

Traffic Impact Assessment -

Rutleys Road/Centennial Mannering Access Road Intersection

November 2011

Centennial Mannering Pty Ltd

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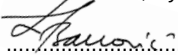
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Contents

	Page number
Glossary	iv
1. Introduction	1
1.1 Study area	3
1.2 Assessment scope	5
1.3 Site visit	5
2. Traffic impact assessment	7
2.1 Existing traffic conditions – traffic volumes	7
2.2 Historic traffic	10
2.3 Traffic generation	10
2.4 Proposed intersection upgrade	11
2.5 Traffic performance	12
2.5.1 Intersection performance metrics	12
2.6 Current intersection performance (2011)	13
2.7 Future intersection performance	15
2.7.1 Background 2012 traffic and current intersection layout	15
2.7.2 2012 operational traffic and current intersection layout	17
2.7.3 2012 operational traffic and new intersection layout	20
2.8 Cycling and pedestrian access	21
3. Conclusions	23

Contents (Continued)

Page number

List of tables

Page number

Table 2.1	Historical traffic flow on the Pacific Highway	10
Table 2.2	RTA levels of service	12
Table 2.3	Modelled existing (2011) intersection performance	14
Table 2.4	2012 Do-nothing intersection performance	17
Table 2.5	2012 Operational intersection performance (increased employee traffic & existing intersection layout)	19
Table 2.6	2012 Operational intersection performance (increased employee traffic & new intersection layout)	20

List of figures

Page number

Figure 1.1	Locality plan	1
Figure 1.2	Mannering Colliery site location	2
Figure 1.3	Rutleys Road, looking southbound from the intersection with Mannering Colliery Access Road	3
Figure 1.4	Rutleys Road, looking northbound from the intersection with Mannering Colliery Access Road	4
Figure 1.5	Mannering Colliery Access Road, looking toward Colliery	4
Figure 1.6	Mannering Colliery Access Road, on approach to its intersection with Rutleys Road	5
Figure 2.1	Existing AM peak hour's traffic volumes (6.00 am–7.00 am)	8
Figure 2.2	Existing AM peak hour's traffic volumes (7.00 am–8.00 am)	8
Figure 2.3	Existing PM peak hour's traffic volumes (2.00 pm–3.00 pm)	9
Figure 2.4	Existing PM peak hour's traffic volumes (3.00 pm–4.00 pm)	9
Figure 2.5	Proposed intersection layout	11
Figure 2.6	Current SIDRA intersection layout	13
Figure 2.7	2012 Do-nothing case AM peak (6.00 am–7.00 am) hourly traffic volume	15
Figure 2.8	2012 2012 Do-nothing case AM peak hour (7.00 am–8.00 am) traffic volume	15
Figure 2.9	2012 2012 Do-nothing case PM peak hour (2.00 pm–3.00 pm) traffic volume	16
Figure 2.10	2012 2012 Do-nothing case PM peak hour (3.00 pm–4.00 pm) traffic volume	16
Figure 2.11	2012 Operational AM peak (6.00 am–7.00 am) hourly traffic volume	17
Figure 2.12	2012 2012 Operational AM peak hour (7.00 am–8.00 am) traffic volume	18
Figure 2.13	2012 2012 Operational PM peak hour (2.00 pm–3.00 pm) traffic volume	18
Figure 2.14	2012 2012 Operational PM peak hour (3.00 pm–4.00 pm) traffic volume	19
Figure 2.15	SIDRA layout of the proposed Rutleys Road/Mannering Colliery Access Road intersection upgrade	20

Appendices

Appendix A
SIDRA movement summaries

Glossary

DoS	Degree of Saturation
DP&I	Department of Planning & Infrastructure
km/h	kilometre per hour
LoS	Level of service
m	metre
ROM	Run-of-mine
RRPM	Retro Reflective Pavement Markers
veh/h	vehicles per hour

1. Introduction

Parsons Brinckerhoff was commissioned by Centennial Mannering Pty Ltd to undertake a traffic impact assessment for the Rutleys Road/Mannering Colliery Access Road intersection, located adjacent to the existing Mannering Colliery site. The intersection and its immediate surrounds are shown on the Locality Plan in Figure 1.1.

