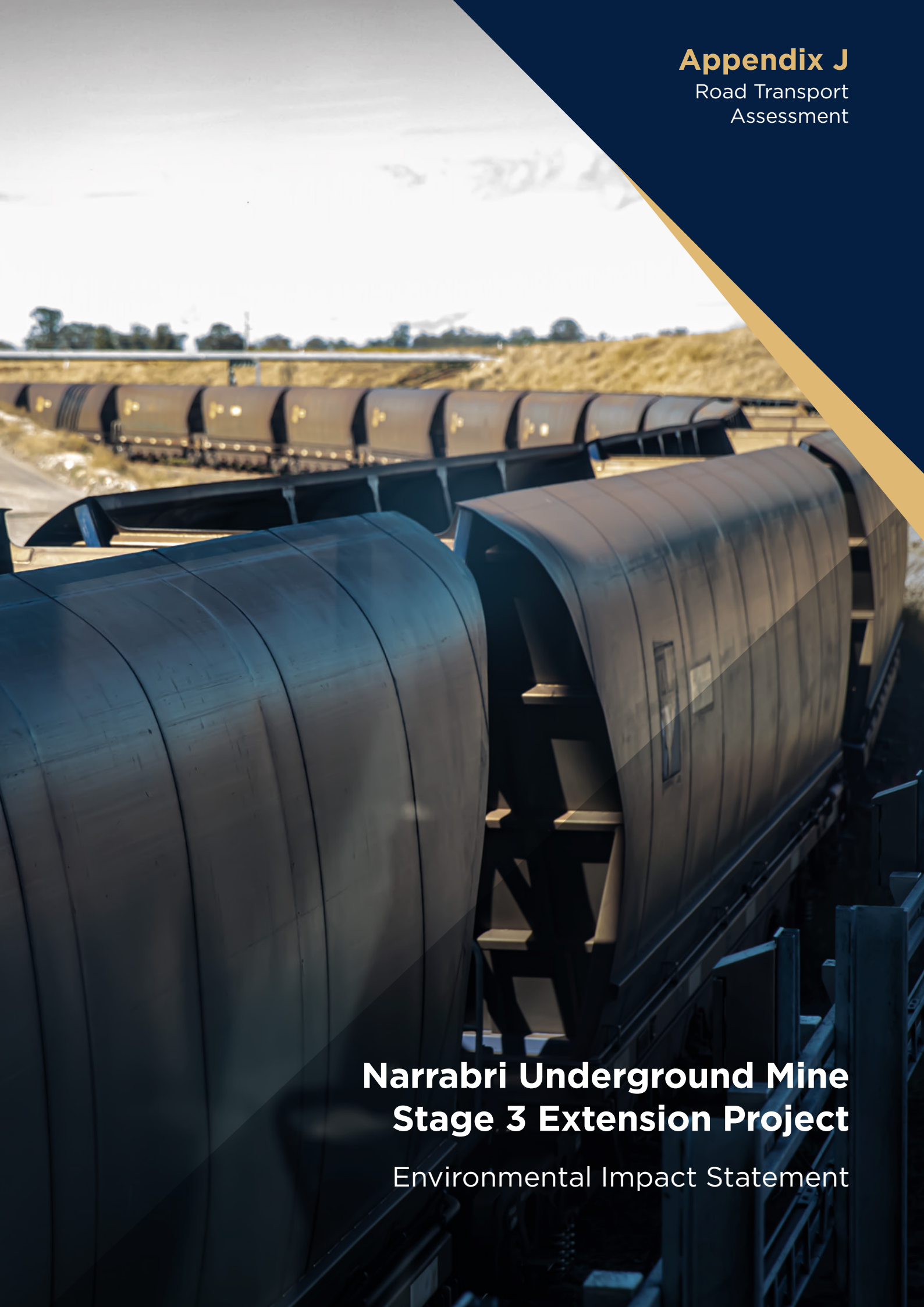

Appendix J
Road Transport Assessment

Narrabri Underground Mine Stage 3 Extension Project

Environmental Impact Statement

Narrabri Underground Mine Stage 3 Extension Project

Road Transport Assessment

Prepared for:

Narrabri Coal Operations Pty Ltd

24 August 2020

The Transport Planning Partnership

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Narrabri Underground Mine Stage 3 Extension Project

Road Transport Assessment

Client: Narrabri Coal Operations Pty Ltd

Version: Final

Date: 24 August 2020

TTPP Reference: 17380

Quality Record

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Appendices

A. TRAFFIC SURVEYS
B. RAILWAY LEVEL CROSSINGS
C. SIDRA INTERSECTION OUTPUT SUMMARIES

1 Introduction

The Narrabri Mine is located approximately 25 kilometres (km) south-east of Narrabri and approximately 60 km north-west of Gunnedah in the Gunnedah Basin within the Narrabri Shire Council Local Government Area of New South Wales (NSW) (Figure 1.1). The Narrabri Mine is operated by Narrabri Coal Operations Pty Limited (NCOPL).

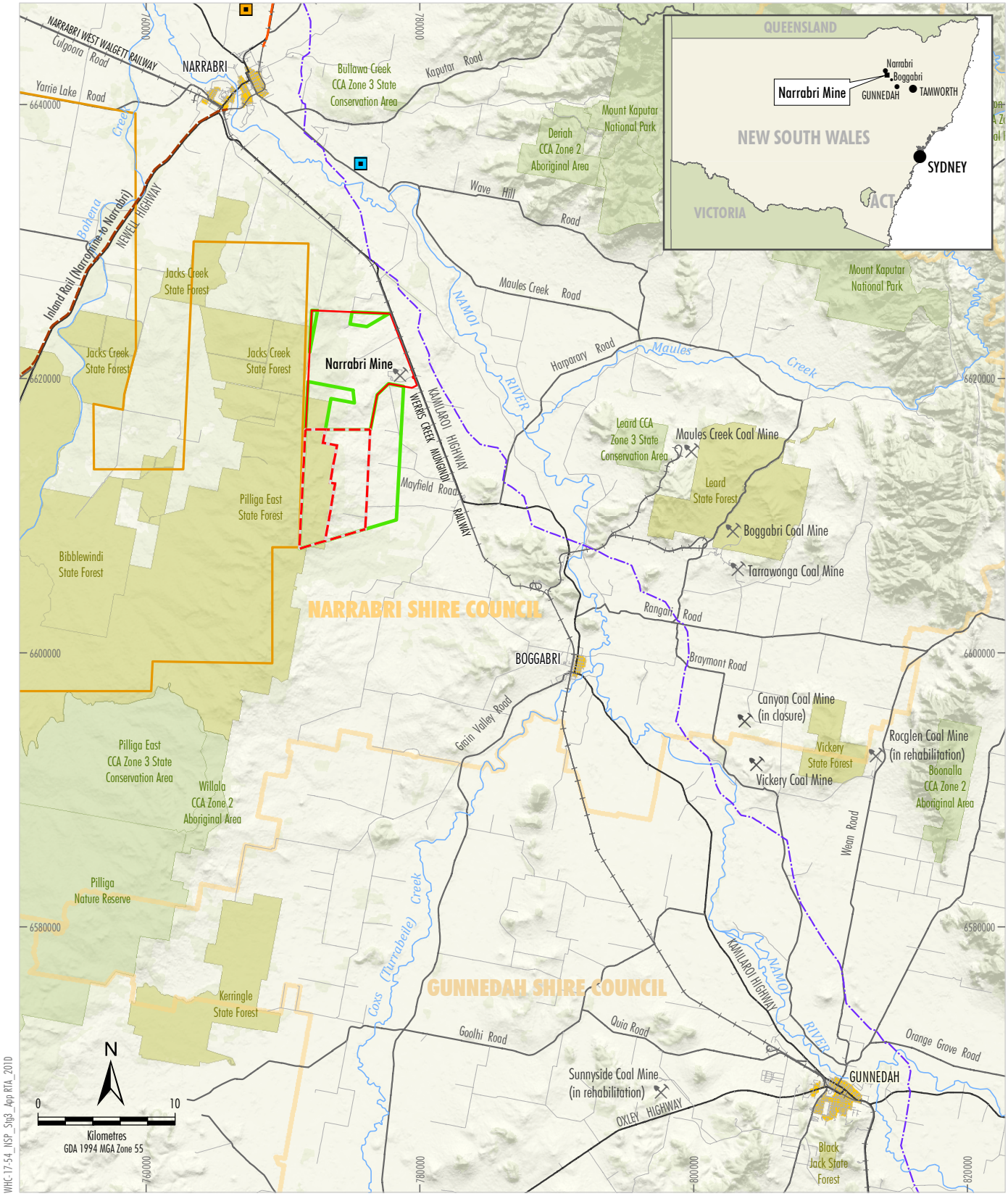
NCOPL is seeking a new Development Consent under the State Significant Development provisions of Part 4 of the NSW *Environmental Planning and Assessment Act, 1979* (EP&A Act) for the Narrabri Underground Mine Stage 3 Extension Project (the Project). This Road Transport Assessment forms part of the Environmental Impact Statement (EIS) which has been prepared to accompany the Development Application for the Project. The Secretary's Environmental Assessment Requirements (SEARs) states the following requirement in regard to the road transport assessment:

- ***Transport*** *– including an assessment of the likely transport impacts of the development on the capacity, condition, safety and efficiency of the local and State road network and the rail network;*

This report has also considered the general requirements of the SEARs:

- *a description of the existing environment likely to be affected by the development, using sufficient baseline data;*
- *an assessment of the likely impacts of all stages of the development, including appropriate worst-case scenarios and consideration of any cumulative impacts and taking into consideration any relevant legislation, environmental planning instruments, guidelines, policies, plans and industry codes of practice; [and]*
- *a description of the measures that would be implemented to mitigate and/or offset the likely impacts of the development […]*

In addition, the SEARs refer to guidelines which are relevant to the assessment, including the Transport for New South Wales (TfNSW) (formerly Roads and Maritime Services [RMS] and Roads and Traffic Authority [RTA]) *Guide to Traffic Generating Developments* (RTA, 2002) and TfNSW's *Road Design Guide* (RMS, N.D.) and relevant Austroads Standards. It is noted that TfNSW and other road agencies across Australasia have adopted the Austroads guides to provide a level of consistency and harmonisation across all jurisdictions. The Austroads guides and the Australian Standards which are referenced in them, are therefore the primary technical references for use within TfNSW, 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. The Transport Planning Partnership has also prepared this Road Transport Assessment to address relevant input to the SEARs from TfNSW and Narrabri Shire Council.



LEGEND

- Mine Site
- Exploration Licence (EL 6243)
- Mining Lease (ML 1609)
- Provisional Mining Lease Application Area
- Local Government Boundary
- State Forest
- State Conservation Area, Aboriginal Area

Other Major Projects

- Narrabri South Solar Farm
- Proposed Silverleaf Solar Farm
- Narrabri Gas Project (Santos NSW [Eastern] Pty Ltd)
- Inland Rail (Narrabri to North Star - Phase 1)
- Proposed Inland Rail (Narromine to Narrabri)
- Queensland Hunter Gas Pipeline

Source: Geoscience Australia (2011); NSW Spatial Services (2019)

WHITEHAVEN COAL

NARRABRI STAGE 3 PROJECT

Regional Location

Figure 1.1

2 The Narrabri Mine

2.1 Approved Operations

Project Approval 08_0144 allows for the production and processing of up to 11 million tonnes per annum (Mtpa) of run-of-mine (ROM) coal until July 2031.

The existing workforce at the Narrabri Mine of up to approximately 520 people generally travel to and from the Narrabri Mine in the following directions:

- North of the Narrabri Mine – 60%; and
- South of the Narrabri Mine – 40%.

Work is undertaken 24 hours per day and seven days per week, with shift times as presented in Table 2.1.

Table 2.1: Workforce Shifts

Shift	Start Time	End Time
Underground Day	6:30 am	4:00 pm
Underground Afternoon	2:30 pm	12:00 am
Underground Night (NCOPL Staff)	10:30 pm	8:00 am
Underground Night (Contractors)	6:30 pm	6:30 am
Drillers (7 days)	6:00 am	6:00 pm
Weekend	6:30 am	6:30 pm

The workforce drives to and from the Narrabri Mine using private or contractors' vehicles. There is no formal car pooling program in place. The Narrabri Mine receives approximately 20 heavy vehicle deliveries per day, and five light vehicle deliveries per day.

Product coal is transported by train from the Narrabri Mine, using the Narrabri Mine Balloon Loop to and from the Werris Creek Mungindi Railway. The Narrabri Mine generates an average of four trains per day and a peak of eight trains per day.

2.2 Proposed Stage 3 Extension Project

The Project involves an extension to the south of the approved underground mining area to gain access to additional coal reserves within Mining Lease Applications (MLA) 1 and 2 (Figure 2.1), an extension of the mine life to 2044, and development of supporting surface infrastructure. ROM coal production would occur at a rate of up to 11 Mtpa, consistent with the currently approved limit. A detailed description of the Project is provided in Section 2 in the Main Report of the EIS.

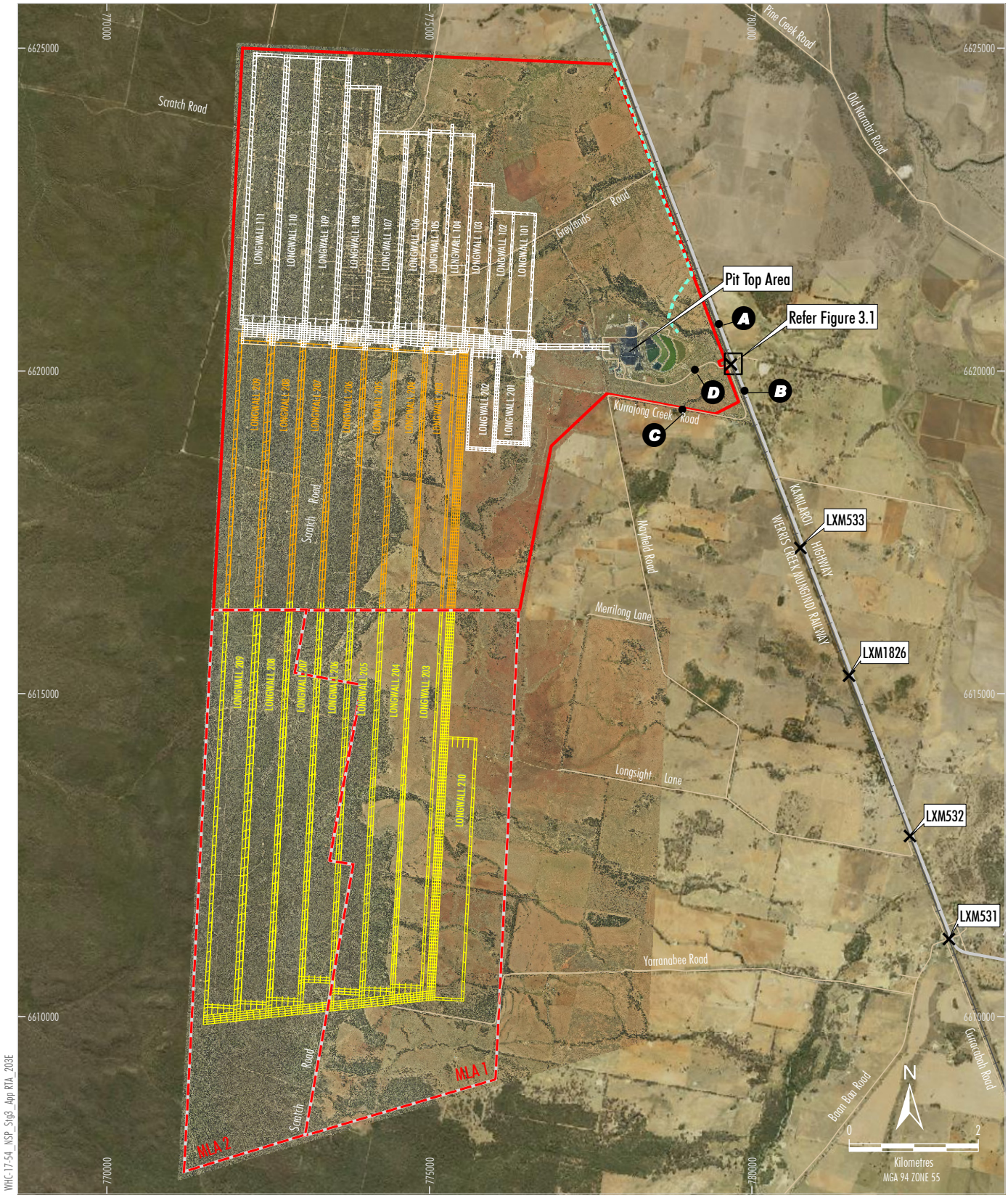
With regard to potential impacts on the road transport aspects of the Narrabri Mine, the Project proposes:

- an extension in mine life from 2031 to 2044;
- no change to the maximum ROM coal production rate;
- no change to the average or peak number of trains transporting product coal per day;
- no change to the operational workforce;
- an approximate increase of 20 people for short-term construction activities, noting that multiple short periods of construction activity would occur throughout the Project life as infrastructure development occurs; and
- co-disposal of exploration waste at the Narrabri Mine of up to approximately 15,000 cubic metres (m^3) over the life of the Project.

To assess the potential road transport impacts of the Project, two future maximum case scenarios have been adopted for review:

- short term (2025) including maximum ROM coal production and the additional construction workers present; and
- longer term (2032) during the period in which the mine life is proposed to be extended, with the additional construction workers present.

It is anticipated that construction activity associated with the Project infrastructure development would occur for short periods throughout the life of the Project (Section 4.1), however construction activities have been conservatively assumed to occur in both scenarios. Other unrelated changes to the road network have also been considered in these scenarios so that cumulative impacts can be considered (Section 3.6).



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LEGEND

- Mining Lease (ML 1609)
- Provisional Mining Lease Application Area
- Existing Water Supply Pipeline (Buried)
- Approved Underground Mining Layout
- Indicative Underground Mining Layout to be Extended for Project
- Indicative Underground Project Mining Layout
- Rail Crossing
- Traffic Count Location

Source: NCOPL (2019); NSW Spatial Services (2019); TTPP (2020)

WHITEHAVEN COAL

NARRABRI STAGE 3 PROJECT

Approved and Project General Arrangement and Survey Locations

Figure 2.1

3 Road Transport Environment

3.1 Existing Road Network

The existing road network serving the Project is presented on Figure 2.1 and described below.

