2026 PM Project TMD and NEH Stage 1 (Site Folder: TM Dr and NEH)]

Network: N101 [2026 PM Project (Network Folder: General)]

Thomas Mitchell Drive and New England Highway
MPO PM Peak
2026 With Project
Site Category: Existing Geometry
Stop (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: New England Hwy S														
4	L2	77	46.4	77	46.4	0.067	9.5	LOS A	0.1	1.1	0.08	0.61	0.08	56.0
5	T1	443	5.8	443	5.8	0.236	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.9
Approach		520	11.8	520	11.8	0.236	1.4	LOS A	0.1	1.1	0.01	0.09	0.01	89.4
North: New England Hwy N														
12	R2	13	25.0	13	25.0	0.014	10.6	LOS B	0.0	0.2	0.50	0.66	0.50	59.3
Approach		13	25.0	13	25.0	0.014	10.6	NA	0.0	0.2	0.50	0.66	0.50	59.3
West: Thomas Mitchell Drive														
1	L2	54	6.1	54	6.1	0.031	8.5	LOS A	0.0	0.0	0.00	0.60	0.00	64.3
2	T1	311	5.4	311	5.4	0.442	13.4	LOS B	0.9	6.8	0.59	1.10	0.81	53.1
Approach		366	5.5	366	5.5	0.442	12.6	LOS B	0.9	6.8	0.50	1.03	0.69	55.6
All Vehicles		899	9.4	899	9.4	0.442	6.1	NA	0.9	6.8	0.22	0.48	0.29	75.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network 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).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101-2 [2026 PM Project TMD and NEH Stage 2 (Site Folder: TM Dr and NEH)]

Network: N101 [2026 PM Project (Network Folder: General)]

Thomas Mitchell Dr and New England Hwy
MPO PM Peak
2026 With Project
Site Category: Existing Geometry
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
North: New England Hwy N														
11	T1	428	11.7	428	11.7	0.236	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.9
Approach		428	11.7	428	11.7	0.236	0.0	NA	0.0	0.0	0.00	0.00	0.00	99.9
NorthWest: Merge Movement														
32a	R1	311	5.4	311	5.4	0.241	1.1	LOS A	0.3	2.4	0.39	0.32	0.39	94.5
Approach		311	5.4	311	5.4	0.241	1.1	LOS A	0.3	2.4	0.39	0.32	0.39	94.5
All Vehicles		739	9.0	739	9.0	0.241	0.5	NA	0.3	2.4	0.16	0.14	0.16	98.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network 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).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

ROUTE TRAVEL PERFORMANCE

Route: R101 [2026 PM Project]

Network: N101 [2026 PM Project (Network Folder: General)]

New Route
Network Category: (None)

Route Travel Performance						
Performance Measure	**Vehicles**		**Per Unit Distance**		**Persons**	
Travel Speed (Average)	70.5	km/h			70.5	km/h
Travel Distance (Average)	1170.0	m			1170.0	m
Travel Time (Average)	59.7	sec	51.1	sec/km	59.7	sec
Desired Speed (Input)	60.0	km/h				
Route Delay (Average)	14.5	sec	12.4	sec/km	14.5	sec
Route Stop Rate	1.43		1.22	per km	1.43	
Route Level of Service (LOS)	LOS A					
Speed Efficiency	1.00[3]					
Travel Time Index	10.00					
Congestion Coefficient	1.00					

3 Calculated Average Travel Speed exceeds the specified Desired Speed.

Route Travel Movement Performance											
Mov ID	Turn	Trav Dist m	Trav Time sec	Aver. Speed km/h	Aver. Delay sec	Prop. Queued	Eff. Stop Rate	Aver. No. Cycles	Dem. Flow Rate veh/h	Arv. Flow Rate veh/h	Deg. of Satn
Site ID: 101-1 Site Name: 2026 PM Project TMD and NEH Stage 1											
West Approach											
2	T1	510.0	34.6	53.1	13.4	0.59	1.10	0.81	311	311	0.442
Site ID: 101-2 Site Name: 2026 PM Project TMD and NEH Stage 2											
NorthWest Approach											
32a	R1	660.0	25.1	94.5	1.1	0.39	0.32	0.39	311	311	0.241