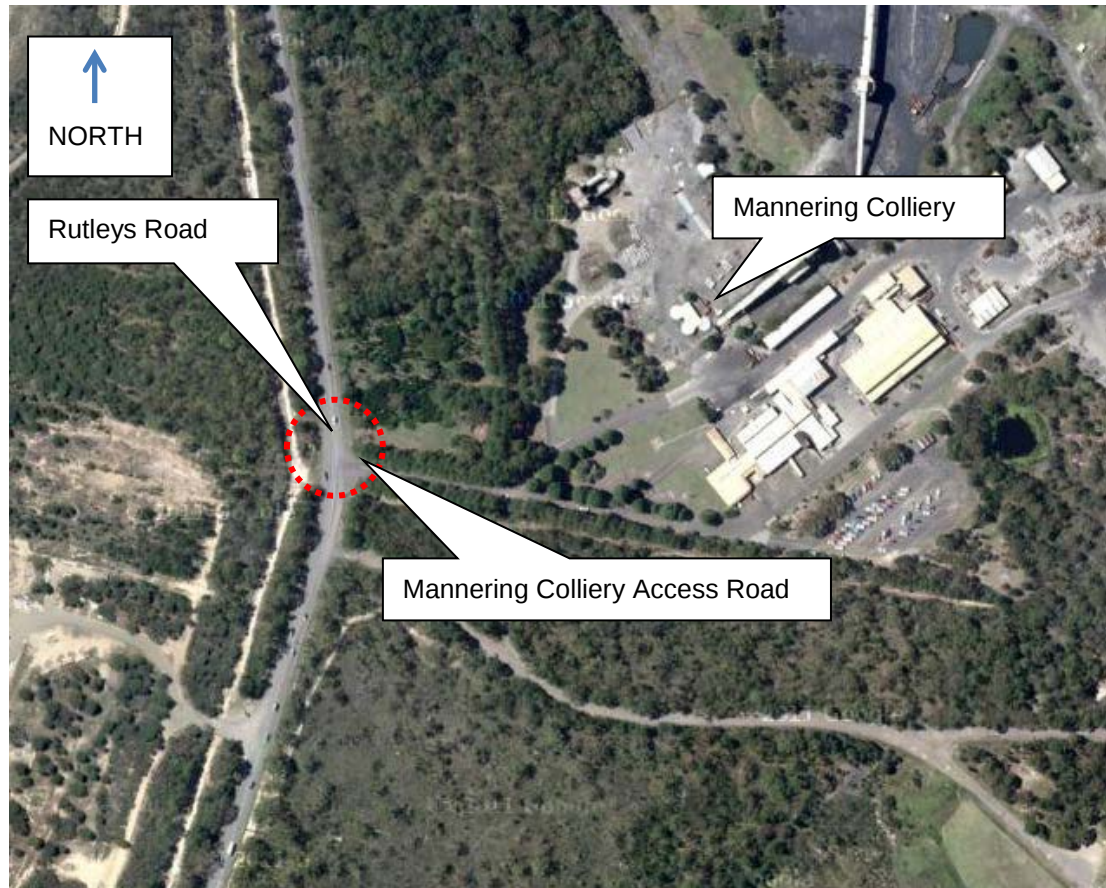


Figure 1.1 Locality plan

Mannering Colliery is an existing underground coal mine located approximately 40 km south of Newcastle (refer to Figure 1.2).

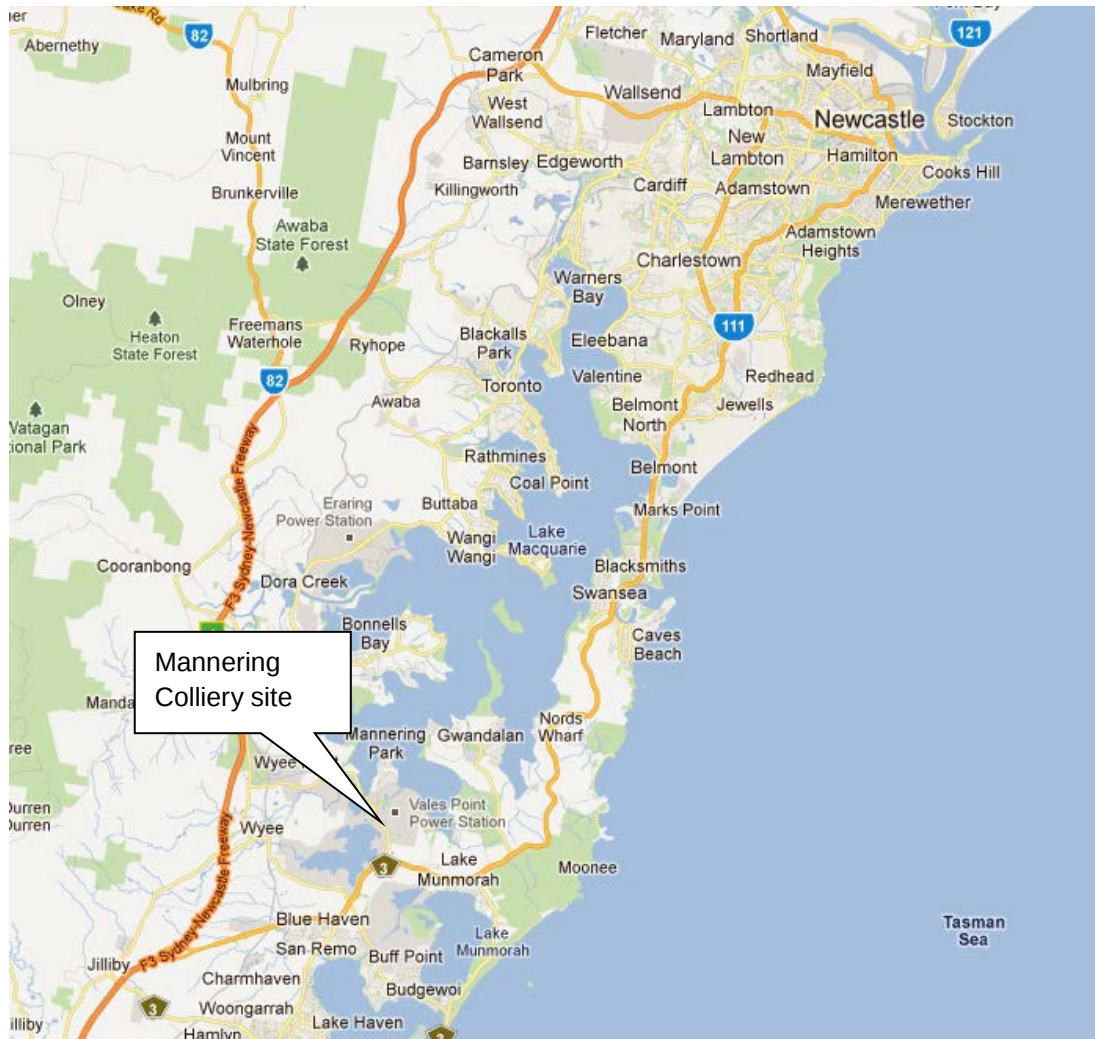


Figure 1.2 Mannering Colliery site location

The mine produces ROM coal which is transported via a dedicated overland conveyor to Vales Point Power Station, for domestic electricity generation.

The extension to Mannering Colliery was granted Project Approval (PA 06-0311) by the then Minister for Planning on 12 March 2008 following the submission of the Mannering Colliery Extension of Mining Environmental Assessment (Hansen Bailey 2007).

Centennial Mannering have applied to the Department of Planning and Infrastructure (DP&I) to modify its consent in order to:

- extend its underground mining operations within the Fassifern Seam and beyond the existing 2008 Project Approval boundary using bord and pillar mining methods
- extend its underground mining operations into the Great Northern Seam using bord and pillar mining methods

- provide full time employment for a total of 170 employees, beyond the currently approved 90 employees.

1.1 Study area

The study area includes the Mannering Colliery Access Road and Rutleys Road intersection, located approximately 900m north of the intersection of Rutleys Road and Pacific Highway at Doyalson North.

Rutleys Road is a two-lane, two-way, undivided rural road approximately 10 m wide (at the intersection), travelling in a general north-south direction. It is a collector road with a posted speed limit of 80 km/h, providing access to a number of coal mine sites and power stations in the nearby vicinity (refer to Figures 1.3 & 1.4).