The Kamilaroi Highway (Route B51) is a State Road which provides a link between New England Highway at Willow Tree and Bourke. In the region of the Narrabri Mine, the Kamilaroi Highway passes through regional centres such as Gunnedah, Boggabri and Narrabri, and is paralleled by the Werris Creek Mungindi Railway along much of the route between Breeza and Narrabri. In the vicinity of the Narrabri Mine, the Kamilaroi Highway has a sealed surface with a single travel lane in each direction, sealed shoulders and a posted speed limit of 100 kilometres per hour (km/h). Centre line marking on the Kamilaroi Highway comprises single broken dividing lines, double one-way barrier lines, and lengths double two-way barrier lines in proximity to the intersection with Kurrajong Creek Road.

The intersection of the Kamilaroi Highway with Kurrajong Creek Road has a fourth leg on the eastern side of the Kamilaroi Highway, which provides gated access to a gravel quarry. That road is signposted with a speed limit of 40 km/h, and a channelised right turn lane is provided in the Kamilaroi Highway for vehicles turning right into that access road.

Kurrajong Creek Road is a local road which extends between the Kamilaroi Highway and Mayfield Road. Kurrajong Creek Road extends approximately 80 metres (m) westward from the Kamilaroi Highway, then turns through 90 degrees on the western side of the Werris Creek Mungindi Railway and runs parallel to the railway for approximately 800 m, then curves to an approximately east-west alignment for approximately 2.1 km to Mayfield Road. Kurrajong Creek Road is a sealed two-way road with no centre line marking, a posted speed limit of 80 km/h, and crosses the single track Werris Creek Mungindi Railway at a level crossing. The crossing is actively controlled, with flashing lights and boom barriers.

Together with other local roads including Merrilong Lane and Longsight Lane, Kurrajong Creek Road provides vehicular access for the local rural properties on the western side of the Werris Creek Mungindi Railway.

Mayfield Road intersects with the Kamilaroi Highway approximately 8 km south of the intersection of the Kamilaroi Highway with Kurrajong Creek Road. Mayfield Road is a sealed two-way road with no centre line marking between Kurrajong Creek Road and its intersection with Merrilong Lane, and remains unsealed for approximately 6.5 km between that intersection and the Kamilaroi Highway. Mayfield Road crosses a number of floodways, at which advisory speeds of 40 km/h are signposted.

The condition of the unsealed portion varies, and the poorer lengths have significant rutting and corrugations which restrict vehicle speeds. Mayfield Road crosses the Werris Creek Mungindi Railway at a level crossing which is passively controlled with "STOP" sign controls. Mayfield Road is signposted as being used by school buses.

Mine Access Road is a sealed two-way road which extends westward from the 90 degree bend in Kurrajong Creek which lies to the west of the Werris Creek Mungindi Railway. It provides all vehicular access to and from the Narrabri Mine and is approximately 7 m wide, widening on bends. It is marked with double two-way barrier lines along its length, which prevents U-turns and overtaking manoeuvres in both directions. It has a posted speed limit of 60 km/h, reducing to 40 km/h as it approaches the Narrabri Mine infrastructure area and car park.

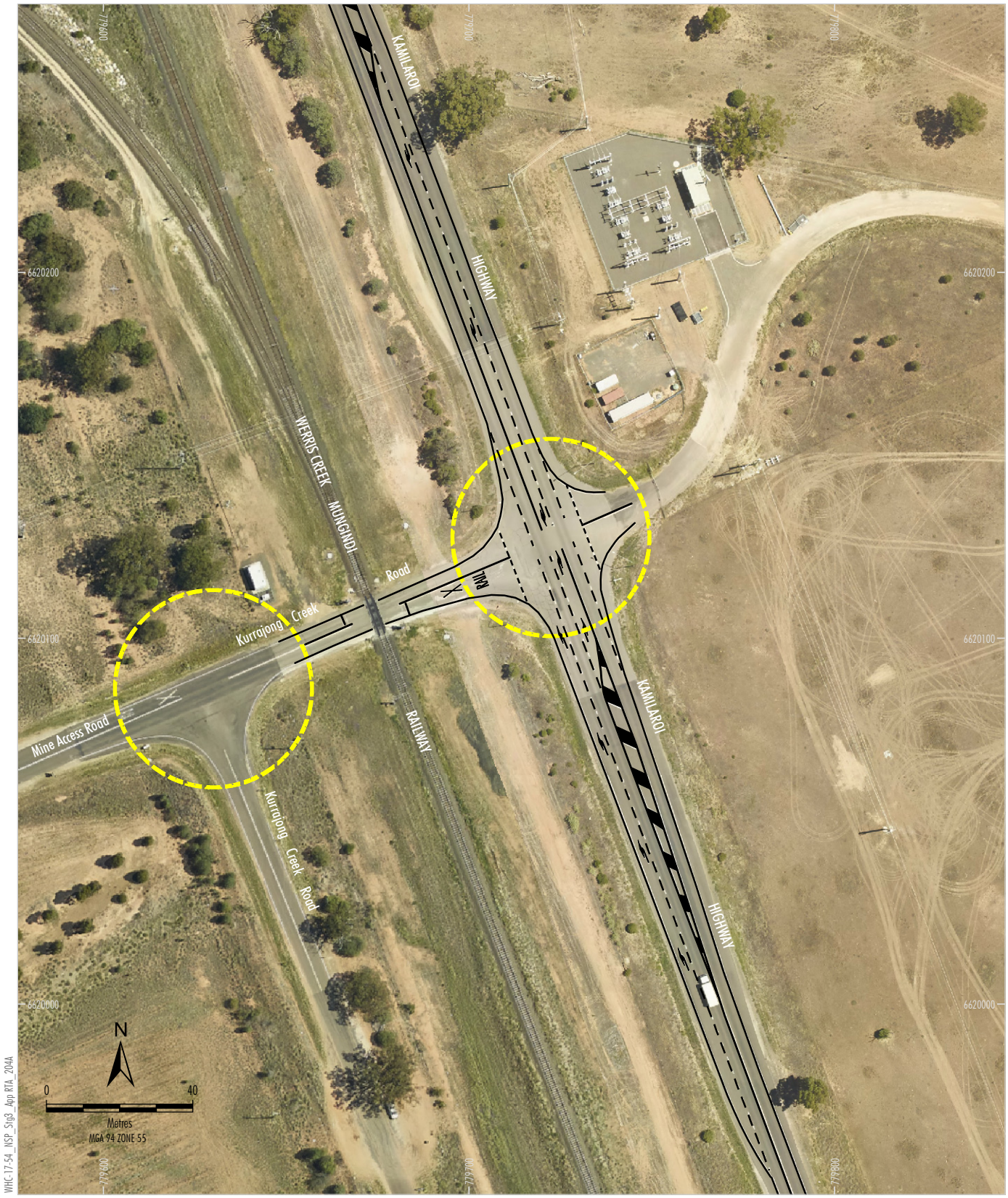
3.2 Existing Intersection Conditions

At its intersection with Kurrajong Creek Road, the Kamilaroi Highway is widened with channelised left and right turn lanes for vehicles turning into Kurrajong Creek Road, and sealed shoulders on both sides of the Kamilaroi Highway (Figure 3.1). Overhead street lighting is provided at the intersection.

The right turn bay in the Kamilaroi Highway for entry to Kurrajong Creek Road is developed over a distance of approximately 200 m on the northern approach to the intersection, and includes a deceleration and storage lane length of approximately 125 m, and a taper zone of approximately 20 m. The available length is constrained by the culvert crossing of a creek to the north. The left turn deceleration lane on the southern approach of the intersection is approximately 150 m long, with a taper zone of approximately 25 m.

The desirable minimum Safe Intersection Sight Distance required for northbound and southbound drivers on the Kamilaroi Highway to observe a vehicle on Kurrajong Creek Road and moving into a potential collision situation is 248 m assuming a level pavement. This allows for a three second observation time for an approaching driver to observe a problem ahead, plus the Stopping Sight Distance which is the distance required to enable a normally alert driver, travelling at the design speed on wet pavement, to perceive, react and brake to a stop before reaching a hazard on the road ahead.

The Minimum Gap Sight Distance is based on distances corresponding to the critical acceptance gap that drivers are prepared to accept when entering or crossing the traffic stream, and is measured from the potential point of conflict between an approaching vehicle and a vehicle entering the traffic stream, along the centre of the travel lane of the approaching vehicle. It is measured from the eye height of the approaching driver (car 1.1 m, truck 2.4 m) to an object 0.65 m high, representing the height of a vehicle indicator light.



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LEGEND

Intersection Survey Location

Source: Orthophotos - Whitehaven Coal (2017); NSW Trade & Investment (2017); NCOPL (2018)

WHITEHAVEN COAL

NARRABRI STAGE 3 PROJECT

Mine Site Intersection

Figure 3.1

For turning movements at the Kurrajong Creek Road intersection, the minimum gap sight distances required by Austroads (2017) are:

- 139 m towards the south for the left turn from Kurrajong Creek Road to the Kamilaroi Highway;
- 222 m towards the north and south for the right turn from Kurrajong Creek Road to the Kamilaroi Highway; and
- 139 m towards the south for the right turn from the Kamilaroi Highway to Kurrajong Creek Road.

The available sight distances significantly exceed these minimum requirements, noting that the line of sight allows northbound and southbound drivers on the Kamilaroi Highway to observe a vehicle stopped in Kurrajong Road or moving into a potential conflict position from a distance of over 700 m from the intersection. A driver stopped in Kurrajong Creek Road can observe a northbound vehicle over 700 m from the intersection and a southbound vehicle over 800 m from the intersection. A driver stopped in the Kamilaroi Highway to turn right into Kurrajong Creek Road can also observe northbound vehicles on the Kamilaroi Highway some 700 m from the intersection.

It is noted that a roadside sign on the western side of the Kamilaroi Highway south of the intersection can partially obscure the line of sight from a driver waiting in Kurrajong Creek Road to a northbound vehicle, however this occurs over a limited distance, and once the northbound vehicle is no longer obscured by the sign, the sight distance still exceeds 500 m.

The observations made at the intersection therefore indicate that sight distances for drivers approaching the intersection on both the Kamilaroi Highway and Kurrajong Creek Road exceed the minimum requirements for intersection sight distances as set out in Austroads (2017).

3.3 Existing Traffic Volumes

3.3.1 Traffic Survey Program

To quantify existing traffic conditions on roads serving the Project, a program of traffic surveys was conducted during June 2019. The timing of the surveys was discussed with NCOPL to avoid atypical activity at the Narrabri Mine (e.g. shutdowns). The survey program included automatic tube counters for one week between 17 June to 23 June 2019 inclusive on (Figure 2.1):

- the Kamilaroi Highway north of Kurrajong Creek Road;
- the Kamilaroi Highway south of Kurrajong Creek Road;
- Kurrajong Creek Road; and
- Mine Access Road;

Intersection turning movement surveys were also conducted over a 14-hour period on Tuesday 25 June 2019 at the intersections of (Figure 2.1):

- the Kamilaroi Highway and Kurrajong Creek Road; and
- Kurrajong Creek Road and Mine Access Road.

The intersection turning movement surveys also included recording of times during which the level crossing was occupied by a train.

Results of the traffic survey program are presented in Appendix A.

3.3.2 Midblock Survey Results

Table 3.1 presents a summary of the surveyed daily traffic volumes from the automatic tube counters as described in Section 3.3.1.

Table 3.1: Surveyed Daily Traffic Volumes June 2019 (vehicles per day)

Site[A]	Road	Mon	Tue	Wed	Thu	Fri	Sat	Sun
A	Kamilaroi Highway North of Kurrajong Creek Road	2,332	2,528	2,581	2,479	2,579	1,835	1,945
B	Kamilaroi Highway South of Kurrajong Creek Road	2,448	2,423	2,557	2,583	2,641	1,818	1,884
C	Kurrajong Creek Road East of Mayfield Road	22	33	25	27	32	20	13
D	Mine Access Road West of Kurrajong Creek Road	788	932	914	915	739	400	355

[A] *Refer to Figure 2.1.*

The results demonstrate that the weekday volumes are distinctly different from those on weekend days. As weekday traffic volumes are higher, the following assessment considers the average weekday (rather than average daily) traffic conditions.

The surveys included classification of the vehicles based on the Austroads Vehicle Classification System. Light vehicles include motorcycles, cars, vans, four-wheel drives, 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 daily classified traffic volumes are summarised in Table 3.2.

Table 3.2: Surveyed Average Weekday Daily Traffic Classification 2019 (vehicles per day)

Site[A]	Road	Light	Heavy	Total	Per Cent Heavy
A	Kamilaroi Highway North of Kurrajong Creek Road	2,012	483	2,496	19.4
B	Kamilaroi Highway South of Kurrajong Creek Road	2,097	431	2,528	17.0
C	Kurrajong Creek Road East of Mayfield Road	24	3	27	11.1
D	Mine Access Road West of Kurrajong Creek Road	782	73	855	8.5

[A] *Refer to Figure 2.1.*
Note: excludes a small number of vehicles which were unclassified by the counters.

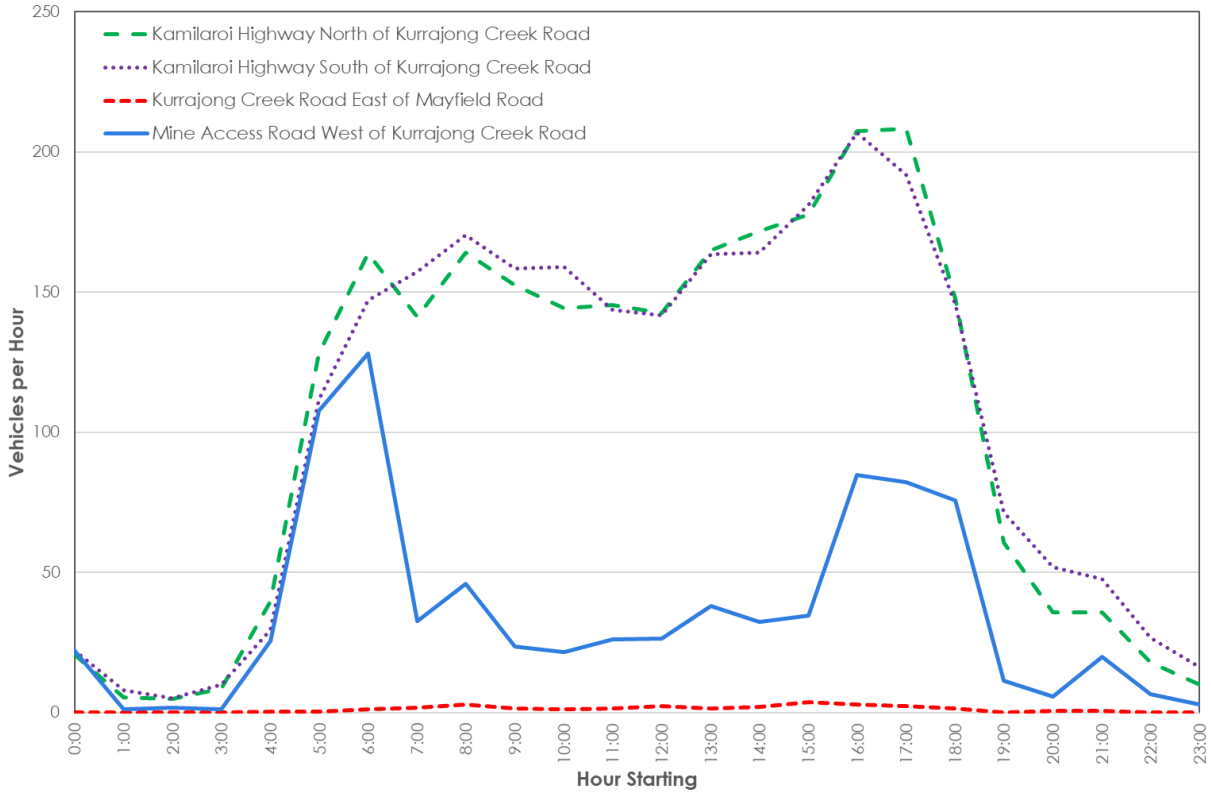
The surveys recorded the hourly traffic volume throughout the survey period. Over the average weekday, the AM peak (busiest hour between midnight and midday) and PM peak (busiest hour between midday and midnight) hourly traffic volumes are summarised in Table 3.3, and the distribution of traffic throughout the average weekday is presented in Figure 3.2.

Table 3.3: Surveyed Average Weekday Peak Hour Traffic (vehicles per hour)

Site[A]	Road	AM Peak Hour		PM Peak Hour	
		Hour Starting	Vehicles per Hour	Hour Starting	Vehicles per Hour
A	Kamilaroi Highway North of Kurrajong Creek Road	6:00 am and 8:00 am[B]	164	4:00 pm and 5:00 pm[B]	208
B	Kamilaroi Highway South of Kurrajong Creek Road	8:00 am	170	4:00 pm	207
C	Kurrajong Creek Road East of Mayfield Road	8:00 am	3	3:00 pm	4
D	Mine Access Road West of Kurrajong Creek Road	6:00 am	128	4:00 pm	85

[A] *Refer to Figure 2.1.*
[B] *The maximum hourly volumes occurred in two hourly periods during both the AM and PM periods.*

Figure 3.2: Surveyed Average Weekday Traffic by Time of Day (vehicles per hour)



These results demonstrate that over the average weekday, the busiest hour at each survey location does not coincide. The AM peak hour on the Mine Access Road is the busiest hour, while the PM peak hour on the Kamilaroi Highway is the busiest hour. The traffic on Kurrajong Creek Road is spread throughout the day without distinct peaks.

3.3.3 Existing Narrabri Mine Traffic

The traffic surveys identified the total number of vehicle trips generated by the Narrabri Mine, as measured by vehicles arriving and departing via the Mine Access Road. As summarised in Table 3.1, the daily trips generated by the Narrabri Mine varied between a low of 355 vehicle trips on the Sunday to 932 vehicle trips on the Tuesday, with an average of 860 vehicle trips per weekday.

Figure 3.3 presents the surveyed distribution of inbound and outbound traffic to and from the Narrabri Mine throughout the average weekday.