MOVEMENT SUMMARY

Site: 101-1 [2036 AM Project TMD and NEH Stage 1 (Site Folder: TM Dr and NEH)]

Network: N101 [2036 AM Project (Network Folder: General)]

Thomas Mitchell Drive and New England Highway
MPO AM Peak
2036 With Project
Site Category: Existing Geometry
Stop (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: New England Hwy S														
4	L2	274	12.1	274	12.1	0.215	8.9	LOS A	0.4	3.1	0.18	0.60	0.18	65.0
5	T1	318	23.4	318	23.4	0.188	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.9
Approach		592	18.2	592	18.2	0.215	4.2	LOS A	0.4	3.1	0.08	0.28	0.08	79.9
North: New England Hwy N														
12	R2	61	0.0	61	0.0	0.048	9.0	LOS A	0.1	0.6	0.42	0.65	0.42	67.9
Approach		61	0.0	61	0.0	0.048	9.0	NA	0.1	0.6	0.42	0.65	0.42	67.9
West: Thomas Mitchell Drive														
1	L2	13	8.3	13	8.3	0.008	8.3	LOS A	0.0	0.0	0.00	0.60	0.00	63.7
2	T1	141	10.2	141	10.2	0.215	12.5	LOS B	0.3	2.3	0.53	1.05	0.53	54.6
Approach		154	10.1	154	10.1	0.215	12.2	LOS B	0.3	2.3	0.48	1.01	0.48	55.9
All Vehicles		808	15.3	808	15.3	0.215	6.0	NA	0.4	3.1	0.19	0.45	0.19	75.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network 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).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101-2 [2036 AM Project TMD and NEH Stage 2 (Site Folder: TM Dr and NEH)]

Network: N101 [2036 AM Project (Network Folder: General)]

Thomas Mitchell Dr and New England Hwy
MPO AM Peak
2036 With Project
Site Category: Existing Geometry
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
North: New England Hwy N														
11	T1	460	11.4	460	11.4	0.253	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.9
Approach		460	11.4	460	11.4	0.253	0.0	NA	0.0	0.0	0.00	0.00	0.00	99.9
NorthWest: Merge Movement														
32a	R1	141	10.2	141	10.2	0.116	1.2	LOS A	0.1	1.1	0.38	0.31	0.38	94.7
Approach		141	10.2	141	10.2	0.116	1.2	LOS A	0.1	1.1	0.38	0.31	0.38	94.7
All Vehicles		601	11.1	601	11.1	0.253	0.3	NA	0.1	1.1	0.09	0.07	0.09	99.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network 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).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

ROUTE TRAVEL PERFORMANCE

Route: R101 [2036 AM Project]

Network: N101 [2036 AM Project (Network Folder: General)]

New Route
Network Category: (None)

Route Travel Performance						
Performance Measure	**Vehicles**		**Per Unit Distance**		**Persons**	
Travel Speed (Average)	71.7	km/h			71.7	km/h
Travel Distance (Average)	1170.0	m			1170.0	m
Travel Time (Average)	58.7	sec	50.2	sec/km	58.7	sec
Desired Speed (Input)	60.0	km/h				
Route Delay (Average)	13.7	sec	11.7	sec/km	13.7	sec
Route Stop Rate	1.36		1.17	per km	1.36	
Route Level of Service (LOS)	LOS A					
Speed Efficiency	1.00[3]					
Travel Time Index	10.00					
Congestion Coefficient	1.00					