Figure 1.3 Rutleys Road, looking southbound from the intersection with Mannering Colliery Access Road



Figure 1.4 Rutleys Road, looking northbound from the intersection with Mannering Colliery Access Road

Mannering Colliery Access Road (referred as the Access Road in this report) is a two-way two-lane, sealed access road to the Mannering Colliery which is approximately 7.5 m wide, with a posted speed limit of 15 km/h (refer to Figures 1.5 & 1.6). There is a raised 0.3 m wide concrete median, located on the road's approach to the intersection.



Figure 1.5 Mannering Colliery Access Road, looking toward Colliery



Figure 1.6 Mannering Colliery Access Road, on approach to its intersection with Rutleys Road

1.2 Assessment scope

The following assessment has been undertaken to evaluate the traffic implications of the proposed increase in employment:

- existing traffic conditions at the Rutleys Road/Mannering Colliery Access Road intersection, including the existing traffic volumes and traffic control
- the forecast traffic generated as result of the planned increase in the number of employees was calculated
- an assessment of the existing intersection performance was established by modelling
- an assessment of the future intersection performances, considering the existing and proposed intersection layout were then modelled and compared.

1.3 Site visit

For the purpose of the study, an inspection of the Rutleys Road/Mannering Colliery Access Road intersection was undertaken on Wednesday 14 September 2011. The site inspection allowed Parsons Brinckerhoff to gain a better understanding of the site and current conditions. A number of photographs were taken during the site inspection.

2. Traffic impact assessment

2.1 Existing traffic conditions – traffic volumes

The existing traffic volumes and peak hour turning movements were calculated from the turning movement survey that was undertaken on Monday 19 September 2011, between 5.00 am and 8.00 pm at the Rutleys Road/Mannering Colliery Access Road intersection.

From the survey, the following AM and PM peak traffic hours were identified:

- AM peak hour between 6.00 am and 7.00 am
- PM peak hour between 4.15 pm and 5.15 pm.

As discussed further in Section 2.3, there are three separate shift times over a five day week. The day shift starts at 7.00 am, afternoon shift at 3.00 pm and night shift at 11.00 pm. Employee arrival trips at the colliery prior to the shift, and outbound trips after the shift, indicate that the peak site traffic would occur over a 2 hour period. Given that Rutleys Road is the busier route, the actual peak traffic volumes along Rutleys Road would not necessarily occur at the same time as the site's peak traffic volumes.

Parsons Brinckerhoff has therefore undertaken intersection analyses over four separate one hour peak periods when the site's peak traffic movements occur as these turning movements would be critical to the intersection's operation and performance. The four separate one hour peak periods were as follow:

- AM peak hour between 6.00 am and 7.00 am
- AM peak hour between 7.00 am and 8.00 am
- PM peak hour between 2.00 pm and 3.00 pm
- PM peak hour between 3.00 pm and 4.00 pm.

Figures 2.1 to 2.4 show the existing turning movement volumes at the intersection during the analysed peak hours.

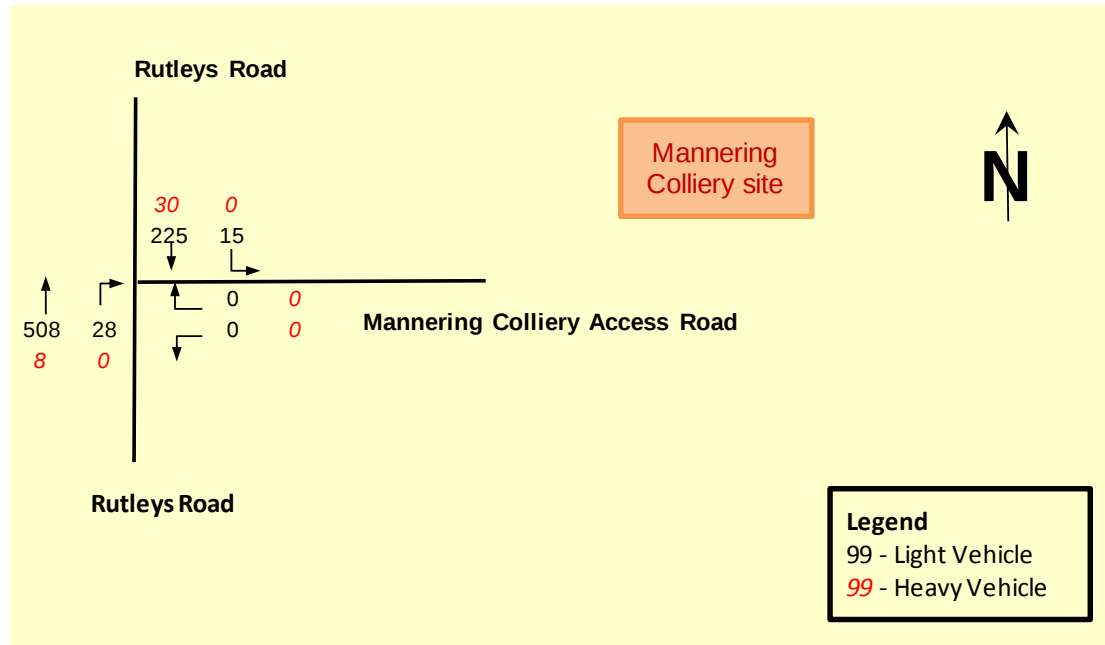


Figure 2.1 Existing AM peak hour's traffic volumes (6.00 am–7.00 am)