Figure 3.3: Surveyed Average Weekday Narrabri Mine Traffic Generation

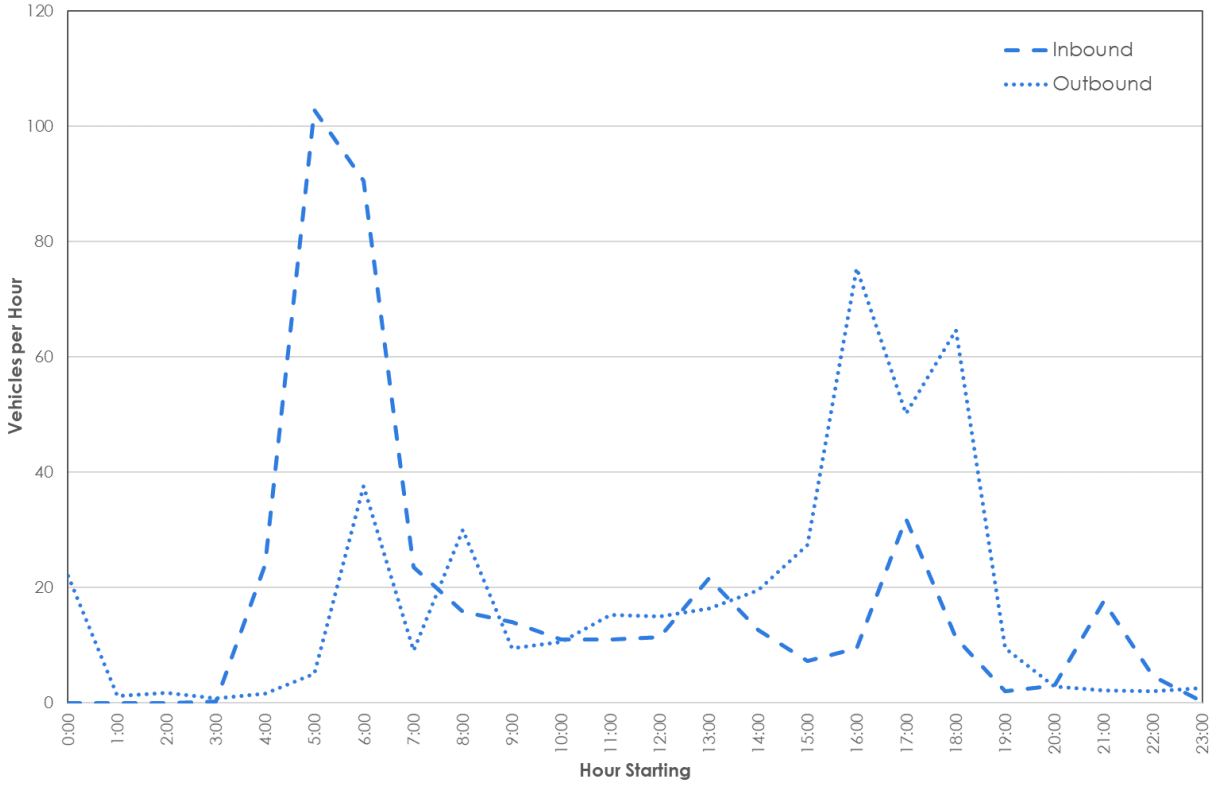


Figure 3.3 indicates that there is a distinct peak in inbound traffic to the Narrabri Mine between 5:00 am and 7:00 am, with a lesser peak in outbound traffic occurring between 4:00 pm and 7:00 pm. The traffic generation decreases during the day between 7:00 am and 4:00 pm, and generally remains low overnight between 7:00 pm and 5:00 am.

It is noted that the pattern of outbound traffic is distinctly different on a Friday afternoon compared with the other weekdays, due to the change from weekday to weekend shifts. On the Friday, there was no distinct peak in outbound traffic at 4:00 pm to 5:00 pm, rather there was a single distinct peak at 6:00 pm to 7:00 pm. This impacts the average weekday conditions in the afternoon somewhat. Considering only the Monday to Thursday conditions, the afternoon peak was 87 vehicles per hour between 4:00 pm and 5:00 pm.

3.3.4 Intersection Turning Movement Results

Vehicle turning movements were recorded at the intersections of Kurrajong Creek Road with the Narrabri Mine Access Road and with the Kamilaroi Highway over 14 hours between 5:00 am and 7:00 pm on Tuesday 25 June 2019.

The following key observations were made from the results of the intersection turning movement surveys over the surveyed 14 hours:

- A small number of vehicles entered or exited the Mine Access Road via a side trip to Kurrajong Creek Road south. It is understood that some employees meet before and after shift at an off-site location on Kurrajong Creek Road just south of the Mine Access Road intersection. Comparison between the intersection turning movement survey results and the tube count results indicates that the number of vehicles surveyed in Kurrajong Creek Road immediately south of the intersection (95 vehicles over 14 hours) was significantly greater than the number surveyed east of Mayfield Road (27 vehicles over 14 hours) over the same period of time. The results suggest that a significant proportion of the vehicle turning movements into and out of Kurrajong Creek Road south of the Mine Access Road are associated with workers driving to and from the informal meeting area either as a side trip on the way to or from work, or as a single purpose trip during a break period. These trips do not continue on Kurrajong Creek Road any further south than the informal meeting area. This was confirmed by on-site observation of driver behaviour in this section of Kurrajong Creek Road.
- Approximately 62 per cent of the light vehicles on Kurrajong Creek Road west of the Kamilaroi Highway arrived or departed to the north on the Kamilaroi Highway, and 38 per cent arrived or departed to the south.
- Approximately 40 per cent of the heavy vehicles on Kurrajong Creek Road west of the Kamilaroi Highway arrived or departed to the north on the Kamilaroi Highway, and 60 per cent arrived or departed to the south.

The results of the intersection surveys indicate that the number of vehicle trips generated by the Narrabri Mine peaked between 5:45 am and 6:45 am, with 149 vehicles inbound and 21 vehicles outbound. After midday, the busiest hour for trip generation of the Narrabri Mine occurred between 4:15 pm and 5:15 pm, with 14 vehicles inbound and 94 vehicles outbound.

3.3.5 Narrabri Mine Traffic Distribution

The results of the traffic survey program have been used to estimate the existing average weekday traffic generation of the Narrabri Mine and its distribution on the surrounding roads at the time of the traffic surveys. This is summarised in Table 3.4 for the average weekday and the peak hours for the Narrabri Mine-generated traffic.

Table 3.4: Average Weekday Narrabri Mine Operational Traffic Generation

	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)	
	Light Vehicles	Heavy Vehicles	Light Vehicles	Heavy Vehicles	Light Vehicles	Heavy Vehicles
Total Trips	124	4	80	5	784	76
via the Kamilaroi Highway North	77	1	50	2	487	30
via the Kamilaroi Highway South	47	3	30	3	297	46
via Kurrajong Creek Road	0	0	0	0	0	0

3.4 Railway Level Crossings

3.4.1 Werris Creek Mungindi Railway

Narrabri Mine coal trains enter and exit the Narrabri Mine Balloon Loop to and from the south on the Werris Creek Mungindi Railway. North of the Narrabri Mine Balloon Loop, the Werris Creek Mungindi Railway carries cotton, grain and general freight trains and passenger trains. Based on forecasts of train movements on the Werris Creek Mungindi Railway for 2030 presented in GTA Consultants (2018), the indicative number of train movements on the Werris Creek Mungindi Railway north and south of the Narrabri Mine Balloon Loop junction are presented in Table 3.5.

Table 3.5: Indicative Daily Train Movements on the Werris Creek Mungindi Railway in 2030

	Average per Day	Peak per Day
Source or Type of Trains		
Cotton, grain and general freight	9	9
XPT Passenger	2	2
Narrabri Mine	8	16
Boggabri Coal Mine[A]	5.5	5.5
Maules Creek Coal Mine[B]	10	20
Vickery Extension Project (if constructed)[C]	10	16
Total Train Movements on Sections of the Werris Creek Mungindi Railway		
North of Narrabri Mine	11	11
North of Boggabri and Maules Creek Coal Mines	19	27
South of Boggabri and Maules Creek Coal Mines	34.5	52.5
South of Vickery Extension Project Loop	44.5	68.5

[A] *Refer to Section 3.6.1.5*
[B] *Refer to Section 3.6.1.6*
[C] *Refer to Section 3.6.1.4, and includes product coal sourced from Tarrawonga Coal Mine (Section 3.6.1.7).*

These forecasts suggest that the number of train movements on the Werris Creek Mungindi Railway increases significantly from north to south of the Boggabri and Maules Creek loop, and the contribution of the Narrabri Mine to the total number of trains decreases from 59 to 30 per cent of the peak daily trains. On this basis, the level crossings between the Narrabri Mine Balloon Loop and the Maules Creek/Boggabri Coal Mine Balloon Loop have been examined and are discussed below. Each level crossing was reviewed with regard to its controls, signage and sight distance for vehicle drivers, with photographs of each crossing presented in Appendix B.

3.4.2 Kurrajong Creek Road Level Crossing

All vehicles accessing the Narrabri Mine travel through the level crossing (LXM 534) on Kurrajong Creek Road. A railway crossing signal assembly (RX-5) incorporating a "RAILWAY CROSSING" (R6-25) sign, "STOP ON RED SIGNAL" (R6-9) sign, flashing lights, and a boom barrier is provided on each approach. "RAIL X" and "STOP" line pavement marking is provided on the eastern and western approaches to the level crossing, and the roads are marked with edgelines and double two-way barrier lines, enhanced with a narrow concrete median approximately 14 m long on each approach to prevent drivers from driving around the lowered barrier.

Advance warning of the level crossing is given for northbound drivers on the Kamilaroi Highway by a diagrammatic warning sign (W7-13), which is typically used for where there is a passive level crossing on the side road, followed by a railway crossing flashing signals ahead sign (W7-4). As the level crossing is on the side road, this sign should be used in conjunction with a "ON SIDE ROAD" (W8-3) sign to form a RX-7 assembly.

Southbound drivers on the Kamilaroi Highway are provided with advance warning of the level crossing by way of a diagrammatic warning sign (W7-13), which is typically used for where there is a passive level crossing on the side road, followed by a RX-7 signage assembly which is used for an active level crossing on the side road.

It is understood that the channelised storage lanes and taper zones in the Kamilaroi Highway at the intersection with Kurrajong Creek Road (Figure 3.1) were designed with consideration of the storage requirements of the anticipated traffic volumes arriving at the intersection over the maximum closure time of the crossing (RW Corkery, 2009).

The Narrabri Mine generates an average of four trains per day and a peak of eight trains per day (Section 2.1). Each train crosses the level crossing on Kurrajong Creek Road when entering the Narrabri Mine Balloon Loop and again when exiting the balloon loop, thus the Narrabri Mine-generated trains occupy the crossing an average of eight times per day, and a peak of 16 times per day. The Narrabri Mine-generated train movements occur 24 hours per day and seven days per week.

3.4.3 Other Local Level Crossings

Aside from the Kurrajong Creek Road level crossing (Section 3.4.2), there are four other public level crossings between the Narrabri Mine and the junction for the Maules Creek-Boggabri Coal Mine loop (Figure 2.1), described below.

LXM 533 Pineview Road Turrawan

Pineview Road crosses the Werris Creek Mungindi Railway at a passive level crossing approximately 3.0 km south-southeast of the Kurrajong Creek Road level crossing. Pineview Road is an unsealed road providing access to two properties, and there is approximately 40 m storage distance between the level crossing and the Kamilaroi Highway. The level crossing allows for a single lane of road traffic only.

Signage for approaching vehicle drivers in both directions at the level crossing includes a railway crossing stop assembly (RX-2) (made up of a "RAILWAY CROSSING" (R6-25) sign, "STOP" (R1-1) sign and "LOOK FOR TRAINS" (G9-48) sign) on the left hand side of the road and a railway crossing width marker assembly (RX-9) (made up of "RAILWAY" and "CROSSING" (G9-32 and G9-33) signs and width hazard marker (D4-3) signs). On the western approach, the "RAILWAY" and "CROSSING" signs are both located on the right hand side of the road, rather than the usual arrangement of one on each side of the road.

Pineview Road crosses the railway at 90 degrees, and sight distance for vehicle drivers at the level crossing is good, with the railway line following a straight and level alignment in the vicinity.

LXM 1826 Public Road (Narrabri Road) Baan Baa

Narrabri Road crosses the Werris Creek Mungindi Railway at a passive level crossing approximately 5.1 km south-southeast of the Kurrajong Creek Road level crossing. Narrabri Road is an unsealed road, and there is approximately 30 to 40 m storage distance between the level crossing and the Kamilaroi Highway. The level crossing allows for a single lane of road traffic only.

Signage for approaching vehicle drivers in both directions at the level crossing includes a railway crossing stop assembly (RX-2) (made up of a "RAILWAY CROSSING" (R6-25) sign, "STOP" (R1-1) sign and "LOOK FOR TRAINS" (G9-48) sign) on the left hand side of the road and a railway crossing width marker assembly (RX-9) (made up of "RAILWAY" and "CROSSING" (G9-32 and G9-33) signs and width hazard marker (D4-3) signs).

Narrabri Road crosses the railway at 90 degrees, and sight distance for vehicle drivers at the level crossing is good, with the railway line following a straight and level alignment in the vicinity. On the western side of the Werris Creek Mungindi Railway, Narrabri Road appears to provide access to railway/services land and to private property only, being an unsealed track leading to a locked gate at the time of inspection.

LXM 532 Mayfield Road Baan Baa

Mayfield Road crosses the Werris Creek Mungindi Railway at a passive level crossing approximately 7.8 km south-southeast of the Kurrajong Creek Road level crossing. Mayfield Road is an unsealed road, and there is approximately 30 m storage distance in Mayfield Road between the level crossing and the Kamilaroi Highway.

Signage for approaching vehicle drivers in both directions at the level crossing includes a railway crossing stop assembly (RX-2) (made up of a "RAILWAY CROSSING" (R6-25) sign, "STOP" (R1-1) sign and "LOOK FOR TRAINS" (G9-48) sign) on the left hand side of the road and a railway crossing width marker assembly (RX-9) (made up of "RAILWAY" and "CROSSING" (G9-32 and G9-33) signs and width hazard marker (D4-3) signs and guideposts).

Mayfield Road crosses the railway at 90 degrees, and sight distance for vehicle drivers at the level crossing is good, with the railway line following a straight and level alignment in the vicinity. Mayfield Road forms part of the local road network described in Section 3.1.

LXM 531 Baranbah Street Baan Baa

Baranbah Street at Baan Baa crosses the Werris Creek Mungindi Railway at an active level crossing approximately 9.7 km south-southeast of the Kurrajong Creek Road level crossing. There is approximately 30 m storage distance in Baranbah Street between the level crossing and the Kamilaroi Highway. A railway crossing signal assembly (RX-5) incorporating a "RAILWAY CROSSING" (R6-25) sign, "STOP ON RED SIGNAL" (R6-9) sign, flashing lights, boom barrier and width hazard marker (D-4-3) signs are provided on each approach. "RAIL X" and STOP line pavement markings enhanced with a narrow concrete median and guideposts are provided on the western approach. On the eastern approach, Baranbah Street is marked with double two-way barrier lines. There is no visible STOP line or "RAIL X" marking on Baranbah Street between the Kamilaroi Highway and the level crossing.

Advance warning of the level crossing is given for northbound and southbound drivers on the Kamilaroi Highway by a diagrammatic warning sign assembly (RX-4, made up of W7-7 and W8-3), which is typically used for where there is a passive level crossing on the side road. This is followed by a railway crossing flashing signals ahead on side road signage assembly (RX-7, made up of W7-4 and W8-3).

3.4.4 Kurrajong Creek Railway Level Crossing Survey

During the intersection surveys described in Section 3.3.4, the times during which the railway level crossing on Kurrajong Creek Road was closed to road traffic due to a train being present were also recorded. Video footage of the crossing was recorded between 2:02 am and 7:58 pm, over which time the level crossing was closed six times as presented in Table 3.6. The start and end times refer to the commencement and end of the flashing lights being displayed at the level crossing, noting that vehicles may be on the crossing at the start or end of that period.

Table 3.6: Railway Level Crossing Road Closures 2 am to 8 pm 25 June 2019

Start Time	End Time	Total Closure Time	Notes
3:49:36	3:50:50	0:01:14	Northbound freight train No vehicles delayed
9:30:25	9:32:25	0:02:00	Southbound passenger train No vehicles delayed
13:25:35	13:26:55	0:01:20	Southbound freight train Two eastbound vehicles delayed
14:21:11	14:22:19	0:01:08	Southbound single locomotive One eastbound vehicle delayed
16:25:50	16:27:30	0:01:40	Northbound passenger train One westbound and two eastbound vehicles delayed
17:59:19	18:09:00	0:09:41	Northbound coal train Four westbound and 12 eastbound vehicles delayed

Over the observed 18-hour period, the majority of closures were of less than two minutes duration, with the exception of the evening closure for a coal train which continued for close to ten minutes. During that closure, all vehicles approaching the level crossing on the western side queued, and none of the 12 delayed vehicles diverted to Kurrajong Creek Road south. The queue of four westbound vehicles did not extend past the give way holding line at the intersection of Kurrajong Creek Road with the Kamilaroi Highway.

As the survey program captured only one closure of the road at the level crossing due to the movement of a coal train, NCOPL conducted timing checks on two other occasions that the level crossing was closed due to the movement of a coal train. Similar to the formal survey, the recorded closure times were from the commencement to the end of the flashing lights being displayed at the level crossing, noting that vehicles may be on the crossing at the start or end of that period:

- Tuesday 16 July 2019 approximately 1:30 pm, closure time 8 minutes 56 seconds; and
- Wednesday 17 July 2019 approximately 8:52 am, closure time 7 minutes, 50 seconds.

NCOPL has reported that on occasions when the level crossing is closed at the shift changeover times, the queue of westbound vehicles extends into the storage bays on the Kamilaroi Highway. This did not occur at any time on 25 June. Limited video footage was available from an incomplete survey of the intersection of Kurrajong Creek Road and the Kamilaroi Highway conducted on Tuesday 11 June 2019. Review of that footage indicates that at approximately 6:00 am on that day, closure of the level crossing resulted in a queue of eight vehicles forming in the northbound left turn lane and nine vehicles in the southbound right turn lane. Another closure at approximately 6:15 am that day resulted in a queue of two vehicles in the northbound left turn lane and five vehicles in the southbound right turn lane. Both these closures occurred during the same hour as when the peak occurred during the full survey on 25 June, i.e. between 5:45 am and 6:45 am. On both these occasions on 11 June, the queues were well within the storage capacity of the turning lanes which were designed for this purpose.