3 Calculated Average Travel Speed exceeds the specified Desired Speed.

Route Travel Movement Performance											
Mov ID	Turn	Trav Dist m	Trav Time sec	Aver. Speed km/h	Aver. Delay sec	Prop. Queued	Eff. Stop Rate	Aver. No. Cycles	Dem. Flow Rate veh/h	Arv. Flow Rate veh/h	Deg. of Satn
Site ID: 101-1 Site Name: 2036 AM Project TMD and NEH Stage 1											
West Approach											
2	T1	510.0	33.6	54.6	12.5	0.53	1.05	0.53	141	141	0.215
Site ID: 101-2 Site Name: 2036 AM Project TMD and NEH Stage 2											
NorthWest Approach											
32a	R1	660.0	25.1	94.7	1.2	0.38	0.31	0.38	141	141	0.116

MOVEMENT SUMMARY

Site: 101-1 [2036 PM Project TMD and NEH Stage 1 (Site Folder: TM Dr and NEH)]

Network: N101 [2036 PM Project (Network Folder: General)]

Thomas Mitchell Drive and New England Highway
MPO PM Peak
2036 With Project
Site Category: Existing Geometry
Stop (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: New England Hwy S														
4	L2	74	49.3	74	49.3	0.066	9.6	LOS A	0.1	1.1	0.08	0.60	0.08	55.3
5	T1	490	5.9	490	5.9	0.261	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.9
Approach		564	11.6	564	11.6	0.261	1.3	LOS A	0.1	1.1	0.01	0.08	0.01	90.2
North: New England Hwy N														
12	R2	14	23.1	14	23.1	0.016	10.8	LOS B	0.0	0.2	0.52	0.68	0.52	59.6
Approach		14	23.1	14	23.1	0.016	10.8	NA	0.0	0.2	0.52	0.68	0.52	59.6
West: Thomas Mitchell Drive														
1	L2	52	4.3	52	4.3	0.029	8.6	LOS A	0.0	0.0	0.00	0.60	0.00	64.9
2	T1	327	4.1	327	4.1	0.489	14.2	LOS B	1.1	7.8	0.62	1.12	0.93	51.9
Approach		379	4.1	379	4.1	0.489	13.4	LOS B	1.1	7.8	0.54	1.05	0.80	54.5
All Vehicles		958	8.8	958	8.8	0.489	6.2	NA	1.1	7.8	0.23	0.47	0.33	75.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network 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).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101-2 [2036 PM Project TMD and NEH Stage 2 (Site Folder: TM Dr and NEH)]

Network: N101 [2036 PM Project (Network Folder: General)]

Thomas Mitchell Dr and New England Hwy
MPO PM Peak
2036 With Project
Site Category: Existing Geometry
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
North: New England Hwy N														
11	T1	471	11.6	471	11.6	0.260	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.9
Approach		471	11.6	471	11.6	0.260	0.0	NA	0.0	0.0	0.00	0.00	0.00	99.9
NorthWest: Merge Movement														
32a	R1	327	4.1	327	4.1	0.261	1.3	LOS A	0.4	2.6	0.42	0.37	0.42	94.2
Approach		327	4.1	327	4.1	0.261	1.3	LOS A	0.4	2.6	0.42	0.37	0.42	94.2
All Vehicles		798	8.5	798	8.5	0.261	0.5	NA	0.4	2.6	0.17	0.15	0.17	98.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network 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).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

ROUTE TRAVEL PERFORMANCE

Route: R101 [2036 PM Project]

Network: N101 [2036 PM Project (Network Folder: General)]

New Route
Network Category: (None)

Route Travel Performance						
Performance Measure	**Vehicles**		**Per Unit Distance**		**Persons**	
Travel Speed (Average)	69.5	km/h			69.5	km/h
Travel Distance (Average)	1170.0	m			1170.0	m
Travel Time (Average)	60.6	sec	51.8	sec/km	60.6	sec
Desired Speed (Input)	60.0	km/h				
Route Delay (Average)	15.5	sec	13.2	sec/km	15.5	sec
Route Stop Rate	1.48		1.27	per km	1.48	
Route Level of Service (LOS)	LOS A					
Speed Efficiency	1.00[3]					
Travel Time Index	10.00					
Congestion Coefficient	1.00					