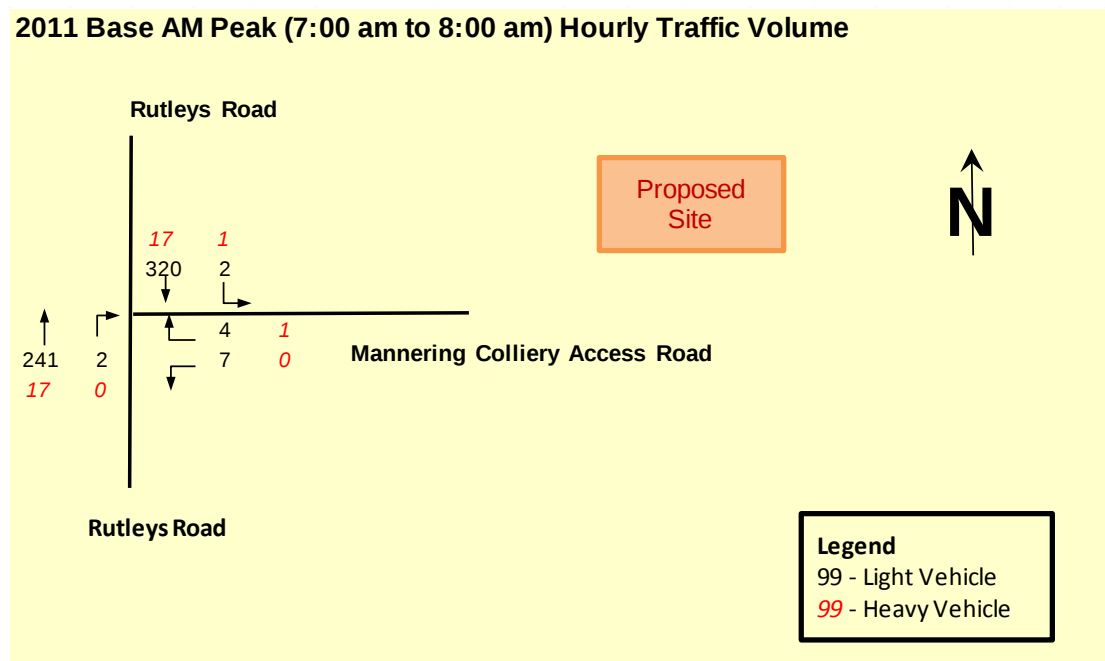


Figure 2.2 Existing AM peak hour's traffic volumes (7.00 am–8.00 am)

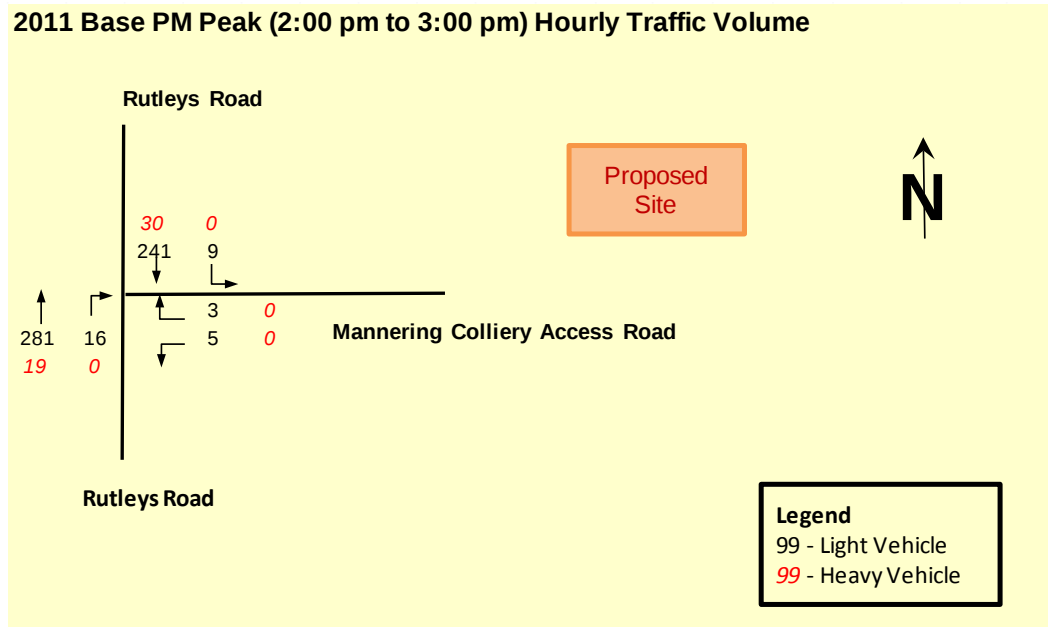


Figure 2.3 Existing PM peak hour's traffic volumes (2.00 pm–3.00 pm)

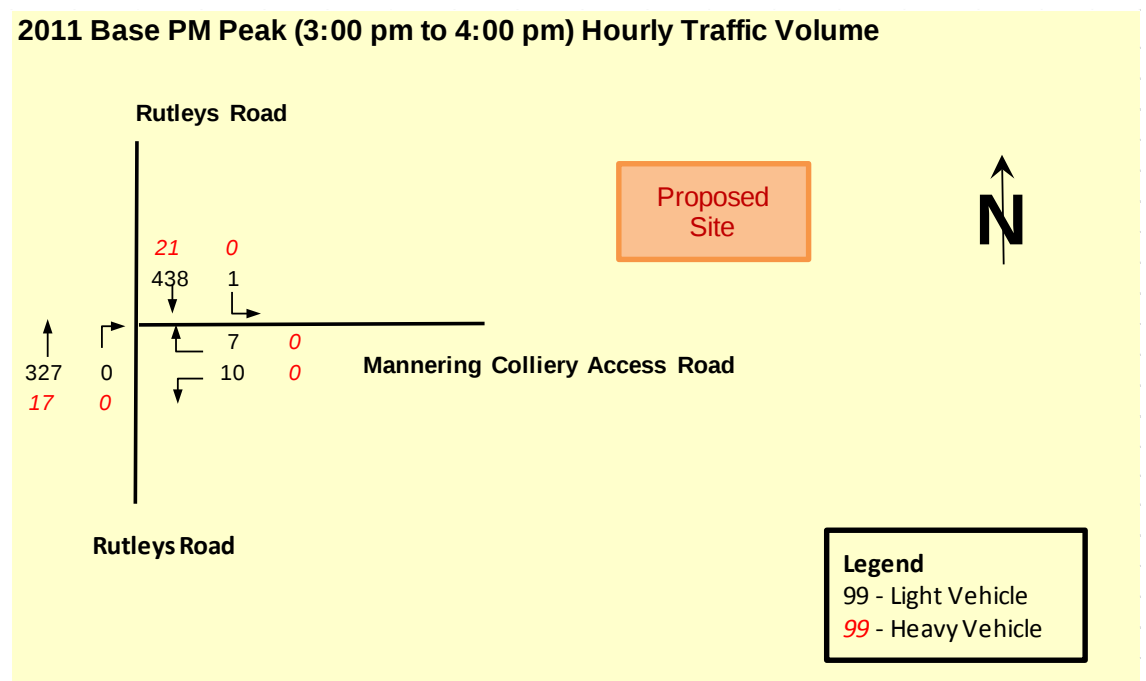


Figure 2.4 Existing PM peak hour's traffic volumes (3.00 pm–4.00 pm)

2.2 Historic traffic

AADT data records were available for the periods 1980 to 2004 from the RTA count station V05.002, which is located on the Pacific Highway, approximately 2 km south of Lake Macquarie Bridge.