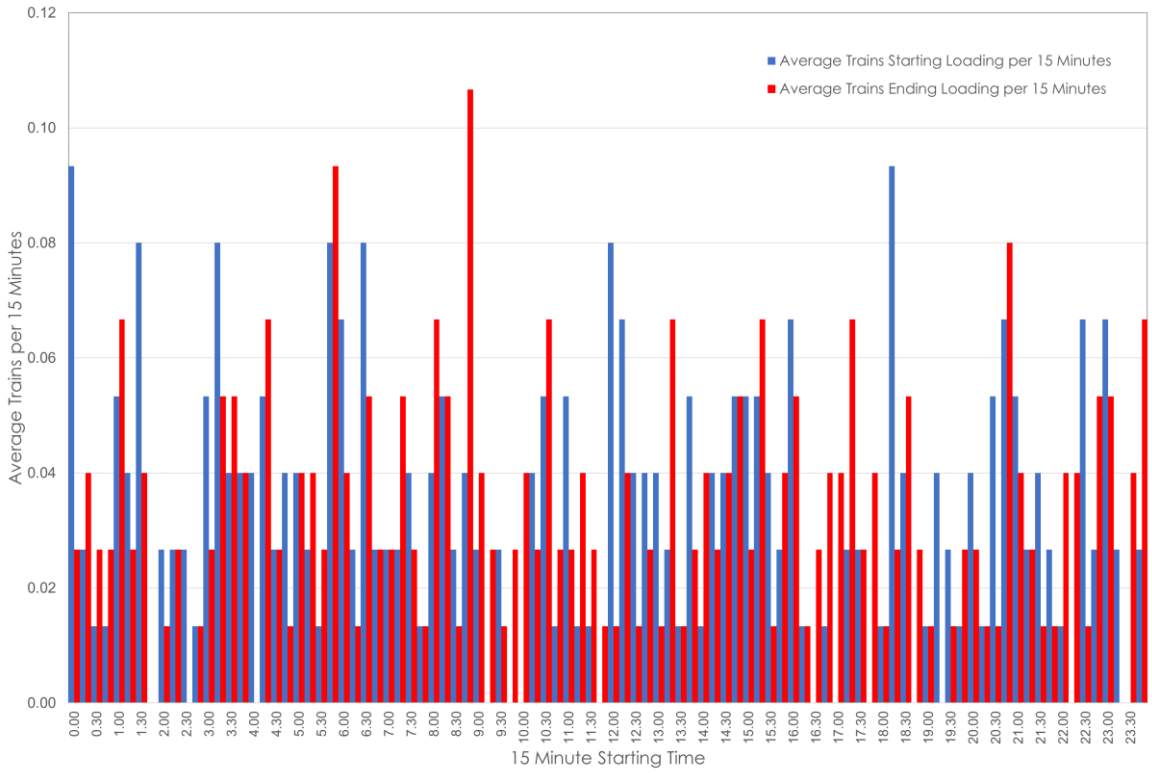
3.4.5 Rail Loading at the Narrabri Mine

NCOPL's records of the transport of ROM coal from the Narrabri Mine have been reviewed for the periods during December 2018 and between 1 June 2019 and 15 July 2019. The records show that over the 76 days of data available and excluding one day on which no trains were loaded, there was an average of 3.2 trains arriving to be loaded on any one day.

The data include the times at which each train arrived at the loading point, started and completed loading, and departed the loading point, noting there is some delay between those times and the times at which the train closes the level crossing. For example, the level crossing was opened at 6:09 pm after the northbound coal train captured on the survey on 25 June, and NCOPL's records indicate it arrived at the loading point six minutes later at 6:15 pm, and started loading at 6:33 pm. The average loading time is 134 minutes, and 90 per cent of trains were loaded in under 150 minutes.

Figure 3.4 presents the average number of trains per day starting and ending loading in each 15 minute period of the day over the 76 days of data reviewed. This indicates that over the data period, the arrival and departure times of coal trains are spread throughout the day, with no distinct pattern of relatively busy or quiet periods in the day.

Figure 3.4: Trains Loading Start and End Times (76 Days in 2018-2019)



3.5 Road Safety History

Road crash information was obtained from TfNSW for the most recent five year period available, being from 1 October 2013 to 30 September 2018, and included provisional data to 28 May 2019 which may be subject to change. The data include those crashes which 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 primary access routes relevant to the Project and surrounding roads:

- the Kamilaroi Highway between Newell Highway at Narrabri and Boston Street at Boggabri;
- Kurrajong Creek Road; and

- Mayfield Road, Merrilong Lane and Longsight Lane (local access roads, not Project access roads).

Over the investigation period and routes reviewed, a total of 34 crashes occurred, resulting in four fatalities, 16 people being seriously injured, and 24 people being moderately injured. Three of the reported crashes occurred during the provisional data period between 1 October 2013 and 28 May 2019. All reported crashes occurred on the Kamilaroi Highway; no crashes occurred on the local roads. No crashes occurred at the intersection of the Kamilaroi Highway with Kurrajong Creek Road. Table 3.7 summarises the number and general types of crashes which occurred on the sections of road under consideration.

Table 3.7: General Crash Types (1 October 2013 to 28 May 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
Kamilaroi Highway	54	-	2	2	3	1	-	3	20	3	34
Kurrajong Creek Road	3.1	-	-	-	-	-	-	-	-	-	-
Mayfield Road	10.4	-	-	-	-	-	-	-	-	-	-
Merrilong Lane	1.0	-	-	-	-	-	-	-	-	-	-
Longsight Lane	2.6	-	-	-	-	-	-	-	-	-	-
Total Crashes by Type		**0**	**2**	**2**	**3**	**1**	**0**	**3**	**20**	**3**	**34**

Table 3.7 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 two-thirds of the total reported crashes in Table 3.7. 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 per cent 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 four fatal crashes which occurred on the Kamilaroi Highway over the period investigated are detailed below:

- 28 May 2014 at 10:10 pm, 25 km south of Newell Highway on a straight section of undivided road. The crash occurred in fine weather, on a dry road surface, in darkness. A northbound light truck (utility or panel van) travelling at 100 km/h on the incorrect side of the road struck a southbound semitrailer travelling at 100 km/h in the lane head-on. Fatigue was nominated as a contributing factor to the crash. As well as one fatality, one other person was moderately injured.
- 24 November 2017 at 4:06 am, 300 m south of Kurrajong Creek Road. The crash occurred in fine weather, on a dry road surface, in darkness. A northbound car travelling at 100 km/h lost control on a straight section of undivided road, and left the carriageway to the right and struck a tree. Fatigue was nominated as a contributing factor to the crash. As well as one fatality, two other people were moderately injured.
- 14 January 2018 at 8:30 am, 320 m south of Goodyers Lane (approximately 2.3 km south of Kurrajong Creek Road). The crash occurred on a dry road surface in fine weather, and in daylight. A northbound 4WD travelling at 100 km/h lost control on a straight undivided section of the Kamilaroi Highway, and left the carriageway to the right and struck a drain or culvert and then struck a tree. Fatigue was nominated as a contributing factor to the crash.
- 2 April 2018 at 6:45 pm, 1.5 km north of Finchs Lane at Boggabri (approximately 2 km north of Boggabri township). The crash occurred on a dry road surface, in fine weather and darkness. A southbound car travelling at 100 km/h southbound on the incorrect side of the road struck a northbound car travelling at 100 km/h in the lane head-on. Speeding was nominated as a contributing factor, and there was temporary roadworks/detour/diversion. As well as one fatality, five people were seriously injured.

Fatigue was nominated as a contributing factor to three of the four fatal crashes. A driver is assessed as having been fatigued if they were described by police as being asleep, drowsy or fatigued, or if their vehicle performed a manoeuvre which suggested loss of concentration due to fatigue (travelled to the wrong side of a straight road and was involved in a head-on crash, or ran off a straight road or to the outside of a curve and was not directly identified as having been travelling at excessive speed and no other relevant manoeuvre was identified).

Nearly half of the 34 crashes on the Kamilaroi Highway identified speeding and/or fatigue as a contributing factor to the crash. Six of the 42 vehicles involved in the crashes were heavy vehicles.

A summary of the characteristics of the crashes on the Kamilaroi Highway is provided in Table 3.8. The data do not highlight any specific location with a notably poor crash history which may suggest an inherent concern with the road layout at that location.

Table 3.8: Kamilaroi Highway Crash Summary (1 October 2013 to 28 May 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	2	3	1	0	3	20	3	34
Crash Location										
2-way undivided road	-	-	2	1	-	-	3	15	2	23
Divided road	-	-	-	-	-	-	-	3	-	3
Cross Intersection	-	2	-	-	-	-	-	-	-	2
Tee Intersection	-	-	-	2	1	-	-	2	1	6
Road Surface Condition										
Dry	-	2	2	3	1	-	3	18	3	32
Wet	-	-	-	-	-	-	-	2	-	2
Weather										
Fine	-	2	2	3	1	-	3	19	3	33
Raining	-	-	-	-	-	-	-	1	-	1
Natural Lighting										
Dawn	-	1	-	-	-	-	-	-	-	1
Daylight	-	1	-	3	1	-	2	11	2	20
Darkness	-	-	2	-	-	-	1	9	1	13
Severity of Crash										
Fatal	-	-	2	-	-	-	-	2	-	4
Serious Injury	-	-	-	-	1	-	1	5	1	8
Moderate Injury	-	2	-	2	-	-	-	6	-	10
Non-casualty (towaway)	-	-	-	1	-	-	2	6	1	10
Uncategorised Injury	-	-	-	-	-	-	-	1	1	2
Vehicle Type										
Car, 4WD, station wagon, utility		4	3	5	1	-	2	18	2	35
Rigid Truck		-	-	-	-	-	-	-	1	1
Articulated Vehicle		-	1	1	1	-	-	2	-	5
Unknown		-	-	-	-	-	1	-	-	1
Contributing Factors										
Speed (only)	-	1	1	-	-	-	-	1	2	5
Fatigue (only)	-	-	1	-	-	-	-	7	-	8
Speeding and Fatigue	-	-	-	-	-	-	1	1	1	3
None	-	1	-	3	1	-	2	11	-	18

3.6 Changes to Road Transport Environment

3.6.1 Major Developments in the Region

Changes to the traffic conditions can be expected on the Kamilaroi Highway as a result of changes to existing major developments in the region. The potential changes to the Kamilaroi Highway in the vicinity of the Project expected to occur due to approved or proposed developments are discussed in this section.

3.6.1.1 Narrabri Mine

Without the Project, the Narrabri Mine would cease operating on 26 July 2031. After cessation of operations, some traffic would be generated to and from the site due to rehabilitation activities. For the purpose of this assessment, it has however been assumed that after 26 July 2031, the site would generate negligible traffic volumes on the average weekday.

3.6.1.2 Narrabri South Solar Farm

Development Consent (SSD-8387) was granted for the Narrabri South Solar Farm (NSSF) in December 2018. It is proposed to be located on Old Gunnedah Road approximately 10 km southeast of Narrabri (Figure 1.1). Impact Traffic Engineering (2017) prepared an assessment of the traffic and transport implications of the NSSF, and found that the external traffic generation of the NSSF would peak at approximately 76 vehicle trips per day during the busiest month of its construction stage. Those trips would include 46 trips by staff and 30 heavy vehicle trips. Impact Traffic Engineering (2017) does not provide information about the expected distribution of those trips on the surrounding road network.

Construction has not yet commenced, however once operational, the NSSF would generate negligible vehicle trips, as it would be remotely operated with low numbers of workers required for routine maintenance activities only.

3.6.1.3 Silverleaf Solar Farm

The Silverleaf Solar Farm proposed by ENGIE Renewables Australia Pty Ltd involves the development of a 120-million-watt photovoltaic solar farm and associated infrastructure approximately 4 km north of Narrabri (Figure 1.1). The proposed construction workforce is 120 personnel for approximately 12 months. During the approximate 35-year operational phase, a workforce of about six personnel would be required (GHD, 2019).

The Silverleaf Solar Farm is expected to generate approximately 80 heavy vehicle trips per week and up to 240 light vehicle trips per day during peak construction. GHD (2019) indicates that the contribution of the average daily light vehicle numbers to the Kamilaroi Highway traffic volumes would be negligible during construction.

The Silverleaf Solar Farm would not impact on the operation of the surrounding road network during operations as vehicle numbers would low and limited to those associated with infrequent maintenance activities (GHD, 2019).

The Silverleaf Solar Farm is therefore not expected to impact traffic conditions on the Kamilaroi Highway over an extended period south of Narrabri, and it has not been considered further in this assessment.

3.6.1.4 Vickery Extension Project

The Vickery Extension Project would include development of an on-site coal handling and preparation plant (CHPP), train load out facility, and a rail spur to connect to the main Werris Creek Mungindi Railway. Extracted coal would be transported by rail.

The Vickery Extension Project would generate traffic on the Kamilaroi Highway in the vicinity of the Narrabri Mine. GTA Consultants (2018) assessed the trip generation and distribution of the Vickery Extension Project for three scenarios, including during its peak construction stage, during its initial mining operational stage, and at its peak mining operational stage. Based on the GTA Consultants (2018) assessments, the potential contribution of traffic generated by Vickery Extension Project on the Kamilaroi Highway between Rangari Road and Narrabri during the Narrabri Mine peak hours has been estimated as follows:

Construction Stage

- 0 light and 0 heavy vehicles between 6:00 am and 7:00 am
- 0 light and 0 heavy vehicles between 4:00 pm and 5:00 pm; and
- 16 light and 10 heavy vehicles per day.

Initial Operational Stage

- 3 light and 0 heavy vehicles between 6:00 am and 7:00 am
- 0 light and 0 heavy vehicles between 4:00 pm and 5:00 pm; and
- 18 light and 0 heavy vehicles per day.

Longer Term Operational Stage

- 22 light and 0 heavy vehicles between 6:00 am and 7:00 am
- 4 light and 2 heavy vehicles between 4:00 pm and 5:00 pm; and
- 130 light and 8 heavy vehicles per day.

3.6.1.5 *Boggabri Coal Mine*

The Boggabri Coal Mine is operated by Idemitsu Australia and is approved (Project Approval 09_0182 [as modified]) to produce up to 8.6 Mtpa of ROM coal, with an on-site CHPP and private rail spur and rail loop. The Boggabri Coal Mine is approved to operate until the end of December 2033.

The Boggabri Coal Mine is located southeast of the Narrabri Mine (Figure 1.1) and has two vehicular accesses from the Kamilaroi Highway, each permitting left in and left out movements to and from the Kamilaroi Highway. The southbound access is located approximately 19 km from the Narrabri Mine, and the northbound access approximately 21 km from the Narrabri Mine.

The vehicle trips generated by the Boggabri Coal Mine would have been captured in the traffic surveys conducted on the Kamilaroi Highway, and would continue unchanged until the end of December 2033. Parsons Brinckerhoff (2010) estimated the traffic generation of the Boggabri Coal Mine at its peak operational stage. Based on that assessment, the estimated contribution of the Boggabri Coal Mine to traffic on the Kamilaroi Highway past the Narrabri Mine is estimated at:

- 21 light and 0 heavy vehicles between 6:00 am and 5:00 am;
- 31 light and 0 heavy vehicles between 4:00 pm and 5:00 pm; and
- 150 light and 6 heavy vehicles per day.

3.6.1.6 *Maules Creek Coal Mine*

The Maules Creek Coal Mine (Project Approval 10_0138 [as modified]) (Figure 1.1) is an open cut mining operation which is approved to operate until 2034. It has vehicular access via Therribri Road and also via the left in and left out intersections on the Kamilaroi Highway also used by the Boggabri Coal Mine.

The vehicle trips generated by the Maules Creek Coal Mine would have been captured by the traffic surveys conducted on the Kamilaroi Highway. GTA Consultants (2018) estimated the traffic generated by the Maules Creek Coal Mine and its distribution on the road network. On the basis of that assessment, the estimated contribution of the Maules Creek Coal Mine traffic to traffic on the Kamilaroi Highway north of the highway intersection vehicular accesses has been estimated as follows:

- 6 light and 2 heavy vehicles between 6:00 am and 7:00 am;
- 3 light and 0 heavy vehicles between 4:00 pm and 5:00 pm; and
- 30 light and 6 heavy vehicles per day.

3.6.1.7 *Tarrawonga Coal Mine*

The Tarrawonga Coal Mine (Project Approval 11_0047) is an open cut coal mine located approximately 42 km north-northwest of Gunnedah (Figure 1.1), which is approved to operate until December 2030. Vehicular access is via a private haul road to Rangari Road, and ROM coal is transported by road to the Whitehaven CHPP, located to the north of Gunnedah.

Some vehicle trips generated by the Tarrawonga Coal Mine may be expected to use the Kamilaroi Highway past the Narrabri Mine, generated by employees travelling to and from the site each day, and by deliveries and visitors to and from the north. The vehicle trips generated by the Tarrawonga Coal Mine would have been captured by the traffic surveys conducted on the Kamilaroi Highway. Halcrow (2011) assessed the expected traffic generation and distribution of the Tarrawonga Coal Project. Based on that assessment, the contribution of the Tarrawonga Coal Mine (including haulage of gravel and domestic specification coal at maximum permitted rates) to traffic on the Kamilaroi Highway past the Narrabri Mine has been estimated at:

- 8 light and 0 heavy vehicles between 6:00 am and 7:00 am
- 0 light and 6 heavy vehicles between 4:00 pm and 5:00 pm; and
- 34 light and 44 heavy vehicles per day.

3.6.1.8 *Rocglen Coal Mine*

The Rocglen Coal Mine (Figure 1.1) is approved to extract approximately 1.5 Mtpa of ROM coal until December 2022. Sized ROM coal from the Rocglen Coal Mine is trucked to the Whitehaven CHPP via Blue Vale Road for processing (where required) and train loading, and coal reject from the Whitehaven CHPP is trucked back to the Rocglen Coal Mine for disposal in accordance with Project Approval 10_0015 (as modified). Mining activity at the Rocglen Coal Mine has since ceased.

