

Wybong Road/Mangoola Coal Mine Northern Access Road intersection (refer to Figure 2.14) is priority controlled 'AUR' type intersection which treatment provides a widened section of sealed pavement equivalent in width to the adjacent through lane. The adjoined shoulder is at least 1.0 m wide. The sealed area is sufficient for a 19.0 m heavy vehicle to deviate from its through path and pass on the left of a single unit heavy vehicle. There is an adequate sight distance looking from each approach in all directions.



Figure 2.14 Bengalla Link Road/Wybong Road intersection

New England Highway/Sydney Street (refer to Figure 2.15) is an urban signalised intersection in Muswellbrook, with two approach and two departure lanes on each intersection's approach.



Figure 2.15 New England Highway/Sydney Street intersection

2.2 School bus operation

The local school bus service is the only public transport service that operates in the vicinity of the Mangoola Coal Mine. The school bus service uses Wybong Road and Wybong Post Office Road to transport school children to schools at Sandy Hollow and Denman.

In the AM the school bus reaches Wybong Post Office Road at approximately 7.30 am and continues to Yarraman where the turns round and retraces its route before turning left onto Wybong Road at approximately 7.50 am.

In the PM the school bus reaches Wybong Post Office Road at approximately 4.10 pm, travels to Yarraman and then returns by the same route before turning right onto Wybong Road at approximately 4.25 pm. The bus then proceeds along Wybong Road reaching Sandy Hollow by approximately 5.00 pm.

The operation of the school bus on Wybong Post Road would not be affected by heavy vehicle deliveries as these will not operate whilst the school bus is in operation and road closure would occur after consultation with the bus operator so as to reduce any possible impact.

2.3 Cycling and pedestrian access

The remote location of the mine in relation to major townships does not encourage cycling or walking trips as a travel to work mode. Due to its rural location, there are no dedicated cycling or pedestrian facilities such as bike lanes, off-road shared paths or footpaths in the vicinity of the Mangoola Coal Mine, with the exception of a few cycling symbols in the pavement of the road shoulder of Denman Road at its intersection with Bengalla Link Road, indicating a dedicated cycling lane through the intersection. Cyclists who do choose to ride to work would be required to share the road with vehicular traffic.

2.4 Heavy vehicles route

Substantial upgrade works have been completed on Wybong Road, east of the Mangoola Coal Northern Mine Access Road. All heavy vehicle traffic including oversize/over-mass vehicles use the preferred mine access route from New England Highway via Thomas Mitchell Drive, Bengalla Link Road and Wybong Road East. The preferred access route is shown in Figure 2.16.