Table 2.1 shows the 1980 to 2004 AADT at two-year intervals between 1980 and 1992, and three-year intervals between 1992 and 2004.

Table 2.1 Historical traffic flow on the Pacific Highway

Year	1980	1982	1984	1986	1988	1990	1992	1995	1998	2001	2004
AADT	12,840	17,650	13,742	14,677	13,581	12,158	11,608	13,346	13,948	14,711	15,732

During the 25 year period, traffic volumes along the Pacific Highway had fluctuated considerably. However, the most recent increase in traffic was from 1998 to 2004, and based on this change an average traffic growth rate of 1.8% per annum has been adopted in our analysis for the Pacific Highway.

As Rutleys Road is a local road, with minimal change in activity levels in the surrounding areas. For the purpose of this study, a future traffic growth of 1% per annum has been adopted for this road.

2.3 Traffic generation

Operational mine employees are expected to increase from an approved 90 to 170 as part of the proposed modifications.

It is expected that shift times at the mine will remain unchanged. The additional 80 personnel will be spread across three shifts, five days per week. The shifts start times would be:

- 7.00 am, for the day shift
- 3.00 pm, for the afternoon shift
- 11.00 pm, for the night shift.

Assuming the light vehicles' would have an occupancy rate of 1 person/veh, there would be up to 27 additional inbound light vehicle trips before each shift and an additional 27 outbound light vehicles after each shift.

Given the current patterns of travel through the intersection, the only peak period where additional traffic is expected is the morning peak hour with the additional 27 inbound movements. The additional inbound trips were assumed to be distributed as per the current split as the workers are expected to live in similar areas as the current ones. On that basis 65% would travel to/from the north, while 35% would travel to/from the south.

2.4 Proposed intersection upgrade

The Rutleys Road/Mannering Colliery Access Road intersection is likely to be upgraded by the end of 2012, as per as per Parsons Brinckerhoff's detailed design plan (refer to Figure 2.5).

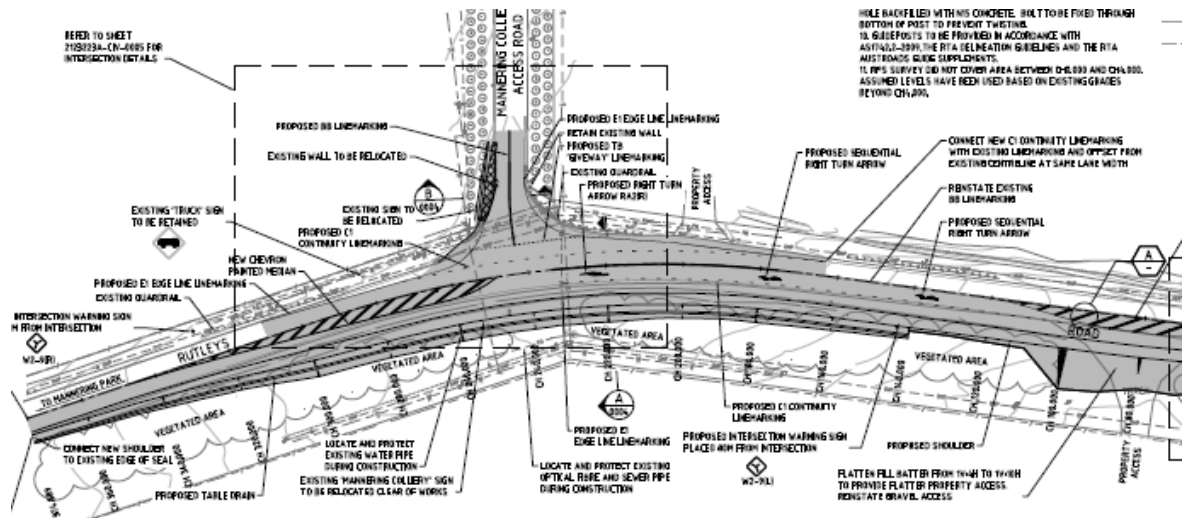


Figure 2.5 **Proposed intersection layout**

The proposed intersection upgrade consists of:

- widening on Rutleys Road northbound side to accommodate a channelized right turn at the intersection (type CHR)
- widening of return profiles on the entry of the access road to accommodate the turning path of a 19 m semi-trailer
- construction of subsoil drainage at the interface of the existing and proposed pavement
- signage, guideposts, line marking and retro-reflective pavement markers (RRPM)
- removal, replacement and extension of an existing 450 diameter culvert and headwall.

The proposed intersection upgrade on Rutleys Roads would allow for through traffic on the southern approach to be unimpeded by right turning traffic into Mannering Colliery Access Road. A right turn bay of adequate length is provided for these movements, which would further increase safety and operation of this intersection.

2.5 Traffic performance

2.5.1 Intersection performance metrics

The ability of the key intersection 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
- queue length.

2.5.1.1 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 2.2).

Table 2.2 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)

2.5.1.2 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.

2.5.1.3 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.

2.5.1.4 Queue length

Queue length is the number of vehicles measured in metres waiting at the stop or yield 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. The intersection queue length is taken from the movement with the longest queue length.

2.6 Current intersection performance (2011)

The current intersection layout as modelled in SIDRA, is represented in Figure 2.6.

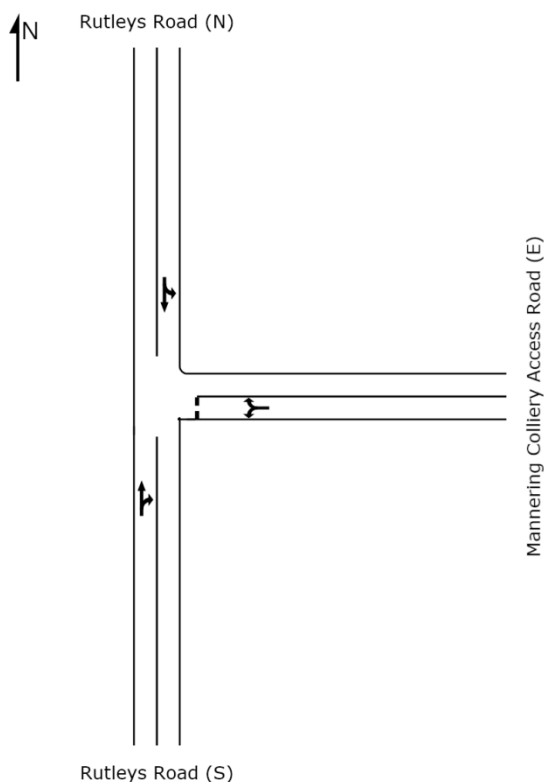


Figure 2.6 Current SIDRA intersection layout

The existing 2011 intersection performance parameters are shown in Table 2.3.