Some vehicle trips generated by the Rocglen Coal Mine may be expected to use the Kamilaroi Highway past the Narrabri Mine, generated by employees travelling to and from the site each day, and by deliveries and visitors. The vehicle trips generated by Rocglen Coal Mine would have been captured by the traffic surveys conducted on the Kamilaroi Highway. GTA Consultants (2017) found that, excluding trucks used for ROM coal haulage, Rocglen Coal Mine generated 60 light vehicle trips per day and 22 heavy vehicle trips per day. An interview survey conducted over 12 hours as part of that audit found that of the 56 light vehicle and 9 heavy vehicle drivers interviewed at the Rocglen Coal Mine:

- 0 light vehicle drivers arrived from Narrabri or Moree; and
- 4 heavy vehicle drivers arrived from Narrabri or Moree.

Those drivers would be expected to have travelled on the Kamilaroi Highway past the Narrabri Mine. The contribution of Rocglen Coal Mine to surveyed traffic on the Kamilaroi Highway past the Narrabri Mine would therefore be limited to fewer than 10 heavy vehicles per day.

3.6.1.9 Narrabri Gas Project

The Narrabri Gas Project involves the development and operation of a gas production field, including installation of gas wells, gas and water gathering systems, and supporting infrastructure, including a central gas processing facility located approximately 20 km south west of Narrabri. GHD (2016) assessed the traffic impacts of the Narrabri Gas Project, and found that the construction and operational traffic would primarily use Newell Highway to access the various facilities, with some limited access via Kamilaroi Highway close to Narrabri generating a peak pf 70 vehicle trips per day over three days during the construction stage. The Narrabri Gas Project is therefore not expected to impact traffic conditions on the Kamilaroi Highway over an extended period south of Narrabri, and it has not been considered further in this assessment.

3.6.1.10 Inland Rail

The proposed Inland Rail (Narrabri to North Star Section [Phases 1 and 2]) forms part of the Inland Rail Proposal from Brisbane to Melbourne by the Australian Rail Track Corporation Ltd. Phase 1 was approved in August 2020 and construction had not commenced at the time of writing. Phase 2 was at the assessment phase at the time of writing this document. The Traffic, Transport and Access Assessment for the Inland Rail (Narrabri to North Star Section did not predict any impacts on the Kamilaroi Highway in the vicinity of the Project (GHD 2017).

The proposed Inland Rail (Narromine to Narrabri Section) (located approximately 23 km north-west of the Narrabri Mine) also forms part of the Inland Rail Proposal. SEARs for the Inland Rail (Narromine to Narrabri Section) had been issued at the time of writing this document. As no environmental assessment documentation was available, limited information and data were available regarding the Inland Rail (Narromine to Narrabri Section) at the time of writing this document.

There is potential for other developments (e.g. intermodal transport hubs) to be developed subsequent to the development of the Inland Rail.

Limited information and data were available regarding the Inland Rail (or other potential developments) at the time of writing this document and it has not been considered further in this assessment.

3.6.1.11 *Queensland Hunter Gas Pipeline*

The approved Queensland Hunter Gas Pipeline will involve the construction and operation of an approximate 825 km long high-pressure gas transmission pipeline from the Queensland border near Boomi to Newcastle (including a short pipeline lateral to the Maitland area) (Hunter Gas Pipeline Pty Ltd, 2008). The approved pipeline alignment is approximately 1.3 km to the east of the Narrabri Mine (Figure 1.1).

The Queensland Hunter Gas Pipeline was approved by the NSW Minister for Planning in February 2009 and construction was yet to commence at the time of writing this document.

A total construction workforce of approximately 600 personnel will be spread across two main working groups along the pipeline alignment. It is expected that it would take approximately four months for construction activities to move through an area. An operational workforce of approximately 25 personnel would be required for the Queensland Hunter Gas Pipeline (Hunter Gas Pipeline Pty Ltd, 2008).

The Queensland Hunter Gas Pipeline is therefore not expected to impact traffic conditions on the Kamilaroi Highway over an extended period in the vicinity of the Project, and it has not been considered further in this assessment.

3.6.2 Background Traffic Growth

Changes to existing traffic conditions can be expected to occur which are not directly attributable to a specific development. A growth rate of 1.0 per cent per annum has been assumed to occur on the Kamilaroi Highway and has been applied to that part of the surveyed traffic which has not been identified as being generated by one of the major developments (Section 3.6.1). This is consistent with the rate adopted by GTA Consultants (2018), following a review of historic traffic volume data on the Kamilaroi Highway which found that the daily traffic volumes have tended to fluctuate, resulting in significant increases or decreases over time.

3.6.3 Cumulative Changes

The cumulative implications of the aforementioned major developments and background traffic growth have been forecast for the future assessment years for the Project years, based on the expected coincidence of the various activities summarised in Table 3.9.

Table 3.9: Cumulative Changes to Road Environment from 2019 Conditions

	Traffic Surveys 2019	Project Short Term Year 2025	Project Long Term Year 2032
Narrabri Mine	Operational	Operational, no change from 2019	Not operational
Narrabri Solar Farm	Not operational	Operational	Operational
Silverleaf Solar Farm	Not operational	Operational	Operational
Vickery Extension Project	Not operational	Operational, peak operational workforce	Operational, peak operational workforce
Boggabri Coal Mine	Operational	Operational, no change from 2019	Operational, no change from 2019
Maules Creek Coal Mine	Operational	Operational, no change from 2019	Operational, no change from 2019
Tarrawonga Coal Mine	Operational	Operational, no change from 2019	Not operational
Rocglen Coal Mine	Operational	Not operational	Not operational
Narrabri Gas Project	Not operational	Operational	Operational
Queensland Hunter Gas Pipeline	Not operational	Operational	Operational
Background growth	-	Surveyed plus growth of non-mine traffic	Surveyed plus growth of non-mine traffic

As the contribution of Rocglen Coal Mine on existing traffic conditions on the Kamilaroi Highway south of Narrabri is very low, this traffic has not been removed from the surveyed conditions for the future scenarios in which the Rocglen Coal Mine is closed. Similarly, the future contributions of the Narrabri Solar Farm, Silverleaf Solar Farm and Queensland Hunter Gas Pipeline to traffic conditions on the Kamilaroi Highway are expected to be negligible, and have not been considered further in this assessment.

3.7 Baseline Future Traffic Volumes

The forecast hourly and daily traffic volumes on the roads of relevance to the Project have been forecast for the future conditions should the Project not proceed. Table 3.10 summarises the forecast traffic volumes in 2025 with the cumulative impacts of background traffic growth and the anticipated major developments in the region (Table 3.9) during the peak hours for traffic generation of the Narrabri Mine.

Table 3.10: Baseline Average Weekday Traffic 2025

Site[A]	Road	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	**Kamilaroi Highway North of Kurrajong Creek Road**			
	Surveyed 2019	164	208	2,500
	Vickery Extension Project	22	6	138
	Background Growth	6	10	121
	Total Baseline 2025	192	224	2,759
B	**Kamilaroi Highway South of Kurrajong Creek Road**			
	Surveyed	148	207	2,530
	Vickery Extension Project	22	6	138
	Background Growth	6	10	121
	Total Baseline 2025	176	223	2,789
C	**Kurrajong Creek Road East of Mayfield Road**			
	Surveyed	1	3	28
	Vickery Extension Project	0	0	0
	Background Growth	2	2	4
	Total Baseline 2025	3	5	32
D	**Mine Access Road West of Kurrajong Creek Road**			
	Surveyed	128	85	860
	Vickery Extension Project	0	0	0
	Background Growth	0	0	0
	Total Baseline 2025	128	85	860

[A] *Refer to Figure 2.1.*

Table 3.11 summarises the forecast traffic volumes in 2032 with the cumulative impacts of background traffic growth and the anticipated major developments in the region (Table 3.9).

Table 3.11: Baseline Average Weekday Traffic 2032

Site[A]	Road	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	**Kamilaroi Highway North of Kurrajong Creek Road**			
	Surveyed 2019	164	208	2,500
	Vickery Extension Project	22	6	138
	Tarrawonga Coal Mine	-8	-6	-78
	Narrabri Mine[B]	-78	-52	-517
	Background Growth	10	21	267
	Total Baseline 2032	110	177	2,310
B	**Kamilaroi Highway South of Kurrajong Creek Road**			
	Surveyed	148	207	2,530
	Vickery Extension Project	22	6	138
	Tarrawonga Coal Mine	-8	-6	-78
	Narrabri Mine[B]	-50	-33	-343
	Background Growth	10	21	267
	Total Baseline 2032	122	195	2,514
C	**Kurrajong Creek Road East of Mayfield Road**			
	Surveyed	1	3	28
	Vickery Extension Project	0	0	0
	Tarrawonga Coal Mine	0	0	0
	Narrabri Mine[B]	0	0	0
	Background Growth	2	2	6
	Total Baseline 2032	3	5	34
D	**Mine Access Road West of Kurrajong Creek Road**			
	Surveyed	128	85	860
	Vickery Extension Project	0	0	0
	Tarrawonga Coal Mine	0	0	0
	Narrabri Mine[B]	-128	-85	-860
	Background Growth	0	0	0
	Total Baseline 2032	0	0	0

[A] *Refer to Figure 2.1.*
[B] *The approved Narrabri Mine would be completed by 2032 and therefore the existing Narrabri Mine movements have been removed from the baseline traffic estimate.*

3.8 Road Network Performance

3.8.1 Operation of Intersections

The operating characteristics of the surveyed intersections have been assessed using SIDRA INTERSECTION 8, an analysis program which determines characteristics of intersection operating conditions including the degree of saturation, average delays, and levels of service. 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 (RTA, 2002). Table 3.12 shows the criteria adopted by RMS for assessing the level of service.

Table 3.12: Intersection Level of Service Criteria

Level of Service (LoS)	Average Delay per vehicle (secs/veh)	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

Adapted from RTA (2002)

Table 3.13 presents a summary of the existing and forecast baseline peak hour operating characteristics of the surveyed intersections. The surveyed intersections are under priority control, thus the reported average delay is for the movement with the highest average delay per vehicle. At the surveyed T-intersections, this is typically the right turn movement from the minor road to the major road. The 2032 baseline scenario has not been analysed, as the turning vehicle movements at both intersections would be very low under that scenario (which assumes cessation of activity at the Narrabri Mine) such that formal analysis is not warranted.

Detailed results, including vehicle queues are presented in Appendix C.

Table 3.13: Peak Hour Intersection Operating Conditions

Site[A]	Intersection	5:45 am to 6:45 am			4:15 pm to 5:15 pm		
		X-Value	Average Delay[B]	LoS	X-Value	Average Delay[B]	LoS
Surveyed 2019							
E	Kamilaroi Highway and Kurrajong Creek Road	0.07	8.0	A	0.10	8.7	A
F	Kurrajong Creek Road and Mine Access Road	0.08	6.2	A	0.05	6.9	A
Baseline 2025							
E	Kamilaroi Highway and Kurrajong Creek Road	0.08	8.0	A	0.10	8.7	A
F	Kurrajong Creek Road and Mine Access Road	0.08	6.2	A	0.05	6.9	A

[A] *Refer to Figure 2.1.*
[B] Seconds per vehicle for movement with highest average delay per vehicle.

On the basis of the above assessment results and observations of operating conditions during the peak hour periods, it is evident that the intersections currently operate at satisfactory levels of service during peak periods, with spare capacity and acceptable delays. With the forecast changes to traffic conditions expected without the Project in 2025, the operation of the intersections would remain satisfactory, with imperceptible changes to the worst movement at each intersection. These results do not take into account the impact of any closures of the level crossing over the peak hours.

3.8.2 Midblock Level of Service

The capacity of a road is defined as the maximum 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 will be affected by factors such as the pavement width and restricted lateral clearances, the presence of heavy vehicles and grades.

Level of Service (LOS) is defined as a qualitative measure describing the operational conditions within a traffic stream as perceived by drivers and/or passengers. A LOS definition generally describes these conditions in terms of factors such as speed and travel time, freedom to manoeuvre, traffic interruptions, comfort, convenience and safety. LOS A provides 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 Austroads (2020) *Guide to Traffic Management Part 3: Traffic Study and Analysis Methods* provides guidelines for the capacity and performance of two lane, two-way rural roads, which in turn, refers to the *Highway Capacity Manual* (HCM) (Transportation Research Board, 2016). The HCM defines three classes of road which relate to drivers' expectations. Class I roads are those on which motorists expect to travel at relatively high speeds. They 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.

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. 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 3.14.

Table 3.14: LOS Criteria for Two Lane Two Way Roads

Level of Service	Class I		Class II	Class III
	Average Travel Speed (km/h)	PTSF (per cent)	PTSF (per cent)	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 (2020)

The Kamilaroi Highway may be considered as either a Class I or Class II route, and for the purpose of this review, the more stringent criteria for Class I roads have been adopted. The PTSF generally resulted in the lower LOS compared to ATS. Table 3.15 summarises the results of the assessment of midblock LOS on the Kamilaroi Highway. It should be noted that this calculation method does not apply to the Mine Access Road as its posted speed limit of 60 km/h is below the lower threshold of 45 miles per hour (mi/hr) (72 km/h). The LOS on Kurrajong Creek Road south of the Mine Access Road has not been formally assessed, as the very low existing traffic volumes (Section 3.3.2) would inherently result in negligible interaction with other traffic and a good LOS.

Table 3.15: Average Weekday Narrabri Mine Peak Hours Midblock Level of Service

Site[A]	Road	Mine Peak Hour	Inbound Travel Direction to Narrabri Mine		Outbound Travel Direction from Narrabri Mine	
			PTSF	LOS	PTSF	LOS
Surveyed 2019						
A	Kamilaroi Highway North of Kurrajong Creek Road	AM	31.9	A	19.4	A
		PM	21.7	A	35.7	B
B	Kamilaroi Highway South of Kurrajong Creek Road	AM	24.9	A	24.3	A
		PM	27.8	A	31	A
Baseline 2025						
A	Kamilaroi Highway North of Kurrajong Creek Road	AM	35.4	B	19.6	A
		PM	23.7	A	37.9	B
B	Kamilaroi Highway South of Kurrajong Creek Road	AM	24.6	A	28.8	A
		PM	29.8	A	32.3	A
Baseline 2032						
A	Kamilaroi Highway North of Kurrajong Creek Road	AM	26.4	A	19.4	A
		PM	24.4	A	29.2	A
B	Kamilaroi Highway South of Kurrajong Creek Road	AM	18.7	A	28.7	A
		PM	30.6	A	25.8	A

[A] *Refer to Figure 2.1.*

The results indicate that midblock levels of service on the Kamilaroi Highway are currently good during the Narrabri Mine peak hours, at A to B both north and south of Kurrajong Creek Road. With changes to the traffic demands in the future which are unrelated to the Narrabri Mine, levels of service would continue to be good at A to B both north and south of Kurrajong Creek Road.

3.8.3 Kurrajong Creek Road Railway Level Crossing

Under the baseline conditions, the number of times the Kurrajong Creek Road level crossing would be closed per day would be as set out in Table 3.16.

Table 3.16: Baseline Daily Train Movements on the Kurrajong Creek Road Level Crossing

	Average per Day	Peak per Day
Cotton, grain and general freight trains	9	9
XPT Passenger trains	2	2
Narrabri Mine coal trains	8	16
Total	**19**	**27**

This is equivalent to an average of 0.8 and 1.1 closures per hour on an average and peak rail demand day respectively. As demonstrated by the rail loading data (Section 3.4.5), the coal train trips would be spread throughout the day with no discernible pattern.

Based on the results of the intersection surveys and the forecast baseline conditions, the busiest 15 minute period for inbound traffic would occur between 5:45 am and 6:00 am, during which the number of vehicles travelling westbound across the level crossing would be:

- total 43 light and 3 heavy vehicles, of which:
  - 23 light vehicles arrive from the north; and
  - 20 light and 3 heavy vehicles arrive from the south.

A robust assessment of potential delays to vehicles as a result of the closure of the level crossing was undertaken. Table 3.17 summarises the average number of vehicles which would be delayed on the eastern side of the level crossing by closure of the level crossing should it occur during the busiest 15 minute period for inbound traffic to the Narrabri Mine.

Table 3.17: Baseline AM Peak 15 Minutes Impacts of Level Crossing Closure

Level Crossing Closure Time	Number of Vehicles Delayed		Vehicle Queue (m)[A]	
	From North	From South	From North	From South
Passenger and Freight Trains				
1 min 30 sec	2.3	2.3	16	18
2 min	3.1	3.1	21	24
Coal Trains				
7 min	10.7	10.7	75	84
8 min	12.3	12.3	86	95
9 min	13.8	13.8	97	107
10 min	15.3	15.3	107	119

[A] *Assumes 7 m per light vehicle and 13 m per heavy vehicle*

The results in Table 3.17 suggest that the available storage length in Kurrajong Creek Road (approximately 30 m) and the storage bays in the Kamilaroi Highway to the north (125 m) and south (150 m) would contain the expected queues in the event that the 15-minute peak of operational inbound traffic coincided with closure of the level crossing for an extended period of 10 minutes for a slow-moving coal train. Under these circumstances, which are considered to represent the "maximum impact case" conditions, the queue would be contained within the available storage in Kurrajong Creek Road and the Kamilaroi Highway storage bays, and would not overflow into the through lanes on the Kamilaroi Highway. The future traffic demands for the Project would therefore not result in any adverse impacts on the Kamilaroi Highway as a result of queues from the level crossing.

4 Impacts of the Project

4.1 Project Construction Activity

It is anticipated that construction activity associated with the Project infrastructure development would occur for short periods throughout the life of the Project, requiring additional workers to be present, and an increase in heavy vehicle deliveries to the Narrabri Mine. The majority of construction activity would be undertaken during daytime hours, with occasional work at night. To ensure a robust assessment of the potential impacts of the construction activity, this assessment assumes that all construction activity is limited to a 12-hour day shift period, likely to be between 7:00 am and 6:00 pm.

Construction activity is expected to require an average of five heavy vehicle deliveries per day, generating ten vehicle trips per day. These heavy vehicles are expected to be a mix of rigid trucks, semitrailers and B-doubles as required. Consistent with the existing distribution of heavy vehicles, 40 per cent of deliveries would be from the north and 60 per cent from the south.