3 Calculated Average Travel Speed exceeds the specified Desired Speed.

Route Travel Movement Performance											
Mov ID	Turn	Trav Dist m	Trav Time sec	Aver. Speed km/h	Aver. Delay sec	Prop. Queued	Eff. Stop Rate	Aver. No. Cycles	Dem. Flow Rate veh/h	Arv. Flow Rate veh/h	Deg. of Satn
Site ID: 101-1 Site Name: 2036 PM Project TMD and NEH Stage 1											
West Approach											
2	T1	510.0	35.4	51.9	14.2	0.62	1.12	0.93	327	327	0.489
Site ID: 101-2 Site Name: 2036 PM Project TMD and NEH Stage 2											
NorthWest Approach											
32a	R1	660.0	25.2	94.2	1.3	0.42	0.37	0.42	327	327	0.261

MOVEMENT SUMMARY

Site: 101 [Ex AM Wybong and Bengalla (Site Folder: Wybong and Bengalla)]

Wybong Road and Bengalla Road
MPO AM Peak
6:15am to 7:15am
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Bengalla Road														
5	T1	28	2	29	7.1	0.016	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
6	R2	80	5	84	6.3	0.065	7.9	LOS A	0.3	2.0	0.18	0.62	0.18	71.3
Approach		108	7	114	6.5	0.065	5.8	NA	0.3	2.0	0.14	0.46	0.14	77.1
North: Wybong Road North														
7	L2	36	0	38	0.0	0.051	8.0	LOS A	0.2	1.4	0.16	0.62	0.16	73.6
9	R2	16	2	17	12.5	0.051	9.4	LOS A	0.2	1.4	0.16	0.62	0.16	69.0
Approach		52	2	55	3.8	0.051	8.4	LOS A	0.2	1.4	0.16	0.62	0.16	72.1
West: Wybong Road West														
10	L2	20	0	21	0.0	0.011	7.8	LOS A	0.0	0.0	0.00	0.66	0.00	75.3
11	T1	55	1	58	1.8	0.030	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
Approach		75	1	79	1.3	0.030	2.1	NA	0.0	0.0	0.00	0.18	0.00	91.9
All Vehicles		235	10	247	4.3	0.065	5.2	NA	0.3	2.0	0.10	0.41	0.10	80.0

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.

MOVEMENT SUMMARY

Site: 101 [Ex PM Wybong and Bengalla (Site Folder: Wybong and Bengalla)]

Wybong Road and Bengalla Road
MPO PM Peak
4:00pm to 5:00pm
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Bengalla Road														
5	T1	47	1	49	2.1	0.026	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
6	R2	8	1	8	12.5	0.007	8.0	LOS A	0.0	0.2	0.18	0.61	0.18	69.1
Approach		55	2	58	3.6	0.026	1.2	NA	0.0	0.2	0.03	0.09	0.03	93.9
North: Wybong Road North														
7	L2	69	7	73	10.1	0.082	8.3	LOS A	0.3	2.3	0.15	0.62	0.15	70.1
9	R2	19	0	20	0.0	0.082	8.5	LOS A	0.3	2.3	0.15	0.62	0.15	73.5
Approach		88	7	93	8.0	0.082	8.4	LOS A	0.3	2.3	0.15	0.62	0.15	70.8
West: Wybong Road West														
10	L2	26	0	27	0.0	0.015	7.8	LOS A	0.0	0.0	0.00	0.66	0.00	75.3
11	T1	50	3	53	6.0	0.028	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
Approach		76	3	80	3.9	0.028	2.7	NA	0.0	0.0	0.00	0.22	0.00	89.9
All Vehicles		219	12	231	5.5	0.082	4.6	NA	0.3	2.3	0.07	0.35	0.07	81.9

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.