Table 2.3 Modelled existing (2011) intersection performance

Peak hour	DoS	Average delay (sec/veh)	LoS	95 th percentile Queue (m)
AM (6.00 am–7.00 am)	0.30	31	C	17
AM (7.00 am–8.00 am)	0.19	32	C	8
PM (2.00 pm–3.00 pm)	0.18	30	C	9
PM (3.00 pm–4.00 pm)	0.26	31	C	12

The analysis indicates that the intersection operates within its design capacity, with enough spare capacity and with a satisfactory Level of Service.

The longest queue of 17 m occurred on the southern approach of Rutleys Road, waiting for the through/right turn movements due to this approach having a single lane with shared movements.

2.7 Future intersection performance

2.7.1 Background 2012 traffic and current intersection layout

Figures 2.7 to 2.10 show background traffic in 2012, calculated as the sum of background traffic in 2011 and a year's worth of background traffic growth.

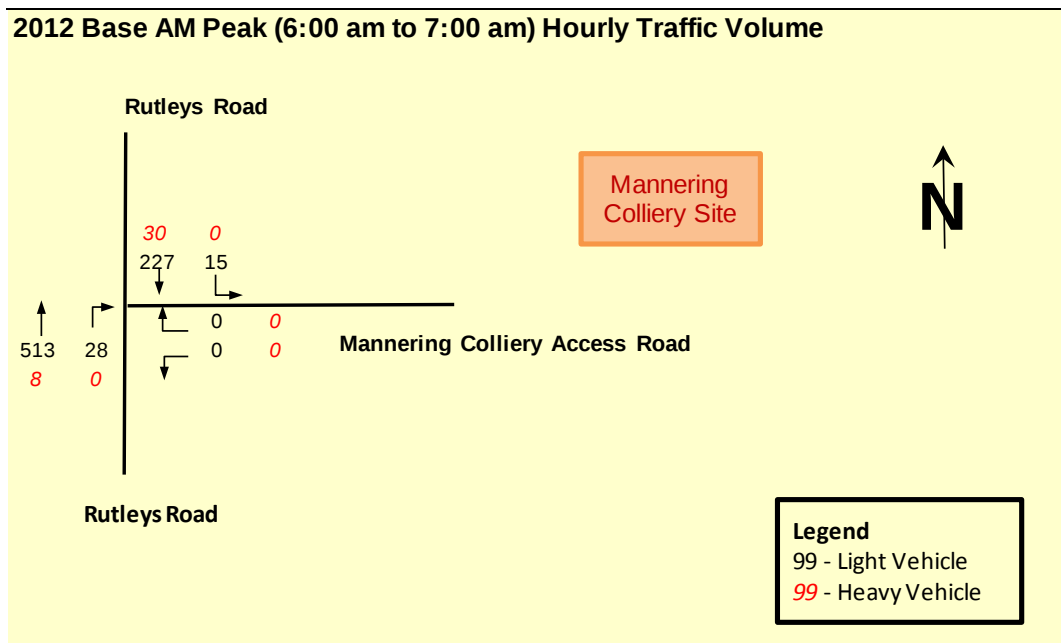


Figure 2.7 2012 Do-nothing case AM peak (6.00 am–7.00 am) hourly traffic volume

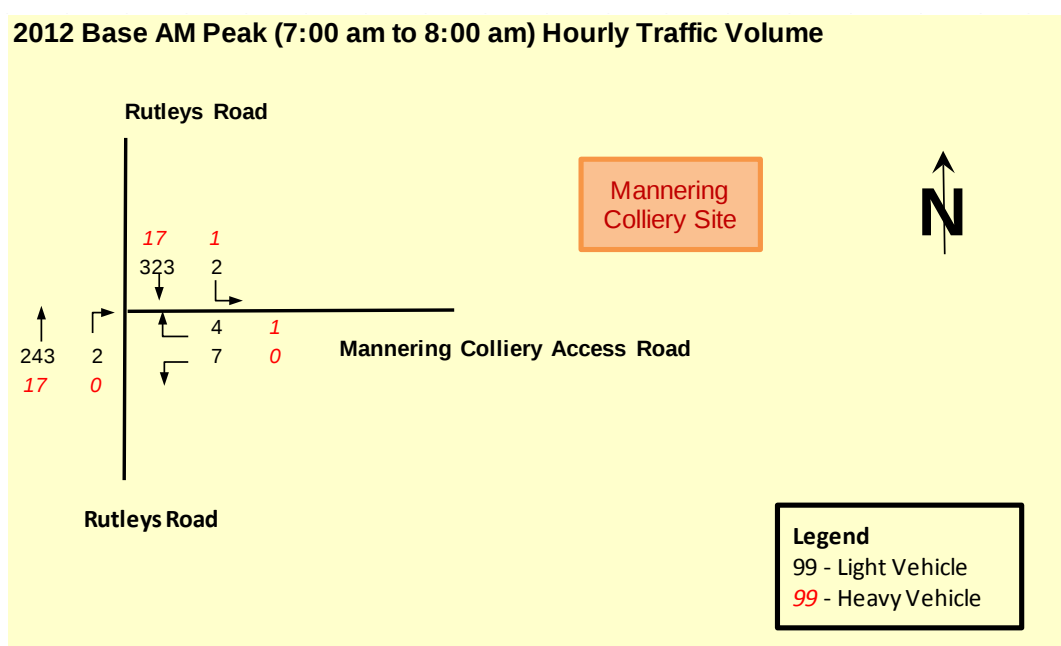


Figure 2.8 2012 Do-nothing case AM peak hour (7.00 am–8.00 am) traffic volume

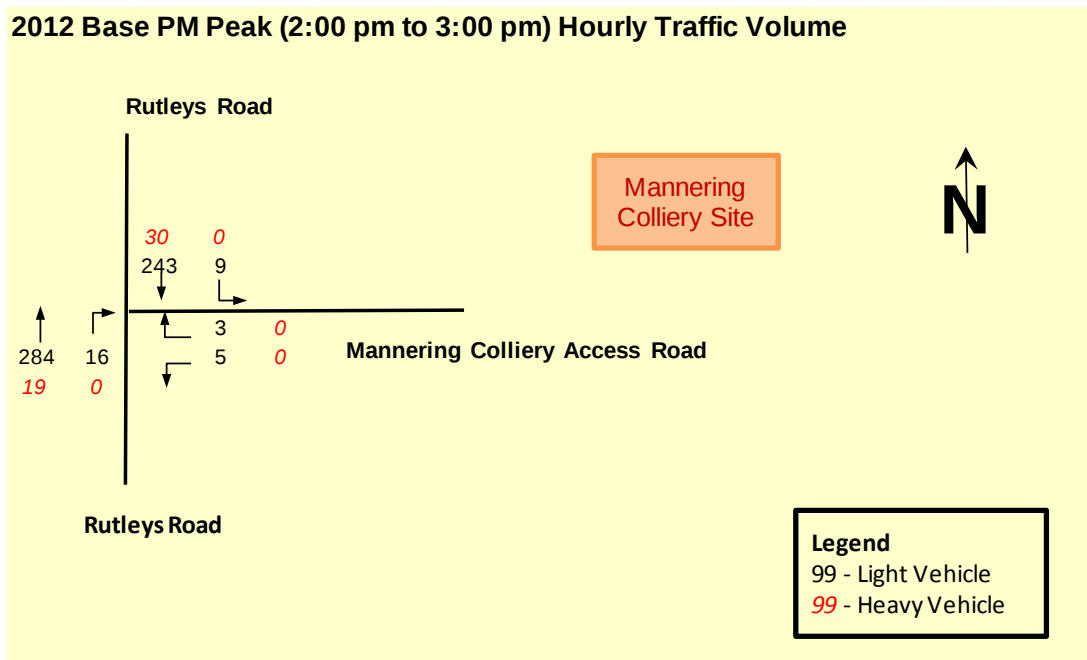