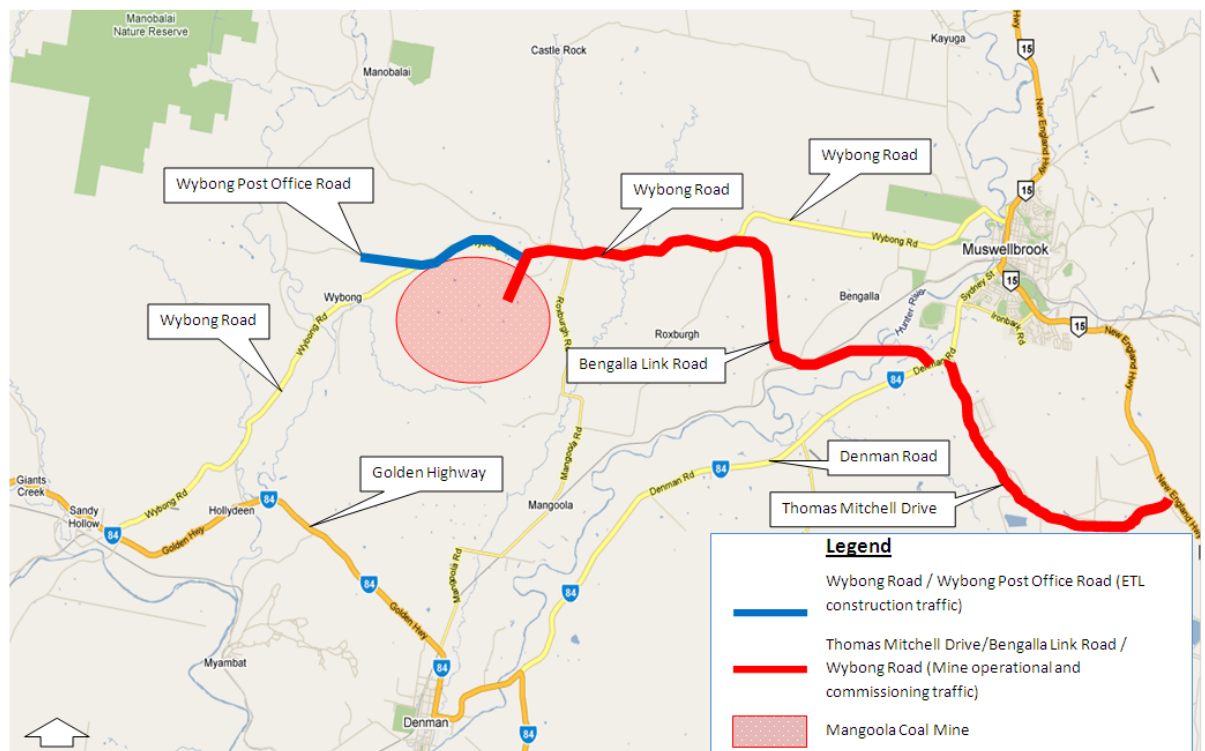


Figure 2.16 Heavy vehicle mine access route

2.5 Recent road upgrades

As part of the works required by the original Project Approval (06-0014), Mangoola Coal has funded and undertaken substantial road upgrades over the last 3 years at a cost of \$11.8 million. Wybong Road East has also been upgraded as has the intersection of the Golden Highway/Wybong Road intersection in Sandy Hollow.

The following safety works have been undertaken by Mangoola Coal to upgrade Wybong Road West:

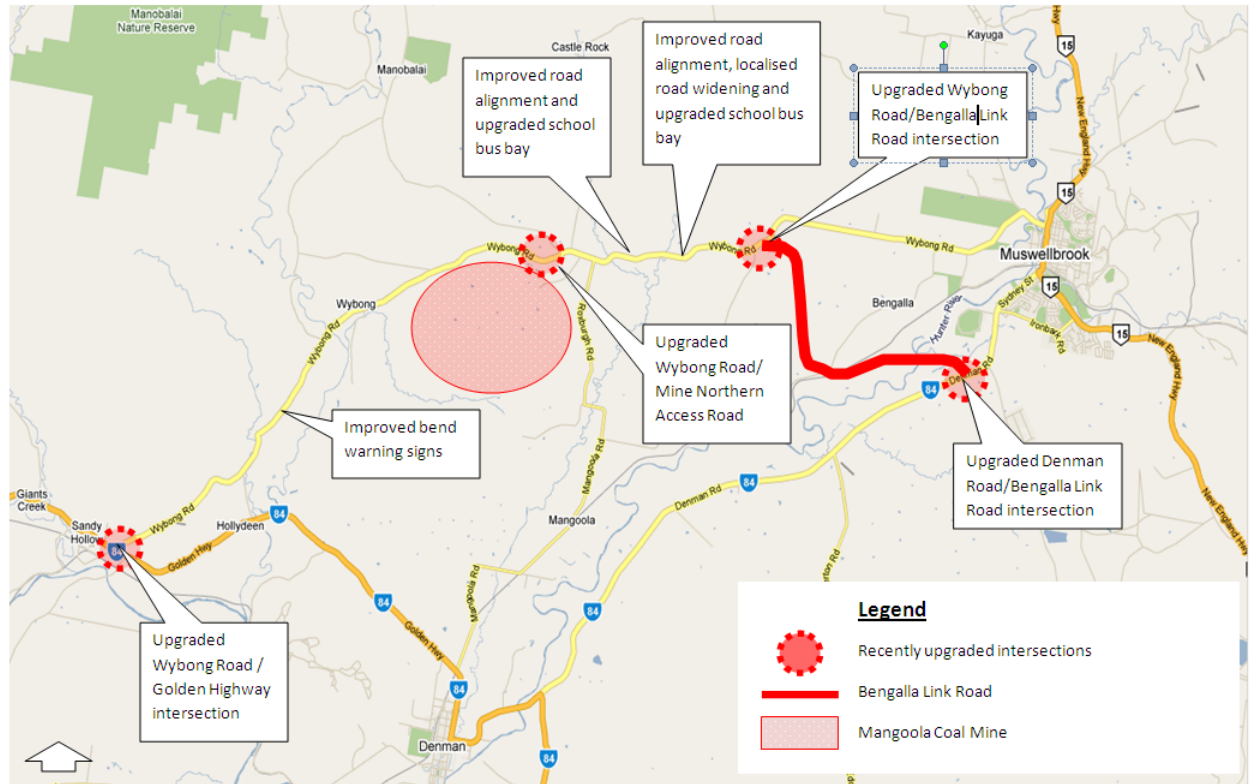
- enhanced signing, particularly on substandard bends
- installation of safety barriers
- localised road widening to provide a minimum of 6.5 m sealed pavement width
- improved facilities for the school buses.