MOVEMENT SUMMARY

Site: 101 [2026 AM Base Wybong and Bengalla (Site Folder: Wybong and Bengalla)]

Wybong Road and Bengalla Road
MPO AM Peak
2026 No Project
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Bengalla Road														
5	T1	30	2	32	6.7	0.017	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
6	R2	89	5	94	5.6	0.072	7.9	LOS A	0.3	2.2	0.19	0.62	0.19	71.5
Approach		119	7	125	5.9	0.072	5.9	NA	0.3	2.2	0.14	0.47	0.14	77.1
North: Wybong Road North														
7	L2	48	0	51	0.0	0.063	8.1	LOS A	0.2	1.7	0.16	0.62	0.16	73.6
9	R2	17	2	18	11.8	0.063	9.5	LOS A	0.2	1.7	0.16	0.62	0.16	69.2
Approach		65	2	68	3.1	0.063	8.4	LOS A	0.2	1.7	0.16	0.62	0.16	72.4
West: Wybong Road West														
10	L2	21	0	22	0.0	0.012	7.8	LOS A	0.0	0.0	0.00	0.66	0.00	75.3
11	T1	58	1	61	1.7	0.032	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
Approach		79	1	83	1.3	0.032	2.1	NA	0.0	0.0	0.00	0.17	0.00	91.9
All Vehicles		263	10	277	3.8	0.072	5.4	NA	0.3	2.2	0.10	0.42	0.10	79.7

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.

MOVEMENT SUMMARY

Site: 101 [2026 PM Base Wybong and Bengalla (Site Folder: Wybong and Bengalla)]

Wybong Road and Bengalla Road
MPO PM Peak
2026 No Project
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Bengalla Road														
5	T1	50	1	53	2.0	0.027	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
6	R2	18	1	19	5.6	0.015	7.9	LOS A	0.1	0.4	0.18	0.62	0.18	71.6
Approach		68	2	72	2.9	0.027	2.1	NA	0.1	0.4	0.05	0.16	0.05	90.5
North: Wybong Road North														
7	L2	77	7	81	9.1	0.090	8.3	LOS A	0.3	2.6	0.16	0.62	0.16	70.4
9	R2	20	0	21	0.0	0.090	8.6	LOS A	0.3	2.6	0.16	0.62	0.16	73.5
Approach		97	7	102	7.2	0.090	8.4	LOS A	0.3	2.6	0.16	0.62	0.16	71.0
West: Wybong Road West														
10	L2	28	0	29	0.0	0.016	7.8	LOS A	0.0	0.0	0.00	0.66	0.00	75.3
11	T1	53	3	56	5.7	0.030	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
Approach		81	3	85	3.7	0.030	2.7	NA	0.0	0.0	0.00	0.23	0.00	89.8
All Vehicles		246	12	259	4.9	0.090	4.8	NA	0.3	2.6	0.08	0.37	0.08	81.4

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.

MOVEMENT SUMMARY

Site: 101 [2036 AM Base Wybong and Bengalla (Site Folder: Wybong and Bengalla)]

Wybong Road and Bengalla Road
MPO AM Peak
2036 No Project
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Bengalla Road														
5	T1	32	2	34	6.3	0.018	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
6	R2	34	0	36	0.0	0.027	7.7	LOS A	0.1	0.7	0.18	0.62	0.18	74.4
Approach		66	2	69	3.0	0.027	4.0	NA	0.1	0.7	0.09	0.32	0.09	84.9
North: Wybong Road North														
7	L2	34	0	36	0.0	0.048	8.1	LOS A	0.2	1.3	0.18	0.62	0.18	73.5
9	R2	16	2	17	12.5	0.048	9.0	LOS A	0.2	1.3	0.18	0.62	0.18	68.9
Approach		50	2	53	4.0	0.048	8.4	LOS A	0.2	1.3	0.18	0.62	0.18	72.0
West: Wybong Road West														
10	L2	18	0	19	0.0	0.010	7.8	LOS A	0.0	0.0	0.00	0.66	0.00	75.3
11	T1	64	1	67	1.6	0.035	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
Approach		82	1	86	1.2	0.035	1.7	NA	0.0	0.0	0.00	0.14	0.00	93.2
All Vehicles		198	5	208	2.5	0.048	4.2	NA	0.2	1.3	0.08	0.32	0.08	84.2

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.