The additional 20 construction workers would travel by private vehicles, generating up to 40 vehicle trips per day. Consistent with the existing distribution of light vehicles, approximately 40 per cent of the additional workers would travel to and from the south and 60 per cent to and from the north. The workers would arrive prior to commencement of their shift and depart at the conclusion of their shift.

Table 4.1 summarises the daily and peak hourly vehicle trips which may be generated by the Project construction activity. This suggests that when the Project construction activity occurs, the total vehicle trip generation of the Narrabri Mine would increase by 50 vehicle trips per day, and 22 vehicle trips during peak hours.

Table 4.1: Additional Project Construction Traffic Generation

	Vehicle Trips per Day		Vehicle Trips in Peak Hours	
	Light Vehicles	Heavy Vehicles	Light Vehicles	Heavy Vehicles
Workforce	40	0	20	0
Deliveries	0	10	0	2
Total Trips	**40**	**10**	**20**	**2**
via Kamilaroi Highway North	24	4	12	0
via Kamilaroi Highway South	16	6	8	2

The timing of the construction activity vehicle trips during the typical weekday would be dependent on the shift times worked by the construction personnel. Considering the existing morning and afternoon peak hours for traffic generated by the Narrabri Mine, it is unlikely that the construction activity would coincide with both the morning and evening peak hours. Should construction activity commence at 7:00 am with a 12-hour shift, the personnel would typically arrive in the hour between 6:00 am and 7:00 am, and depart in the hour between 6:00 pm and 7:00 pm.

To ensure a robust assessment of the potential impacts of the Project, it has been assumed that the construction personnel would travel during the existing peak hours associated with Narrabri Mine traffic. This will tend to overestimate the future peak hour volumes on the road network serving the site.

4.2 Project Operational Activity

Waste from Whitehaven exploration drilling activities in the area would be co-disposed at the Narrabri Mine reject emplacement area (Section 2.2) which would result in up to approximately four heavy vehicle trips per week (two inbound and two outbound) via Kurrajong Creek Road and the Kamilaroi Highway. The traffic generated for the co-disposal of exploration drilling waste is considered to be minor and within the day-to-day variations in existing heavy vehicle trips generated by Narrabri Mine.

The Project would therefore not significantly impact the vehicle trip characteristics of the operational activity at the Narrabri Mine. The number of vehicle trips, the distribution of those trips throughout the day and week, and the distribution on the road network would remain consistent with the existing conditions. The Project would however result in the continuation of the operational activity at its existing level until 2044, rather than ceasing in mid-2031.

The Project would not change the average or peak number of trains at the Narrabri Mine. The Narrabri Mine-generated train movements would continue to occur 24 hours per day and seven days per week.

4.3 Total Project Traffic

Table 4.2 summarises the total vehicle trip generation of the Project during construction activity. The peak hourly volumes assume that the construction peaks would coincide with the operation peaks, which is not expected to occur considering that the likely shift times for the additional construction workers suggest those workers would arrive later than the existing morning peak and depart later than the existing afternoon peak.

Table 4.2: Project Total Traffic Generation During Construction Work Periods

	Daily		AM Peak Hour[A]		PM Peak Hour[A]	
	Light Vehicles	Heavy Vehicles	Light Vehicles	Heavy Vehicles	Light Vehicles	Heavy Vehicles
Total Trips	824	86	144	6	100	7
via Kamilaroi Highway North	511	34	89	1	62	2
via Kamilaroi Highway South	313	52	55	5	38	5
via Kurrajong Creek Road	0	0	0	0	0	0

[A] *Assumes construction workers travel during the operational peak hours.*

4.4 Construction Stage Future Traffic Volumes 2025

Table 4.3 presents the forecast traffic volumes on the road network in 2025 during the Project peak hours, assuming that the construction personnel travel during the existing operational peak hours associated with the Narrabri Mine.

Table 4.3: Average Weekday Traffic with Project in 2025

Site[A]	Road	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	**Kamilaroi Highway North of Kurrajong Creek Road**			
	Baseline 2025	192	224	2,759
	Project	12	12	28
	Total 2025	204	236	2,787
B	**Kamilaroi Highway South of Kurrajong Creek Road**			
	Baseline 2025	176	223	2,789
	Project	10	10	22
	Total 2025	186	235	2,811
C	**Kurrajong Creek Road East of Mayfield Road**			
	Baseline 2025	3	5	32
	Project	0	0	0
	Total 2025	3	5	32
D	**Mine Access Road West of Kurrajong Creek Road**			
	Baseline 2025	128	85	860
	Project	22	22	50
	Total 2025	150	107	910

[A] *Refer to Figure 2.1.*
Refer to Table 3.10 for derivation of baseline volumes.

4.5 Operational Stage Future Traffic Volumes 2032

Table 4.4 presents the forecast traffic volumes on the road network in 2032 during the Project's peak hours, assuming that the construction personnel travel during the existing operational peak hours associated with the Narrabri Mine.

Table 4.4: Average Weekday Traffic with Project in 2032

Site[A]	Road	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	**Kamilaroi Highway North of Kurrajong Creek Road**			
	Baseline 2032	110	177	2,310
	Project	90	64	545
	Total 2032	200	241	2,855
B	**Kamilaroi Highway South of Kurrajong Creek Road**			
	Baseline 2032	122	195	2,514
	Project	60	43	365
	Total 2032	182	238	2,879
C	**Kurrajong Creek Road East of Mayfield Road**			
	Baseline 2032	3	5	34
	Project	0	0	0
	Total 2032	3	5	34
D	**Mine Access Road West of Kurrajong Creek Road**			
	Baseline 2032	0	0	0
	Project	150	107	910
	Total 2032	150	107	910

[A] *Refer to Figure 2.1.*
Refer to Table 3.11 for derivation of baseline volumes.

4.6 Future Road Network Performance

4.6.1 Operation of Intersections

The operation of the intersections of Kurrajong Creek Road with the Mine Access Road and with the Kamilaroi Highway have been reassessed using SIDRA INTERSECTION 8 to determine what operating conditions can be expected to occur with the Project traffic, together with the background traffic changes which are unrelated to the Project. The results of the analyses are summarised in Table 4.5, and results are presented in Appendix C.

Table 4.5: Peak Hour Intersection Operating Conditions During Project Construction Activity

Site[A]	Intersection	5:45 am to 6:45 am			4:15 pm to 5:15 pm		
		X-Value	Average Delay[B]	LoS	X-Value	Average Delay[B]	LoS
Year 2025							
E	Kamilaroi Highway and Kurrajong Creek Road	0.09	8.0	A	0.12	9.1	A
F	Kurrajong Creek Road and Mine Access Road	0.09	6.3	A	0.06	7.1	A
Year 2032							
E	Kamilaroi Highway and Kurrajong Creek Road	0.09	8.0	A	0.11	9.7	A
F	Kurrajong Creek Road and Mine Access Road	0.09	6.3	A	0.06	5.9	A

[A] *Refer to Figure 2.1.*
[B] Seconds per vehicle for movement with highest average delay per vehicle.

The results demonstrate that during construction activity periods with the Project, the intersections are expected to operate at good levels of service, with short delays to vehicles and spare capacity in 2025 and 2032. No upgrades would be required to the intersections in order to mitigate impacts of the Project traffic generation.

4.6.2 Midblock Level of Service

The impact of the Project traffic together with the other unrelated changes to traffic demands has been assessed based on the HCM midblock level of service method described in Section 3.8.2. The results of the reassessment are summarised in Table 4.6, which again considers the Kamilaroi Highway to be a Class I road. These calculations assume that the Project traffic travels during the same peak hours as the existing operational Narrabri Mine traffic, while it is expected that these peaks would not generally coincide due to different shift arrangements for the different personnel.

Table 4.6 demonstrates that should the peak hour Project construction activity traffic coincide with the operational traffic to and from the Narrabri Mine, the resulting levels of service experienced by drivers on the Kamilaroi Highway would remain good. Drivers would experience little or no delay to their travel as a result of other vehicles.

In addition, as the Project would not change the existing low traffic demands on Kurrajong Creek Road south of the Mine Access Road, the LOS on Kurrajong Creek Road would remain good, with drivers expected to experience negligible interaction with other vehicles.

Table 4.6: Future Weekday Narrabri Mine Peak Hour Midblock Level of Service

Site[A]	Road	Mine Peak Hour	Inbound Travel Direction to Narrabri Mine		Outbound Travel Direction from Narrabri Mine	
			PTSF	LOS	PTSF	LOS
Project 2025						
A	Kamilaroi Highway North of Kurrajong Creek Road	AM	37.5	B	19.1	A
		PM	22.5	A	38.8	B
B	Kamilaroi Highway South of Kurrajong Creek Road	AM	26.4	A	28.2	A
		PM	29.5	A	33.9	A
Project 2032						
A	Kamilaroi Highway North of Kurrajong Creek Road	AM	36.4	B	19.8	A
		PM	22.7	A	39.1	B
B	Kamilaroi Highway South of Kurrajong Creek Road	AM	27.2	A	26.8	A
		PM	29.8	A	33.9	A

[A] *Refer to Figure 2.1.*

4.6.3 Kurrajong Creek Road Railway Level Crossing

Under the future conditions with the Project, the number of times the Kurrajong Creek Road level crossing would be closed per day would be as set out in Table 4.7.

Table 4.7: Future Daily Train Movements on the Kurrajong Creek Road Level Crossing

	Average per Day	Peak per Day
Cotton, grain and general freight trains	9	9
XPT Passenger trains	2	2
Narrabri Mine coal trains	8	16
Total	**19**	**27**

This is equivalent to an average of 0.8 and 1.1 closures per hour on an average and peak rail demand day respectively. As demonstrated by the rail loading data (Section 3.4.5), the coal train trips would be spread throughout the day with no discernible pattern.

Based on the results of the intersection surveys and the forecast conditions, and assuming that the Project traffic travels during the same peak 15 minutes as the operational traffic, the busiest 15 minute period for inbound traffic with the Project would occur between 5:45 am and 6:00 am, during which the number of vehicles travelling westbound across the level crossing would be (rounding up):

- 26 light vehicles arrive from the north; and
- 24 light and 4 heavy vehicles arrive from the south.

This is considered a "maximum impact case" scenario as requested by the SEARs, with regard to future peak 15-minute traffic, as the Project construction workforce is likely to commence work at 7:00 am, and so would not be arriving during the same 15 minute peak as the operational traffic, which occurs between 5:45 am and 6:00 am.

Based on the above demands, Table 4.8 summarises the number of vehicles which would be delayed on the eastern side of the level crossing by closure of the level crossing should it occur during the busiest 15 minute period for inbound traffic to the Narrabri Mine with the Project traffic during the same 15 minute period.

Table 4.8: Project AM Peak 15 Minutes Impacts of Level Crossing Closure

Level Crossing Closure Time	Number of Vehicles Delayed		Vehicle Queue (m)[A]	
	From North	From South	From North	From South
Passenger and Freight Trains				
1 min 30 sec	2.6	2.7	18	21
2 min	3.5	3.6	24	28
Coal Trains				
7 min	12.1	12.4	85	97
8 min	13.9	14.2	97	110
9 min	15.6	16.0	109	124
10 min	17.3	17.8	121	138

[A] *Assumes 7 m per light vehicle and 13 m per heavy vehicle*

The results in Table 4.8 suggest that the available storage length in Kurrajong Creek Road (approximately 30 m) and the storage bays in the Kamilaroi Highway to the north (125 m) and south (150 m) would contain the expected queues in the unlikely event that the peak of operational inbound traffic coincided with the peak 15 minutes of arrivals of Project construction activity traffic and closure of the level crossing for an extended period of 10 minutes. Under these exceptional circumstances, the queue would continue to be contained within the available storage, and would not overflow into the through lanes on the Kamilaroi Highway.

4.6.4 Other Railway Level Crossings

The existing peak 15-minute traffic volumes at the other railway level crossings are lower than those at the Kurrajong Creek Road crossing, and the Project is not expected to generate any additional vehicle or train trips across any of the railway level crossings investigated. The Project is therefore not expected to have a perceptible impact on the operation of those level crossings.

4.7 Road Safety

Based on the review of the crash history of the roads relevant to the Project, it is considered that the roads in the local area have no particular accident pattern or causation factors which may be exacerbated by increased use of the road system resulting from the Project construction activity stages.

4.8 Oversize or Overmass Vehicles

Should construction activity at the Project generate the need for the movement for any oversize vehicles, this would be negotiated with TfNSW and Narrabri Shire Council on a case-by-case basis. All oversize loads would be transported with the relevant permits obtained in accordance with *Additional Access Conditions for oversize and overmass heavy vehicles and loads* (TfNSW, 2020), and any other licences and escorts as required by the regulatory authorities.

4.9 Car Parking

Staff car parking and heavy vehicle delivery loading areas would be provided within the Narrabri Mine site to meet the increased demand during construction activity.

4.10 Mitigation Measures

The foregoing assessment has identified that the Project-generated traffic would have negligible impact on the operation of the road network and its intersections, and that there are no specific safety concerns with the existing road transport environment that would be exacerbated by the Project-generated traffic. As a result, there is no specific road or intersection upgrade measures warranted to address potential adverse impacts of the Project.

A number of minor non-conformances with existing road signage in the vicinity of the Narrabri Mine were identified, which primarily relate to missing or use of incorrect advance warning signs for level crossings and incorrect advisory speed signs. These are minor issues which represent low risks to the safety of the road network, and are not exacerbated by the Project-generated traffic.

5 Summary and Conclusions

This study has examined the likely road transport implications of the 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.

Notwithstanding the above, NCOPL would maintain the intersection of the Mine Access Road with Kurrajong Creek Road, and the intersection of Kurrajong Creek Road with Kamilaroi Highway in consultation with the Narrabri Shire Council and TfNSW.

The Project would have minor or no impact on the midblock levels of service experienced by drivers on the Kamilaroi Highway. 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. Sight distances at the key intersection of the Kamilaroi Highway with Kurrajong Creek Road exceed minimum Austroads requirements.

A maximum impact case assessment of the potential peak 15-minute future traffic on the Kurrajong Creek Road railway level crossing found that the available storage space in Kurrajong Creek Road and the storage bays in the Kamilaroi Highway would contain the number of vehicles expected to be delayed during an extended closure of the level crossing.

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Appendix A

Traffic Surveys

Job No	N4957
Client	TTPP
Site	Narrabri Coal Mine Access Rd west of Kamilaroi Hwy
Location	Narrabri Coal Mine Access Rd west of Kamilaroi Hwy
Site No	ATC 1
Start Date	17-Jun-19
Description	Volume Summary
Direction	Combined

MATRIX Traffic and Transport Data

Hour Starting	Day of Week							W'Day Ave	7 Day Ave
	Mon	Tue	Wed	Thu	Fri	Sat	Sun		
	17-Jun	18-Jun	19-Jun	20-Jun	21-Jun	22-Jun	23-Jun		
AM Peak	131	130	136	128	116	72	77		
PM Peak	101	96	94	94	80	73	69	**858**	**720**
0:00	0	26	30	32	22	0	0	22	16
1:00	0	0	3	0	3	1	0	1	1
2:00	1	1	2	3	2	1	0	2	1
3:00	1	0	0	0	4	0	0	1	1
4:00	17	31	28	32	20	11	11	26	21
5:00	97	111	128	116	87	55	45	108	91
6:00	131	130	136	128	116	72	77	128	113
7:00	41	37	27	27	31	13	6	33	26
8:00	28	52	45	56	48	20	13	46	37
9:00	18	24	25	18	32	16	10	23	20
10:00	17	29	17	29	16	15	6	22	18
11:00	22	32	22	19	36	9	7	26	21
12:00	21	32	33	20	26	11	5	26	21
13:00	29	44	37	43	37	5	7	38	29
14:00	26	36	28	34	37	8	7	32	25
15:00	26	44	34	44	25	8	11	35	27
16:00	101	96	94	94	39	17	10	85	64
17:00	95	89	90	84	53	41	47	82	71
18:00	71	75	71	82	80	73	69	76	74
19:00	8	9	14	10	16	18	18	11	13
20:00	2	5	11	11	0	0	1	6	4
21:00	24	19	30	22	4	3	2	20	15
22:00	9	8	6	7	3	3	2	7	5
23:00	3	2	3	4	2	0	1	3	2
Total	788	932	914	915	739	400	355	858	720

7-19	495	590	523	550	460	236	198	524	436
6-22	660	753	714	721	596	329	296	689	581
6-24	672	763	723	732	601	332	299	698	589
0-24	788	932	914	915	739	400	355	858	720

Job No	N4957
Client	TTPP
Site	Kamilaroi Hwy north of Kurrajong Creek Rd
Location	Kamilaroi Hwy north of Kurrajong Creek Rd
Site No	ATC 2
Start Date	17-Jun-19
Description	Volume Summary
Direction	Combined

MATRIX Traffic and Transport Data

Hour Starting	Day of Week							W'Day Ave	7 Day Ave
	Mon	Tue	Wed	Thu	Fri	Sat	Sun		
	17-Jun	18-Jun	19-Jun	20-Jun	21-Jun	22-Jun	23-Jun		
AM Peak	170	186	191	179	168	152	199		
PM Peak	222	232	232	201	221	130	228	**2500**	**2326**
0:00	4	22	28	24	26	9	8	21	17
1:00	2	10	6	2	7	8	11	5	7
2:00	0	5	6	5	8	8	4	5	5
3:00	5	5	10	11	12	5	4	9	7
4:00	29	43	47	44	36	23	16	40	34
5:00	120	137	148	128	108	73	57	128	110
6:00	168	186	145	167	153	98	73	164	141
7:00	148	137	155	151	115	86	55	141	121
8:00	128	155	191	179	168	119	110	164	150
9:00	170	154	161	132	145	152	199	152	159
10:00	114	161	151	136	160	140	125	144	141
11:00	116	156	132	156	167	133	130	145	141
12:00	117	132	146	170	148	110	130	143	136
13:00	130	181	153	157	204	122	145	165	156
14:00	156	148	159	175	221	110	228	172	171
15:00	185	182	165	179	178	122	146	178	165
16:00	200	202	220	201	215	130	150	208	188
17:00	222	232	232	180	176	126	117	208	184
18:00	147	136	157	132	167	108	110	148	137
19:00	53	58	78	53	61	66	51	61	60
20:00	43	33	27	36	39	30	33	36	34
21:00	48	31	35	34	31	21	15	36	31
22:00	16	12	21	17	23	23	17	18	18
23:00	11	10	8	10	11	13	11	10	11
Total	2332	2528	2581	2479	2579	1835	1945	2500	2326