In addition to the Project Approval conditions, Mangoola Coal is currently in negotiation with Muswellbrook Shire Council (MSC) with respect to further upgrades of Wybong Road. The amelioration of failed areas along Wybong Road is currently underway, and a resolution with respect to a long term solution will be discussed with MSC. A long term strategy/solution to be agreed with MCS engineers will be based upon tests carried out on the road conditions in February 2011.

In addition to the above works, the following intersections have been upgraded:

- Bengalla Road/Denman Road intersection
- Wybong Road/Bengalla Road intersection
- Wybong Road/Mangoola Coal Mine Northern Access Road intersection.

Figure 2.17 shows a summary of recent road upgrades.



Source: Google

Figure 2.17 Recent road upgrades

2.6 2011 Existing traffic volumes

Turning movement surveys were undertaken on Thursday 31 March 2011, between 6.00 am and 8.00 pm at the following key intersections (refer to Figure 2.18):

- Thomas Mitchell Drive/New England Highway
- Tomas Mitchell Drive/Denman Road
- Wybong Road/Wybong Post Office Road
- Denman Road/Bengalla Link Road
- Wybong Road/Bengalla Link Road
- New England Highway/Sydney Street

- Kayuga Road/Wybong Road
- Wybong Road/Mangoolia Coal Mine Northern Access Road.

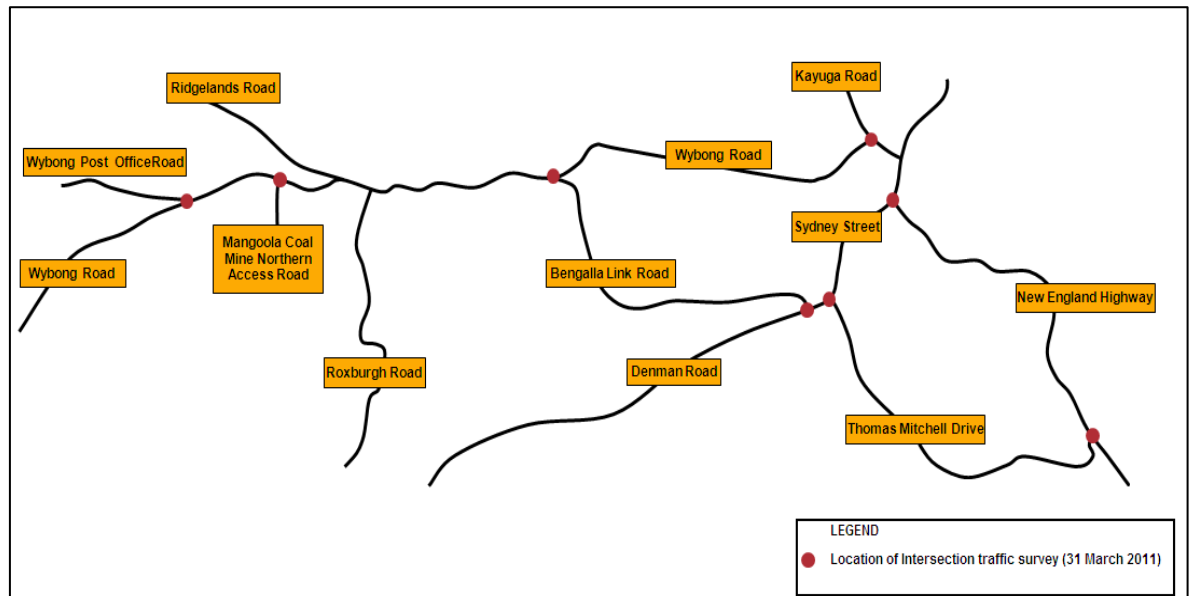


Figure 2.18 Location of traffic surveys and traffic count data stations

The turning traffic count survey indicated that the traffic peak hours occurred between 6.00 am and 7.00 am in the morning and between 4.45 pm and 5.45 pm in the afternoon.