Figure 2.9 2012 Do-nothing case PM peak hour (2.00 pm–3.00 pm) traffic volume

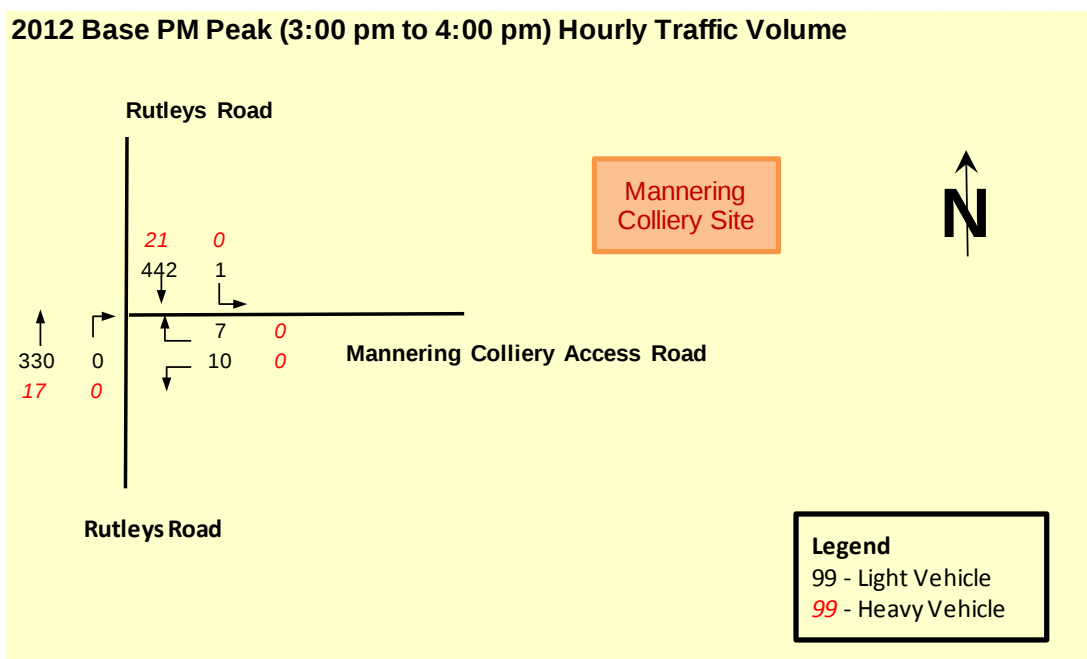


Figure 2.10 2012 Do-nothing case PM peak hour (3.00 pm–4.00 pm) traffic volume

The 2012 base intersection performance forecasts are in Table 2.4.

Table 2.4 2012 Do-nothing intersection performance

Peak hour	DoS	Average delay (sec/veh)	LoS	95th percentile Queue (m)
AM (6.00 am–7.00 am)	0.31	31	C	17
AM (7.00 am–8.00 am)	0.19	32	C	8
PM (2.00 pm–3.00 pm)	0.18	30	C	9
PM (3.00 pm–4.00 pm)	0.26	32	C	12

The analysis indicates that the intersection continues to operate within its design capacity, with enough spare capacity and with a satisfactory Level of Service, similar to existing conditions.

The longest queue of 17 m occurred on the southern approach of Rutleys Road for the through/right turn movements (due to this approach having single lane with shared movements).

2.7.2 2012 operational traffic and current intersection layout

Figures 2.11 to 2.14 show operational traffic in 2012 with additional employees, calculated as the sum of background traffic in 2011 a year of forecast background traffic growth.