MOVEMENT SUMMARY

Site: 101 [2036 PM Base Wybong and Bengalla (Site Folder: Wybong and Bengalla)]

Wybong Road and Bengalla Road
MPO PM Peak
2036 No Project
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Bengalla Road														
5	T1	55	1	58	1.8	0.030	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
6	R2	13	0	14	0.0	0.010	7.7	LOS A	0.0	0.3	0.19	0.61	0.19	74.3
Approach		68	1	72	1.5	0.030	1.5	NA	0.0	0.3	0.04	0.12	0.04	93.8
North: Wybong Road North														
7	L2	35	2	37	5.7	0.051	8.2	LOS A	0.2	1.4	0.17	0.62	0.17	71.5
9	R2	18	0	19	0.0	0.051	8.6	LOS A	0.2	1.4	0.17	0.62	0.17	73.4
Approach		53	2	56	3.8	0.051	8.4	LOS A	0.2	1.4	0.17	0.62	0.17	72.1
West: Wybong Road West														
10	L2	30	0	32	0.0	0.017	7.8	LOS A	0.0	0.0	0.00	0.66	0.00	75.3
11	T1	59	4	62	6.8	0.033	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
Approach		89	4	94	4.5	0.033	2.6	NA	0.0	0.0	0.00	0.22	0.00	90.0
All Vehicles		210	7	221	3.3	0.051	3.7	NA	0.2	1.4	0.06	0.29	0.06	85.7

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.

MOVEMENT SUMMARY

Site: 101 [2026 AM Project Wybong and Bengalla (Site Folder: Wybong and Bengalla)]

Wybong Road and Bengalla Road
MPO AM Peak
2026 With Project
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Bengalla Road														
5	T1	30	2	32	6.7	0.017	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
6	R2	179	32	188	17.9	0.156	8.3	LOS A	0.7	5.5	0.21	0.63	0.21	67.1
Approach		209	34	220	16.3	0.156	7.1	NA	0.7	5.5	0.18	0.54	0.18	70.4
North: Wybong Road North														
7	L2	63	12	66	19.0	0.084	8.6	LOS A	0.3	2.6	0.16	0.63	0.16	67.0
9	R2	17	2	18	11.8	0.084	10.6	LOS A	0.3	2.6	0.16	0.63	0.16	69.0
Approach		80	14	84	17.5	0.084	9.0	LOS A	0.3	2.6	0.16	0.63	0.16	67.4
West: Wybong Road West														
10	L2	24	0	25	0.0	0.014	7.8	LOS A	0.0	0.0	0.00	0.66	0.00	75.3
11	T1	58	1	61	1.7	0.032	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
Approach		82	1	86	1.2	0.032	2.3	NA	0.0	0.0	0.00	0.19	0.00	91.2
All Vehicles		371	49	391	13.2	0.156	6.5	NA	0.7	5.5	0.14	0.48	0.14	73.4

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.