Figures 2.19 and 2.20 show the existing turning movement volumes at the intersections during the analysed peak hours.

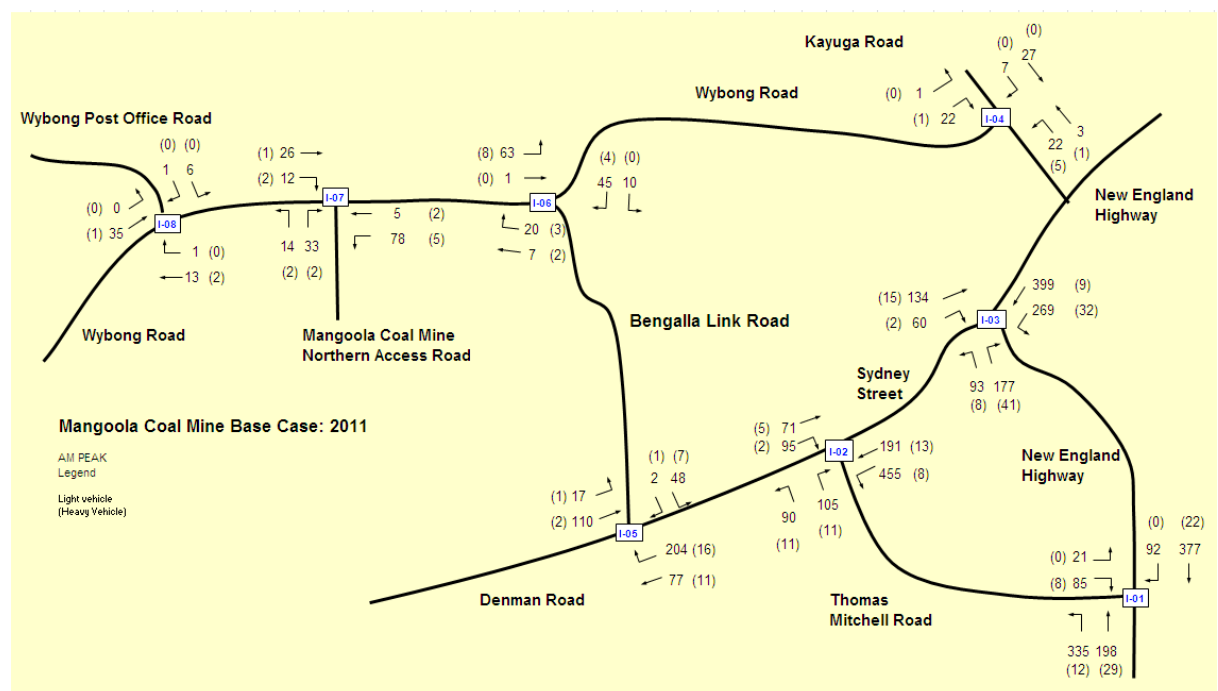


Figure 2.19 Existing intersections AM peak traffic volumes (6.00 am to 7.00 am)