7-19	1833	1976	2022	1948	2064	1458	1645	1969	1849
6-22	2145	2284	2307	2238	2348	1673	1817	2264	2116
6-24	2172	2306	2336	2265	2382	1709	1845	2292	2145
0-24	2332	2528	2581	2479	2579	1835	1945	2500	2326

Job No	N4957
Client	TTPP
Site	Kamilaroi Hwy south of Kurrajong Creek Rd
Location	Kamilaroi Hwy south of Kurrajong Creek Rd
Site No	ATC 3
Start Date	17-Jun-19
Description	Volume Summary
Direction	Combined

MATRIX Traffic and Transport Data

Hour Starting	Day of Week							W'Day Ave	7 Day Ave
	Mon	Tue	Wed	Thu	Fri	Sat	Sun		
	17-Jun	18-Jun	19-Jun	20-Jun	21-Jun	22-Jun	23-Jun		
AM Peak	181	178	191	182	189	168	208		
PM Peak	201	189	222	202	230	133	217	**2530**	**2336**
0:00	6	24	26	34	21	15	12	22	20
1:00	2	13	7	1	17	12	5	8	8
2:00	1	6	9	6	3	5	5	5	5
3:00	5	6	13	10	15	5	4	10	8
4:00	26	27	32	31	31	22	13	29	26
5:00	116	119	124	106	94	82	38	112	97
6:00	148	156	132	148	152	70	50	147	122
7:00	158	140	177	181	130	80	53	157	131
8:00	144	155	191	182	180	121	112	170	155
9:00	181	158	157	165	131	168	208	158	167
10:00	115	178	169	144	189	135	127	159	151
11:00	123	148	139	154	155	130	135	144	141
12:00	118	128	133	173	156	100	119	142	132
13:00	144	177	151	146	199	125	132	163	153
14:00	172	139	152	172	185	103	217	164	163
15:00	195	177	163	200	170	118	136	181	166
16:00	201	179	222	202	230	133	135	207	186
17:00	180	189	203	180	207	125	119	192	172
18:00	154	121	151	139	164	101	132	146	137
19:00	75	72	83	66	61	63	44	71	66
20:00	55	46	50	54	55	38	30	52	47
21:00	77	36	40	46	39	26	21	48	41
22:00	35	18	25	18	37	23	27	27	26
23:00	17	11	8	25	20	18	10	16	16
Total	2448	2423	2557	2583	2641	1818	1884	2530	2336

7-19	1885	1889	2008	2038	2096	1439	1625	1983	1854
6-22	2240	2199	2313	2352	2403	1636	1770	2301	2130
6-24	2292	2228	2346	2395	2460	1677	1807	2344	2172
0-24	2448	2423	2557	2583	2641	1818	1884	2530	2336

Job No	N4957
Client	TTPP
Site	Kurrajong Creek Rd east of Mayfield Rd
Location	Kurrajong Creek Rd east of Mayfield Rd
Site No	ATC 4
Start Date	17-Jun-19
Description	Volume Summary
Direction	Combined

MATRIX Traffic and Transport Data

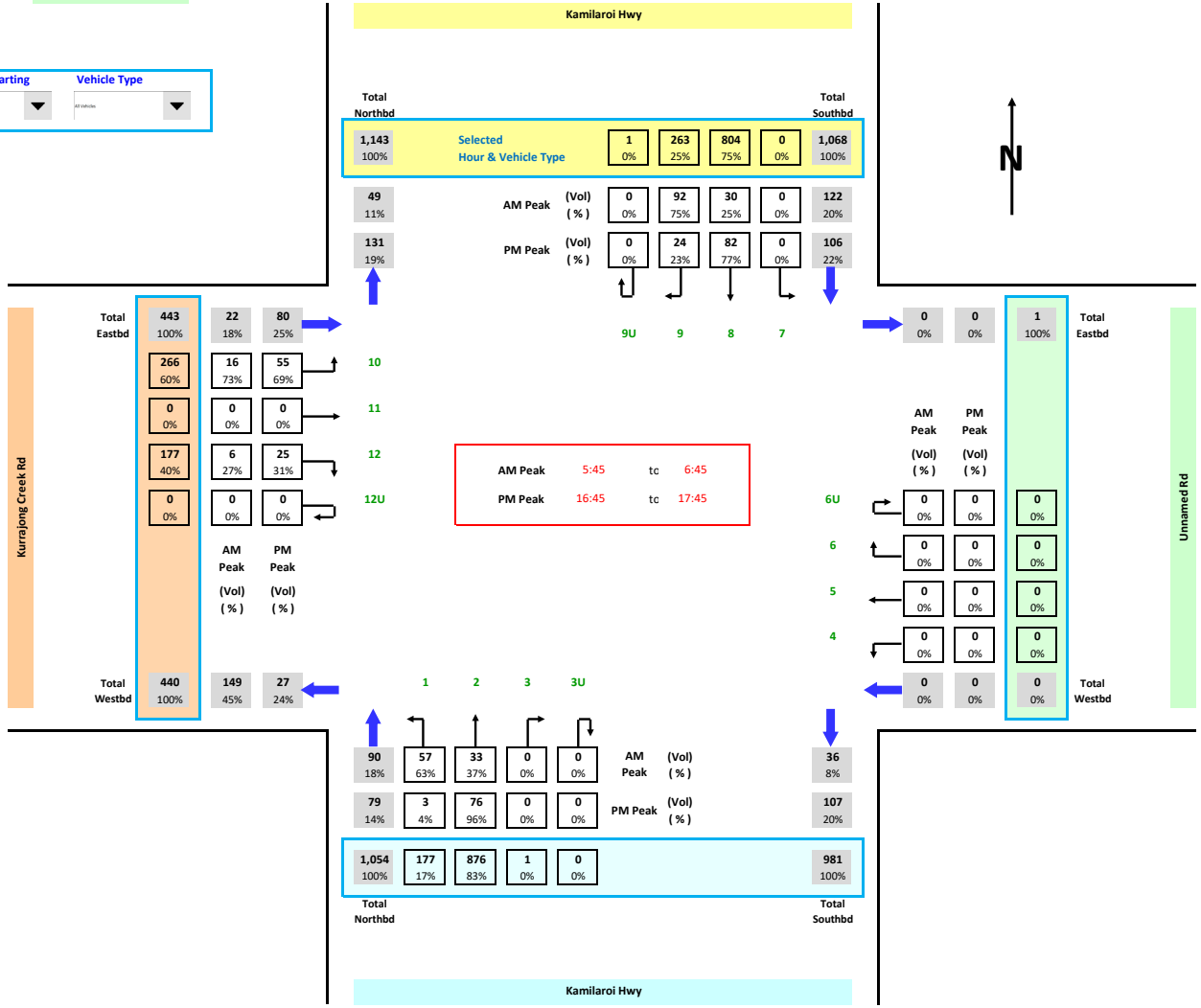
Hour Starting	Day of Week							W'Day Ave	7 Day Ave
	Mon	Tue	Wed	Thu	Fri	Sat	Sun		
	17-Jun	18-Jun	19-Jun	20-Jun	21-Jun	22-Jun	23-Jun		
AM Peak	2	4	2	2	4	4	2		
PM Peak	4	4	3	5	5	4	3	**28**	**25**
0:00	0	0	0	0	0	0	0	0	0
1:00	0	0	0	0	0	0	0	0	0
2:00	0	0	0	0	0	0	0	0	0
3:00	0	0	0	0	0	0	0	0	0
4:00	0	1	0	0	0	0	0	0	0
5:00	1	1	0	0	0	0	0	0	0
6:00	1	2	2	0	1	1	1	1	1
7:00	2	1	2	2	2	4	1	2	2
8:00	2	4	2	2	4	1	1	3	2
9:00	0	2	2	2	1	1	0	1	1
10:00	0	2	2	0	2	2	2	1	1
11:00	1	1	1	1	3	0	0	1	1
12:00	0	4	2	4	2	1	1	2	2
13:00	0	2	3	1	1	0	1	1	1
14:00	1	2	2	3	2	4	0	2	2
15:00	4	3	3	5	4	1	3	4	3
16:00	1	4	2	4	3	1	0	3	2
17:00	2	3	0	2	5	2	1	2	2
18:00	3	1	1	1	1	1	1	1	1
19:00	0	0	0	0	0	0	1	0	0
20:00	2	0	0	0	1	0	0	1	0
21:00	2	0	1	0	0	0	0	1	0
22:00	0	0	0	0	0	1	0	0	0
23:00	0	0	0	0	0	0	0	0	0
Total	22	33	25	27	32	20	13	28	25
7-19	16	29	22	27	30	18	11	25	22
6-22	21	31	25	27	32	19	13	27	24
6-24	21	31	25	27	32	20	13	27	24
0-24	22	33	25	27	32	20	13	28	25

Job No. : N4957
Client : TTPP
Suburb : Narrabri
Location : 1. Kamilaroi Hwy / Kurrajong Creek Rd

Day/Date : Tue, 25th June 2019
Weather : Fine
Description : Classified Intersection Count
: Intersection Diagram

MATRIX Traffic and Transport Data

Hour Starting **Vehicle Type**

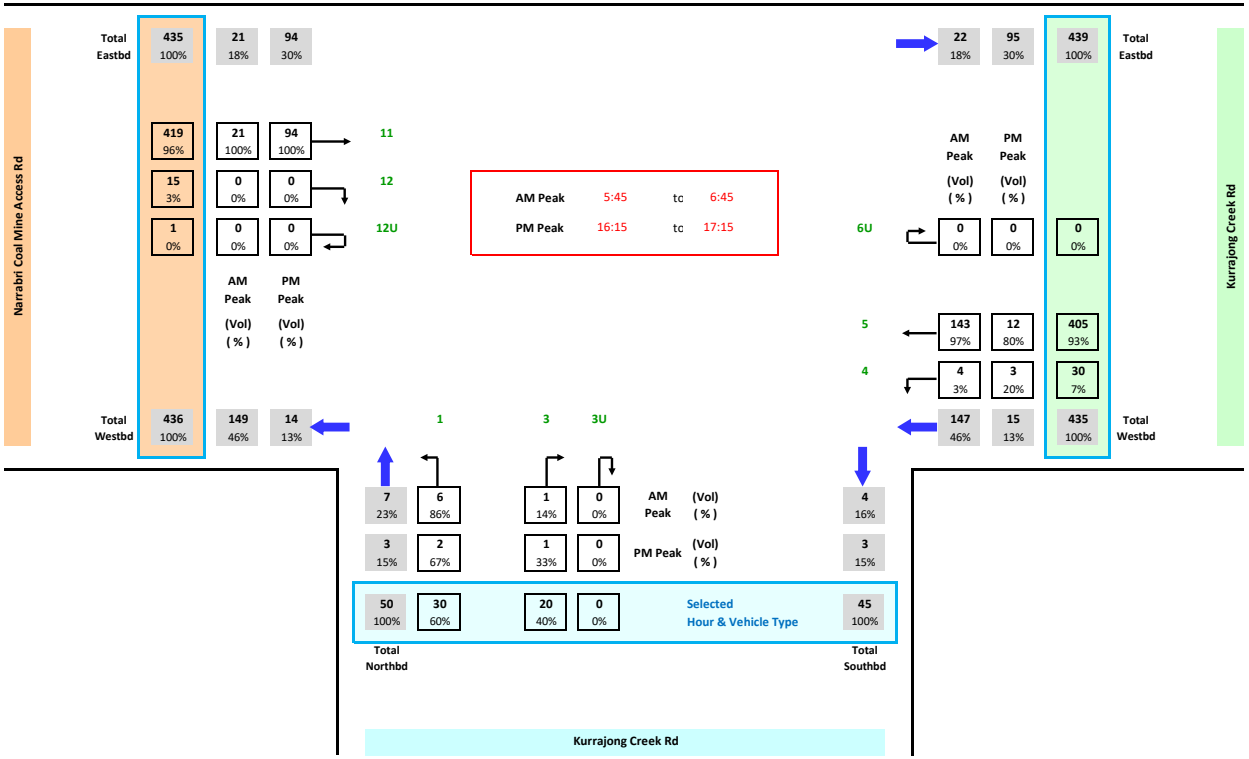


Job No. : N4957
Client : TTPP
Suburb : Narrabri
Location : 2. Kurrajong Creek Rd / Narrabri Coal Mine Access Rd

Day/Date : Tue, 25th June 2019
Weather : Fine
Description : Classified Intersection Count
: Intersection Diagram

MATRIX Traffic and Transport Data

Hour Starting | **Vehicle Type**



Appendix B

Railway Level Crossings

LXM 534 Kurrajong Creek Road – looking west

LXM 534 Kurrajong Creek Road – looking east

LXM 533 Pineview Road Turrawan – looking west

LXM 533 Pineview Road Turrawan – looking east

LXM 533 Pineview Road Turrawan – sight distance for westbound driver looking north

LXM 533 Pineview Road Turrawan – sight distance for westbound driver looking south

LXM 533 Pineview Road Turrawan – sight distance for eastbound driver looking north

LXM 533 Pineview Road Turrawan – sight distance for eastbound driver looking south

LXM 1826 Narrabri Road Baan Baa – looking west

LXM 1826 Narrabri Road Baan Baa – looking east

LXM 1826 Narrabri Road Baan Baa – sight distance for westbound driver looking north

LXM 1826 Narrabri Road Baan Baa – sight distance for westbound driver looking south

LXM 1826 Narrabri Road Baan Baa – sight distance for eastbound driver looking north

LXM 1826 Narrabri Road Baan Baa – sight distance for eastbound driver looking south

LXM 532 Mayfield Road Baan Baa – looking west

LXM 532 Mayfield Road Baan Baa – looking east

LXM 532 Mayfield Road Baan Baa – sight distance for westbound driver looking north

LXM 532 Mayfield Road Baan Baa – sight distance for westbound driver looking south

LXM 532 Mayfield Road Baan Baa – sight distance for eastbound driver looking north

LXM 532 Mayfield Road Baan Baa – sight distance for eastbound driver looking south

LXM 531 Baranbah Street Baan Baa – looking west

LXM 531 Baranbah Street Baan Baa – looking east

Appendix C

SIDRA INTERSECTION Output Summaries

MOVEMENT SUMMARY

Site: 101 [AM Ex Kamilaroi and Kurrajong Creek]

Kamilaroi Hwy and Kurrajong Creek Rd
Surveyed AM peak hour 5:45-6:45am
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Kamilaroi Hwy S												
1	L2	60	7.0	0.034	8.0	LOS A	0.0	0.0	0.00	0.66	0.00	62.9
2	T1	35	33.3	0.022	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
Approach		95	16.7	0.034	5.1	NA	0.0	0.0	0.00	0.42	0.00	77.0
North: Kamilaroi Hwy N												
8	T1	32	20.0	0.018	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
9	R2	97	1.1	0.074	7.8	LOS A	0.3	2.2	0.21	0.62	0.21	61.8
Approach		128	5.7	0.074	5.9	NA	0.3	2.2	0.16	0.47	0.16	71.6
West: Kurrajong Creek Rd												
10	L2	17	0.0	0.021	5.5	LOS A	0.1	0.5	0.11	0.55	0.11	63.6
12	R2	6	0.0	0.021	6.6	LOS A	0.1	0.5	0.11	0.55	0.11	63.3
Approach		23	0.0	0.021	5.8	LOS A	0.1	0.5	0.11	0.55	0.11	63.5
All Vehicles		246	9.4	0.074	5.6	NA	0.3	2.2	0.09	0.46	0.09	72.9

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.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
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 [PM Ex Kamilaroi and Kurrajong Creek]

Kamilaroi Hwy and Kurrajong Creek Rd
Surveyed PM peak hour 4:15-5:15pm
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Kamilaroi Hwy S												
1	L2	3	33.3	0.002	8.7	LOS A	0.0	0.0	0.00	0.66	0.00	61.2
2	T1	85	18.5	0.049	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
Approach		88	19.0	0.049	0.3	NA	0.0	0.0	0.00	0.02	0.00	98.6
North: Kamilaroi Hwy N												
8	T1	67	14.1	0.038	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
9	R2	14	30.8	0.012	8.7	LOS A	0.0	0.4	0.21	0.62	0.21	60.1
Approach		81	16.9	0.038	1.5	NA	0.0	0.4	0.04	0.10	0.04	93.4
West: Kurrajong Creek Rd												
10	L2	61	5.2	0.100	5.7	LOS A	0.4	2.8	0.23	0.57	0.23	59.6
12	R2	41	5.1	0.100	6.7	LOS A	0.4	2.8	0.23	0.57	0.23	59.4
Approach		102	5.2	0.100	6.1	LOS A	0.4	2.8	0.23	0.57	0.23	59.5
All Vehicles		272	13.2	0.100	2.8	NA	0.4	2.8	0.10	0.25	0.10	82.4

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.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
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 [AM Ex Mine Access and Kurrajong Creek]

Narrabri Mine Access and Kurrajong Creek Rd
Surveyed AM peak hour 5:45-6:45am
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Kurrajong Creek Rd S												
1	L2	6	16.7	0.006	6.2	LOS A	0.0	0.2	0.24	0.53	0.24	52.2
3	R2	1	0.0	0.006	6.0	LOS A	0.0	0.2	0.24	0.53	0.24	47.5
Approach		7	14.3	0.006	6.2	LOS A	0.0	0.2	0.24	0.53	0.24	51.7
East: Kurrajong Creek Rd E												
4	L2	4	0.0	0.079	5.4	LOS A	0.0	0.0	0.00	0.02	0.00	57.0
5	T1	151	1.4	0.079	0.0	LOS A	0.0	0.0	0.00	0.02	0.00	59.7
Approach		155	1.4	0.079	0.1	NA	0.0	0.0	0.00	0.02	0.00	59.7
West: Narrabri Mine												
11	T1	22	0.0	0.012	0.0	LOS A	0.0	0.0	0.03	0.03	0.03	59.4
12	R2	1	0.0	0.012	5.9	LOS A	0.0	0.0	0.03	0.03	0.03	57.4
Approach		23	0.0	0.012	0.3	NA	0.0	0.0	0.03	0.03	0.03	59.2
All Vehicles		185	1.7	0.079	0.4	NA	0.0	0.2	0.01	0.04	0.01	59.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
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 [PM Ex Mine Access and Kurrajong Creek]