MOVEMENT SUMMARY

Site: 101 [2026 PM Project Wybong and Bengalla (Site Folder: Wybong and Bengalla)]

Wybong Road and Bengalla Road
MPO PM Peak
2026 With Project
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Bengalla Road														
5	T1	50	1	53	2.0	0.028	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
6	R2	33	12	35	36.4	0.031	8.8	LOS A	0.1	1.1	0.20	0.63	0.20	61.6
Approach		83	13	87	15.7	0.031	3.5	NA	0.1	1.1	0.08	0.25	0.08	80.1
North: Wybong Road North														
7	L2	154	11	162	7.1	0.161	8.3	LOS A	0.7	4.8	0.16	0.62	0.16	71.0
9	R2	24	0	25	0.0	0.161	8.9	LOS A	0.7	4.8	0.16	0.62	0.16	73.4
Approach		178	11	187	6.2	0.161	8.4	LOS A	0.7	4.8	0.16	0.62	0.16	71.3
West: Wybong Road West														
10	L2	28	0	29	0.0	0.016	7.8	LOS A	0.0	0.0	0.00	0.66	0.00	75.3
11	T1	53	3	56	5.7	0.030	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
Approach		81	3	85	3.7	0.030	2.7	NA	0.0	0.0	0.00	0.23	0.00	89.8
All Vehicles		342	27	360	7.9	0.161	5.8	NA	0.7	4.8	0.10	0.44	0.10	77.1

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.

MOVEMENT SUMMARY

Site: 101 [2036 AM Project Wybong and Bengalla (Site Folder: Wybong and Bengalla)]

Wybong Road and Bengalla Road
MPO AM Peak
2036 With Project
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Bengalla Road														
5	T1	32	2	34	6.3	0.018	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
6	R2	220	12	232	5.5	0.182	8.0	LOS A	0.8	6.0	0.23	0.63	0.23	71.4
Approach		252	14	265	5.6	0.182	7.0	NA	0.8	6.0	0.20	0.55	0.20	74.1
North: Wybong Road North														
7	L2	54	0	57	0.0	0.075	8.1	LOS A	0.3	2.0	0.17	0.63	0.17	73.1
9	R2	18	2	19	11.1	0.075	11.1	LOS A	0.3	2.0	0.17	0.63	0.17	69.0
Approach		72	2	76	2.8	0.075	8.8	LOS A	0.3	2.0	0.17	0.63	0.17	72.1
West: Wybong Road West														
10	L2	30	0	32	0.0	0.017	7.8	LOS A	0.0	0.0	0.00	0.66	0.00	75.3
11	T1	64	1	67	1.6	0.035	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
Approach		94	1	99	1.1	0.035	2.5	NA	0.0	0.0	0.00	0.21	0.00	90.5
All Vehicles		418	17	440	4.1	0.182	6.3	NA	0.8	6.0	0.15	0.49	0.15	76.8

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.

MOVEMENT SUMMARY

Site: 101 [2036 PM Project Wybong and Bengalla (Site Folder: Wybong and Bengalla)]

Wybong Road and Bengalla Road
MPO PM Peak
2036 With Project
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Bengalla Road														
5	T1	55	1	58	1.8	0.030	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
6	R2	29	3	31	10.3	0.025	8.1	LOS A	0.1	0.7	0.20	0.62	0.20	69.8
Approach		84	4	88	4.8	0.030	2.8	NA	0.1	0.7	0.07	0.21	0.07	87.0
North: Wybong Road North														
7	L2	240	10	253	4.2	0.243	8.3	LOS A	1.1	7.7	0.18	0.62	0.18	71.9
9	R2	32	0	34	0.0	0.243	9.1	LOS A	1.1	7.7	0.18	0.62	0.18	73.3
Approach		272	10	286	3.7	0.243	8.4	LOS A	1.1	7.7	0.18	0.62	0.18	72.1
West: Wybong Road West														
10	L2	31	0	33	0.0	0.018	7.8	LOS A	0.0	0.0	0.00	0.66	0.00	75.3
11	T1	59	4	62	6.8	0.033	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
Approach		90	4	95	4.4	0.033	2.7	NA	0.0	0.0	0.00	0.23	0.00	89.8
All Vehicles		446	18	469	4.0	0.243	6.2	NA	1.1	7.7	0.13	0.47	0.13	77.7

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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