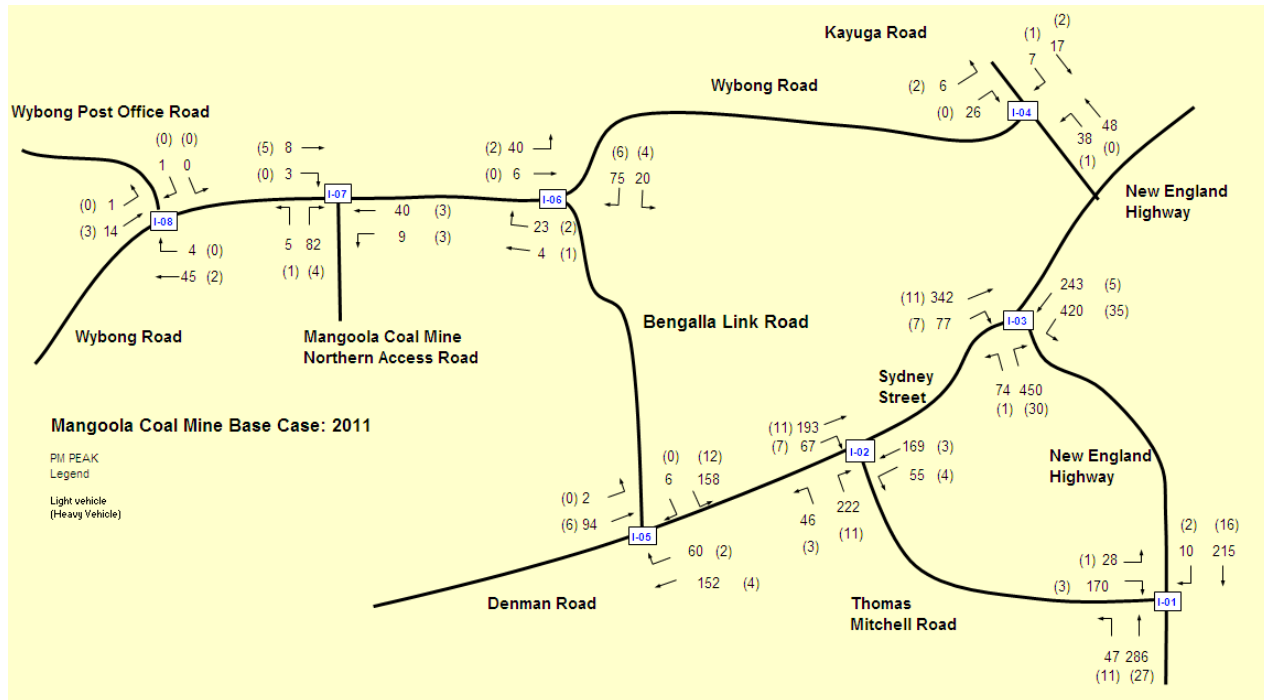


Figure 2.20 Existing intersections PM peak traffic volumes (4.45 pm to 5.45 pm)

2.6.1 Existing intersection traffic performance

2.6.1.1 Model performance indicators

The ability of each of the key intersections to cater for existing and future traffic forecasts was investigated using the SIDRA intersection software package. This package provides several useful indicators in order to determine the level of intersection performance. This report has used four typical performance indicators as listed and described below:

- level of service (LoS)
- degree of saturation (DoS)
- average intersection delay, and
- queue length.

2.6.1.2 Level of Service (LoS)

LoS is a basic performance parameter used to describe the operation of an intersection. Levels of service range from A (indicating good intersection operation) to F (indicating over saturated conditions with long delays and queues). At signalised intersections, the LoS criteria are related to average intersection delay (seconds per vehicle). At priority controlled (give-way and stop controlled) and roundabout intersections, the LoS is based on the modelled delay (seconds per vehicle) for the most delayed movement (refer to Table 2.1).

Table 2.1 RTA levels of service

Level of service	Average delay (seconds per vehicle)	Traffic signals, Roundabout	Priority Intersection ('Stop' and 'Give Way')
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	Operating near capacity	Near capacity and accident study required
E	57 to 70	At capacity. At signals, incidents will cause excessive delays. Roundabouts require other control mode	At capacity; requires other control mode
F	Greater than 71	Unsatisfactory with excessive queuing	Unsatisfactory with excessive queuing; requires other control mode

Source: RTA Guide to Traffic Generating Developments (2002)

2.6.1.3 Degree of saturation (DoS)

DoS is the ratio of demand flow to capacity, and therefore has no unit. As it approaches 1.0, extensive queues and delays could be expected. For a satisfactory situation, DoS should be less than the nominated practical degree of saturation, usually 0.9. The intersection DoS is based on the movement with the highest value.

2.6.1.4 Delay

Delay is the difference between interrupted and uninterrupted travel times through the intersection and is measured in seconds per vehicle. At signalised intersections and roundabouts, the average intersection delay is usually reported. At priority controlled intersections, the average delay for the most delayed movement is usually reported.

2.6.1.5 Queue length

Queue length is directly related to the number of vehicles waiting at the stop line and is usually quoted as the 95th percentile back of queue, which is the value below which 95% of all observed queue lengths fall. It is measured as the length occupied by the vehicles per traffic lane at the start of the green period, when traffic starts moving again after a red signal. The intersection queue length is usually taken from the movement with the longest queue length.

2.6.2 2011 current situation – performance of the key intersections

Figure 2.21 shows the locations of the analysed key intersections and Table 2.2 shows the SIDRA modelling results of their performance under the current traffic conditions.