Narrabri Mine Access and Kurrajong Creek Rd
Surveyed PM peak hour 4:15-5:15pm
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Kurrajong Creek Rd S												
1	L2	2	0.0	0.003	5.6	LOS A	0.0	0.1	0.05	0.57	0.05	53.4
3	R2	1	100.0	0.003	6.9	LOS A	0.0	0.1	0.05	0.57	0.05	46.5
Approach		3	33.3	0.003	6.1	LOS A	0.0	0.1	0.05	0.57	0.05	51.7
East: Kurrajong Creek Rd E												
4	L2	3	0.0	0.008	5.4	LOS A	0.0	0.0	0.00	0.12	0.00	55.6
5	T1	13	8.3	0.008	0.0	LOS A	0.0	0.0	0.00	0.12	0.00	58.1
Approach		16	6.7	0.008	1.1	NA	0.0	0.0	0.00	0.12	0.00	57.6
West: Narrabri Mine												
11	T1	99	3.2	0.052	0.0	LOS A	0.0	0.0	0.00	0.01	0.00	59.9
12	R2	1	0.0	0.052	5.5	LOS A	0.0	0.0	0.00	0.01	0.00	57.7
Approach		100	3.2	0.052	0.1	NA	0.0	0.0	0.00	0.01	0.00	59.8
All Vehicles		119	4.4	0.052	0.4	NA	0.0	0.1	0.00	0.04	0.00	59.2

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.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
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 [AM 2025 Baseline Kamilaroi and Kurrajong Creek]

Kamilaroi Hwy and Kurrajong Creek Rd
Surveyed AM peak hour 5:45-6:45am
2025 Baseline No Project
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Kamilaroi Hwy S												
1	L2	60	7.0	0.034	8.0	LOS A	0.0	0.0	0.00	0.66	0.00	62.9
2	T1	41	30.8	0.025	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
Approach		101	16.7	0.034	4.8	NA	0.0	0.0	0.00	0.39	0.00	78.5
North: Kamilaroi Hwy N												
8	T1	55	13.5	0.031	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
9	R2	97	1.1	0.075	7.8	LOS A	0.3	2.2	0.22	0.63	0.22	61.8
Approach		152	5.6	0.075	5.0	NA	0.3	2.2	0.14	0.40	0.14	76.0
West: Kurrajong Creek Rd												
10	L2	17	0.0	0.021	5.5	LOS A	0.1	0.5	0.13	0.55	0.13	63.5
12	R2	6	0.0	0.021	6.8	LOS A	0.1	0.5	0.13	0.55	0.13	63.2
Approach		23	0.0	0.021	5.9	LOS A	0.1	0.5	0.13	0.55	0.13	63.4
All Vehicles		276	9.2	0.075	5.0	NA	0.3	2.2	0.09	0.41	0.09	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.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
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 [PM 2025 Baseline Kamilaroi and Kurrajong Creek]

Kamilaroi Hwy and Kurrajong Creek Rd
Surveyed PM peak hour 4:15-5:15pm
2025 Baseline No Project
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Kamilaroi Hwy S												
1	L2	3	33.3	0.002	8.7	LOS A	0.0	0.0	0.00	0.66	0.00	61.2
2	T1	95	18.9	0.055	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
Approach		98	19.4	0.055	0.3	NA	0.0	0.0	0.00	0.02	0.00	98.8
North: Kamilaroi Hwy N												
8	T1	75	15.5	0.042	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
9	R2	14	30.8	0.012	8.7	LOS A	0.0	0.4	0.22	0.62	0.22	60.0
Approach		88	17.9	0.042	1.4	NA	0.0	0.4	0.03	0.10	0.03	93.9
West: Kurrajong Creek Rd												
10	L2	61	5.2	0.101	5.8	LOS A	0.4	2.9	0.25	0.57	0.25	59.5
12	R2	41	5.1	0.101	6.8	LOS A	0.4	2.9	0.25	0.57	0.25	59.3
Approach		102	5.2	0.101	6.2	LOS A	0.4	2.9	0.25	0.57	0.25	59.4
All Vehicles		288	13.9	0.101	2.7	NA	0.4	2.9	0.10	0.24	0.10	83.3

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.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
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 [AM 2025 Baseline Mine Access and Kurrajong Creek]

Narrabri Mine Access and Kurrajong Creek Rd
Surveyed AM peak hour 5:45-6:45am
2025 Baseline No Project
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Kurrajong Creek Rd S												
1	L2	6	16.7	0.006	6.2	LOS A	0.0	0.2	0.24	0.53	0.24	52.2
3	R2	1	0.0	0.006	6.0	LOS A	0.0	0.2	0.24	0.53	0.24	47.5
Approach		7	14.3	0.006	6.2	LOS A	0.0	0.2	0.24	0.53	0.24	51.7
East: Kurrajong Creek Rd E												
4	L2	6	16.7	0.081	5.3	LOS A	0.0	0.0	0.00	0.02	0.00	55.6
5	T1	151	1.4	0.081	0.0	LOS A	0.0	0.0	0.00	0.02	0.00	59.7
Approach		157	2.0	0.081	0.2	NA	0.0	0.0	0.00	0.02	0.00	59.5
West: Narrabri Mine												
11	T1	22	0.0	0.012	0.0	LOS A	0.0	0.0	0.03	0.03	0.03	59.4
12	R2	1	0.0	0.012	5.9	LOS A	0.0	0.0	0.03	0.03	0.03	57.4
Approach		23	0.0	0.012	0.3	NA	0.0	0.0	0.03	0.03	0.03	59.2
All Vehicles		187	2.2	0.081	0.5	NA	0.0	0.2	0.01	0.04	0.01	58.9

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.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
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 [PM 2025 Baseline Mine Access and Kurrajong Creek]

Narrabri Mine Access and Kurrajong Creek Rd
Surveyed PM peak hour 4:15-5:15pm
2025 Baseline No Project
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Kurrajong Creek Rd S												
1	L2	2	0.0	0.005	5.6	LOS A	0.0	0.2	0.06	0.57	0.06	53.3
3	R2	3	66.7	0.005	6.9	LOS A	0.0	0.2	0.06	0.57	0.06	45.8
Approach		5	40.0	0.005	6.4	LOS A	0.0	0.2	0.06	0.57	0.06	49.5
East: Kurrajong Creek Rd E												
4	L2	3	0.0	0.008	5.4	LOS A	0.0	0.0	0.00	0.12	0.00	55.6
5	T1	13	8.3	0.008	0.0	LOS A	0.0	0.0	0.00	0.12	0.00	58.1
Approach		16	6.7	0.008	1.1	NA	0.0	0.0	0.00	0.12	0.00	57.6
West: Narrabri Mine												
11	T1	99	3.2	0.052	0.0	LOS A	0.0	0.0	0.00	0.01	0.00	59.9
12	R2	1	0.0	0.052	5.5	LOS A	0.0	0.0	0.00	0.01	0.00	57.7
Approach		100	3.2	0.052	0.1	NA	0.0	0.0	0.00	0.01	0.00	59.8
All Vehicles		121	5.2	0.052	0.5	NA	0.0	0.2	0.00	0.05	0.00	58.9

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.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
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 [AM 2025 Project Kamilaroi and Kurrajong Creek]

Kamilaroi Hwy and Kurrajong Creek Rd
Surveyed AM peak hour 5:45-6:45am
2025 With Project
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Kamilaroi Hwy S												
1	L2	69	7.6	0.039	8.0	LOS A	0.0	0.0	0.00	0.66	0.00	62.9
2	T1	41	30.8	0.025	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
Approach		111	16.2	0.039	5.1	NA	0.0	0.0	0.00	0.41	0.00	77.1
North: Kamilaroi Hwy N												
8	T1	55	13.5	0.031	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
9	R2	109	1.0	0.085	7.9	LOS A	0.4	2.5	0.23	0.63	0.23	61.7
Approach		164	5.1	0.085	5.3	NA	0.4	2.5	0.15	0.42	0.15	74.9
West: Kurrajong Creek Rd												
10	L2	17	0.0	0.021	5.5	LOS A	0.1	0.5	0.13	0.55	0.13	63.4
12	R2	6	0.0	0.021	7.0	LOS A	0.1	0.5	0.13	0.55	0.13	63.1
Approach		23	0.0	0.021	5.9	LOS A	0.1	0.5	0.13	0.55	0.13	63.3
All Vehicles		298	8.8	0.085	5.2	NA	0.4	2.5	0.09	0.43	0.09	74.8

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.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
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 [PM 2025 Project Kamilaroi and Kurrajong Creek]

Kamilaroi Hwy and Kurrajong Creek Rd
Surveyed PM peak hour 4:15-5:15pm
2025 With Extension - Peak Hours Coinciding
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Kamilaroi Hwy S												
1	L2	4	50.0	0.003	9.1	LOS A	0.0	0.0	0.00	0.66	0.00	60.1
2	T1	96	18.7	0.055	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
Approach		100	20.0	0.055	0.4	NA	0.0	0.0	0.00	0.03	0.00	98.3
North: Kamilaroi Hwy N												
8	T1	76	15.3	0.043	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
9	R2	14	30.8	0.012	8.8	LOS A	0.0	0.4	0.23	0.62	0.23	60.0
Approach		89	17.6	0.043	1.3	NA	0.0	0.4	0.03	0.09	0.03	94.0
West: Kurrajong Creek Rd												
10	L2	74	4.3	0.124	5.8	LOS A	0.5	3.6	0.26	0.57	0.26	59.8
12	R2	51	6.3	0.124	6.9	LOS A	0.5	3.6	0.26	0.57	0.26	58.8
Approach		124	5.1	0.124	6.2	LOS A	0.5	3.6	0.26	0.57	0.26	59.4
All Vehicles		314	13.4	0.124	3.0	NA	0.5	3.6	0.11	0.26	0.11	81.7

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.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
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 [AM 2025 Project Mine Access and Kurrajong Creek]

Narrabri Mine Access and Kurrajong Creek Rd
Surveyed AM peak hour 5:45-6:45am
2025 With Project
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Kurrajong Creek Rd S												
1	L2	6	16.7	0.006	6.3	LOS A	0.0	0.2	0.26	0.54	0.26	52.1
3	R2	1	0.0	0.006	6.1	LOS A	0.0	0.2	0.26	0.54	0.26	47.4
Approach		7	14.3	0.006	6.3	LOS A	0.0	0.2	0.26	0.54	0.26	51.7
East: Kurrajong Creek Rd E												
4	L2	6	16.7	0.092	5.3	LOS A	0.0	0.0	0.00	0.02	0.00	55.7
5	T1	173	1.8	0.092	0.0	LOS A	0.0	0.0	0.00	0.02	0.00	59.7
Approach		179	2.4	0.092	0.2	NA	0.0	0.0	0.00	0.02	0.00	59.6
West: Narrabri Mine												
11	T1	22	0.0	0.012	0.0	LOS A	0.0	0.1	0.03	0.03	0.03	59.4
12	R2	1	0.0	0.012	6.0	LOS A	0.0	0.1	0.03	0.03	0.03	57.4
Approach		23	0.0	0.012	0.3	NA	0.0	0.1	0.03	0.03	0.03	59.2
All Vehicles		209	2.5	0.092	0.4	NA	0.0	0.2	0.01	0.04	0.01	59.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
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 [PM 2025 Project Mine Access and Kurrajong Creek]

Narrabri Mine Access and Kurrajong Creek Rd
Surveyed PM peak hour 4:15-5:15pm
2025 With Extension Coinciding
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Kurrajong Creek Rd S												
1	L2	2	0.0	0.005	5.6	LOS A	0.0	0.2	0.07	0.57	0.07	53.3
3	R2	3	66.7	0.005	7.1	LOS A	0.0	0.2	0.07	0.57	0.07	45.7
Approach		5	40.0	0.005	6.5	LOS A	0.0	0.2	0.07	0.57	0.07	49.4
East: Kurrajong Creek Rd E												
4	L2	3	0.0	0.009	5.4	LOS A	0.0	0.0	0.00	0.11	0.00	55.6
5	T1	14	15.4	0.009	0.0	LOS A	0.0	0.0	0.00	0.11	0.00	58.1
Approach		17	12.5	0.009	1.0	NA	0.0	0.0	0.00	0.11	0.00	57.6
West: Narrabri Mine												
11	T1	121	3.5	0.063	0.0	LOS A	0.0	0.0	0.00	0.01	0.00	59.9
12	R2	1	0.0	0.063	5.5	LOS A	0.0	0.0	0.00	0.01	0.00	57.7
Approach		122	3.4	0.063	0.0	NA	0.0	0.0	0.00	0.01	0.00	59.9
All Vehicles		144	5.8	0.063	0.4	NA	0.0	0.2	0.00	0.04	0.00	59.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
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 [AM 2032 Project Kamilaroi and Kurrajong Creek]

Kamilaroi Hwy and Kurrajong Creek Rd
Surveyed AM peak hour 5:45-6:45am
2032 With Project
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Kamilaroi Hwy S												
1	L2	69	7.6	0.039	8.0	LOS A	0.0	0.0	0.00	0.66	0.00	62.9
2	T1	43	29.3	0.026	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
Approach		113	15.9	0.039	5.0	NA	0.0	0.0	0.00	0.41	0.00	77.6
North: Kamilaroi Hwy N												
8	T1	48	17.4	0.028	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
9	R2	109	1.0	0.086	7.9	LOS A	0.4	2.5	0.23	0.63	0.23	61.7
Approach		158	6.0	0.086	5.5	NA	0.4	2.5	0.16	0.44	0.16	73.8
West: Kurrajong Creek Rd												
10	L2	17	0.0	0.023	5.5	LOS A	0.1	0.6	0.14	0.55	0.14	62.2
12	R2	7	14.3	0.023	7.2	LOS A	0.1	0.6	0.14	0.55	0.14	56.1
Approach		24	4.3	0.023	6.0	LOS A	0.1	0.6	0.14	0.55	0.14	60.2
All Vehicles		295	9.6	0.086	5.3	NA	0.4	2.5	0.10	0.43	0.10	74.1

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.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
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 [PM 2032 Project Kamilaroi and Kurrajong Creek]

Kamilaroi Hwy and Kurrajong Creek Rd
Surveyed PM peak hour 4:15-5:15pm
2032 With Project - Peak Hours Coinciding
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Kamilaroi Hwy S												
1	L2	7	71.4	0.006	9.7	LOS A	0.0	0.0	0.00	0.67	0.00	58.8
2	T1	81	15.6	0.046	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
Approach		88	20.2	0.046	0.8	NA	0.0	0.0	0.00	0.06	0.00	96.5
North: Kamilaroi Hwy N												
8	T1	66	12.7	0.037	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
9	R2	11	10.0	0.008	8.0	LOS A	0.0	0.2	0.20	0.61	0.20	61.4
Approach		77	12.3	0.037	1.1	NA	0.0	0.2	0.03	0.08	0.03	94.9
West: Kurrajong Creek Rd												
10	L2	71	0.0	0.113	5.7	LOS A	0.4	3.1	0.23	0.56	0.23	61.9
12	R2	48	2.2	0.113	6.6	LOS A	0.4	3.1	0.23	0.56	0.23	60.7
Approach		119	0.9	0.113	6.1	LOS A	0.4	3.1	0.23	0.56	0.23	61.4
All Vehicles		284	10.0	0.113	3.1	NA	0.4	3.1	0.10	0.28	0.10	81.6

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.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
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 [AM 2032 Project Mine Access and Kurrajong Creek]

Narrabri Mine Access and Kurrajong Creek Rd
Surveyed AM peak hour 5:45-6:45am
2032 With Project
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Kurrajong Creek Rd S												
1	L2	6	16.7	0.006	6.3	LOS A	0.0	0.2	0.26	0.54	0.26	52.1
3	R2	1	0.0	0.006	6.1	LOS A	0.0	0.2	0.26	0.54	0.26	47.4
Approach		7	14.3	0.006	6.3	LOS A	0.0	0.2	0.26	0.54	0.26	51.7
East: Kurrajong Creek Rd E												
4	L2	6	16.7	0.092	5.3	LOS A	0.0	0.0	0.00	0.02	0.00	55.7
5	T1	173	1.8	0.092	0.0	LOS A	0.0	0.0	0.00	0.02	0.00	59.7
Approach		179	2.4	0.092	0.2	NA	0.0	0.0	0.00	0.02	0.00	59.6
West: Narrabri Mine												
11	T1	22	0.0	0.012	0.0	LOS A	0.0	0.1	0.03	0.03	0.03	59.4
12	R2	1	0.0	0.012	6.0	LOS A	0.0	0.1	0.03	0.03	0.03	57.4
Approach		23	0.0	0.012	0.3	NA	0.0	0.1	0.03	0.03	0.03	59.2
All Vehicles		209	2.5	0.092	0.4	NA	0.0	0.2	0.01	0.04	0.01	59.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
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 [PM 2032 Project Mine Access and Kurrajong Creek]

Narrabri Mine Access and Kurrajong Creek Rd
Surveyed PM peak hour 4:15-5:15pm
2032 With Project Coinciding
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Kurrajong Creek Rd S												
1	L2	3	33.3	0.003	6.0	LOS A	0.0	0.1	0.06	0.56	0.06	52.1
3	R2	1	0.0	0.003	5.9	LOS A	0.0	0.1	0.06	0.56	0.06	48.3
Approach		4	25.0	0.003	6.0	LOS A	0.0	0.1	0.06	0.56	0.06	51.4
East: Kurrajong Creek Rd E												
4	L2	4	25.0	0.011	5.3	LOS A	0.0	0.0	0.00	0.13	0.00	53.7
5	T1	15	21.4	0.011	0.0	LOS A	0.0	0.0	0.00	0.13	0.00	58.1
Approach		19	22.2	0.011	1.2	NA	0.0	0.0	0.00	0.13	0.00	57.1
West: Narrabri Mine												
11	T1	118	0.9	0.061	0.0	LOS A	0.0	0.0	0.00	0.01	0.00	59.9
12	R2	1	0.0	0.061	5.5	LOS A	0.0	0.0	0.00	0.01	0.00	57.7
Approach		119	0.9	0.061	0.0	NA	0.0	0.0	0.00	0.01	0.00	59.9
All Vehicles		142	4.4	0.061	0.4	NA	0.0	0.1	0.00	0.04	0.00	59.1

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.
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SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
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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