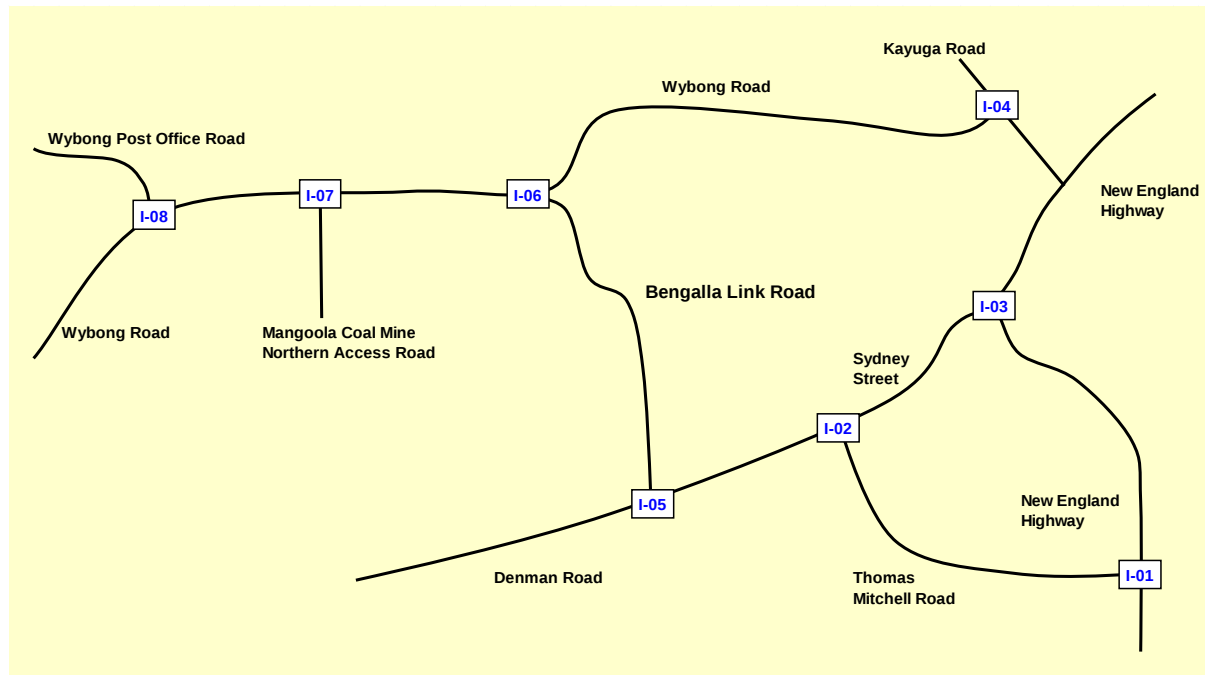


Figure 2.21 Locations of the key intersections

Table 2.2 Modelled existing intersections performance

Intersection	Peak period	DoS	Delays (Sec)	LoS	Queue (m)
I-01 New England Highway/Thomas Mitchell Drive	AM	0.60	48	D	26
	PM	0.56	28	B	28
I-02 Denman Road/Thomas Mitchell Drive	AM	0.34	21	B	13
	PM	0.52	19	B	25
I-03 New England Highway/Sydney Street	AM	0.43	31	C	85
	PM	0.71	36	C	133
I-04 Kayuga Road/Wybong Road	AM	0.03	13	A	1
	PM	0.05	13	A	1
I-05 Denman Road/Bengalla Link Road	AM	0.19	14	A	8
	PM	0.18	13	A	7
I-06 Wybong Road/Bengalla Link Road	AM	0.07	13	A	2
	PM	0.13	14	A	4
I-07 Wybong Road/Mangoola Coal Mine Northern Access Road	AM	0.06	12	A	2
	PM	0.10	12	A	3
I-08 Wybong Road/Wybong Post Office Road	AM	0.02	12	A	1
	PM	0.03	12	A	1

The analysis indicates that all of the key intersections operate within their design capacity, with enough spare capacity and with LoS D or better. Furthermore, the layouts of the key intersections are such that sufficient space is provided for queued vehicles.

The longest queue occurred at the New England Highway/Sydney Street intersection. This traffic comprises non-mine related right turning traffic passing through Muswellbrook or travelling to its CBD. However, the left turning traffic, which may include mine traffic, does not experience significant queuing.

The intersections that carry most of the mine related traffic operate at a good level of service.

Three of the key intersections on the route to Mangoola Coal Mine have recently been upgraded, as discussed in Section 2.5.

2.7 Road safety

As part of this traffic assessment, a road safety deficiency assessment was conducted in accordance with the RTA's *Guide to Traffic Generating Developments (2002)*. This assessment includes the roads used by the majority of construction and operational traffic associated with the Mangoola Coal Mine plan modifications and proposed ETL relocation.

2.7.1 Road safety deficiencies

2.7.1.1 Wybong Road

The following road safety deficiencies were identified on Wybong Road during the safety assessment:

- On approach to the intersection with Bengalla Link Road, the edge line is covered with chipseal aggregate and as such is not clearly visible (refer to Figure 2.22) while some of the road markings at the intersection is faded with no sufficient contrast between the road markings and the pavement (refer to Figure 2.23). Both these deficiencies may results in poor road delineation at night and in adverse weather conditions, affecting safety of the road users².

² This section was constructed as part of the Bengalla Link Road constructed by Bengalla Mine



Figure 2.22 Edge line covered with chipseal aggregate - Wybong Road, looking eastbound toward its intersection with Bengalla Link Road



Figure 2.23 No sufficient contrast between the road markings and the pavement - Wybong Road/Bengalla Link Road intersection

2.7.1.2 Wybong Post Office Road

The following road safety deficiencies were identified on Wybong Post Office Road during the safety assessment:

- the width of Wybong Post Office Road is only in the range of 3.8 m to 4.0 m, which is too narrow for a two-way, two lane road
- no speed limits are posted
- the road shoulders are narrow and unpaved.

The characteristics of this road and lack of the mentioned road features may result in a higher accident rate. Any driver potentially using this road may be unfamiliar with the substandard road condition, which represents a route of inferior quality to the normal route along Wybong Road.

2.7.1.3 Thomas Mitchell Drive

The following road safety deficiencies were identified along Thomas Mitchell Road during the safety assessment:

- There are quite narrow sealed shoulders provided on both sides of the road. Considering the annual average daily traffic of over 1,000 vehicles per day, the shoulder width is less than minimum required 2.0 m, as prescribed by the *RTA's Road Design Guide*.
- There are some potholes, uneven road surface and other pavement deficiencies on approach to and at the intersection with Denman Road (refer to Figures 2.24 to 2.26). Potholes and uneven road surface can cause safety problems for road users as well as moisture infiltration resulting in even further road deterioration.



Figure 2.24 Potholes, uneven road surface and other pavement deficiencies - Thomas Mitchell Drive, looking eastbound from its intersection with Denman Road



Figure 2.25 Potholes, uneven road surface and other pavement deficiencies - Thomas Mitchell Drive, looking toward its intersection with Denman Road



Figure 2.26 Potholes -Thomas Mitchell Drive/Denman Road intersection

- There is no edge line painted along the section of the road thorough the Muswellbrook Industrial Estate, resulting in poor road delineation especially at night and in adverse weather conditions (refer to Figures 2.27 and 2.28).



Figure 2.27 No edge line painted - Thomas Mitchell Drive, looking eastbound



Figure 2.28 No edge line painted - Thomas Mitchell Drive, looking eastbound

- There are a number of substandard curves along the road where sufficient delineation is not provided (e.g. lack of CAMs or/and guide posts) (refer to Figures 2.29 to 2.33). This increases the risk of loss of control crashes to occur, especially at night and in adverse weather conditions.



Figure 2.29 Substandard curve with no sufficient delineation provided - Thomas Mitchell Drive, looking eastbound



Figure 2.30 Substandard curve with no sufficient delineation provided - Thomas Mitchell Drive, looking eastbound



Figure 2.31 Substandard curve with no sufficient delineation provided - Thomas Mitchell Drive, looking eastbound



Figure 2.32 Substandard curve with no sufficient delineation provided - Thomas Mitchell Drive, looking eastbound



Figure 2.33 Substandard curve with no sufficient delineation provided - Thomas Mitchell Drive, looking eastbound

- Pavement arrows are covered by tyre marks and therefore not clearly visible on approach to the intersection with the New England Highway (refer to Figure 2.34). It may result in driver's poor lane discipline and even some confusion on approach to the intersection, especially at night and in adverse weather conditions, affecting the safety of road users.



Figure 2.34 Pavement arrows covered by tyre marks - Thomas Mitchell Drive, looking westbound, on approach to its intersection with the New England Highway