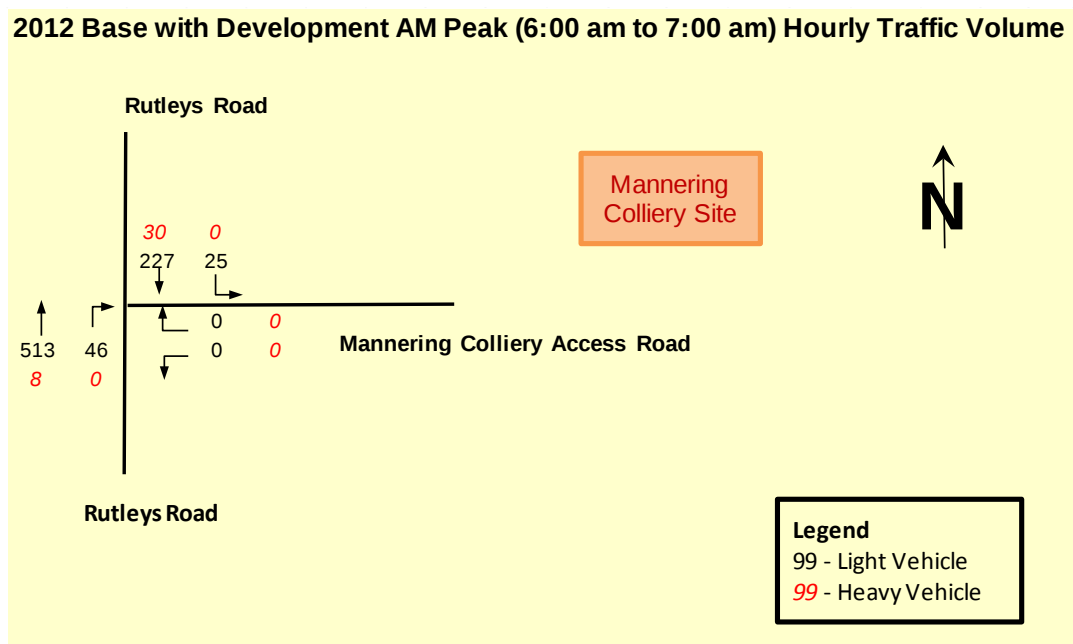


Figure 2.11 2012 Operational AM peak (6.00 am–7.00 am) hourly traffic volume

2012 Base with Development AM Peak (7:00 am to 8:00 am) Hourly Traffic Volume

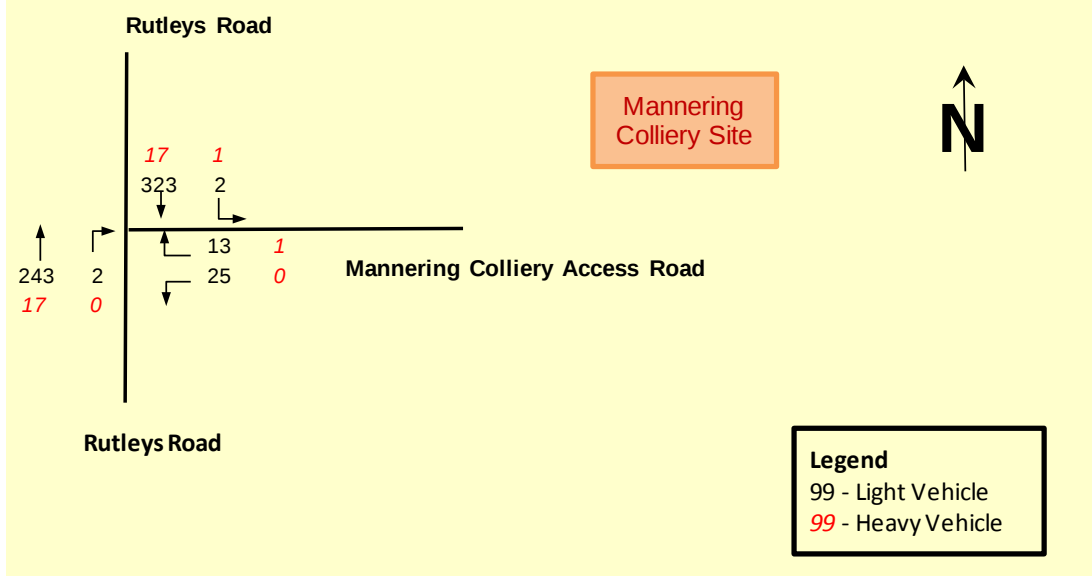


Figure 2.12 2012 Operational AM peak hour (7.00 am–8.00 am) traffic volume

2012 Base with Development PM Peak (2:00 pm to 3:00 pm) Hourly Traffic Volume

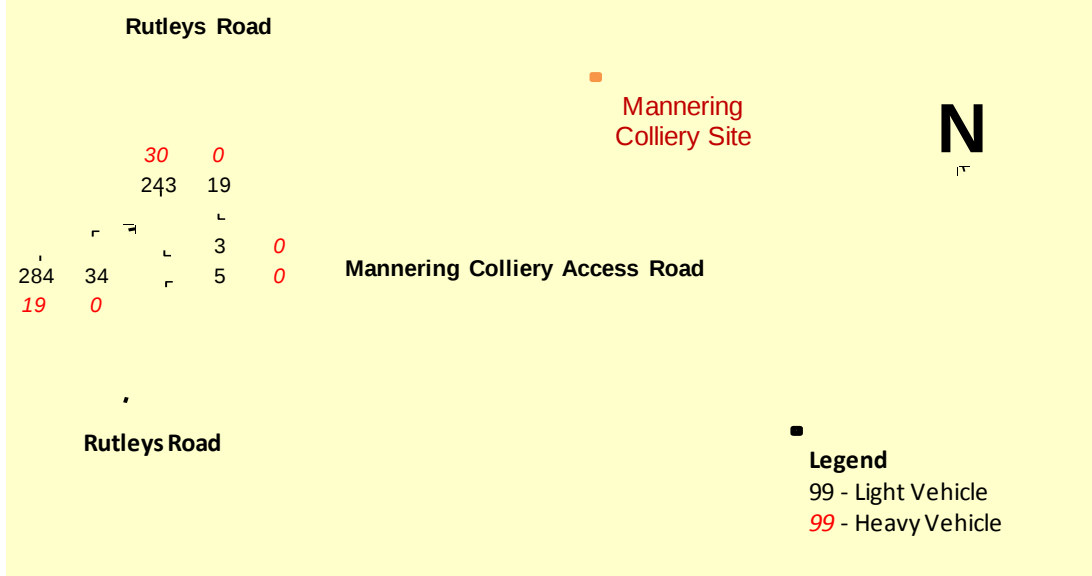


Figure 2.13 2012 Operational PM peak hour (2.00 pm–3.00 pm) traffic volume

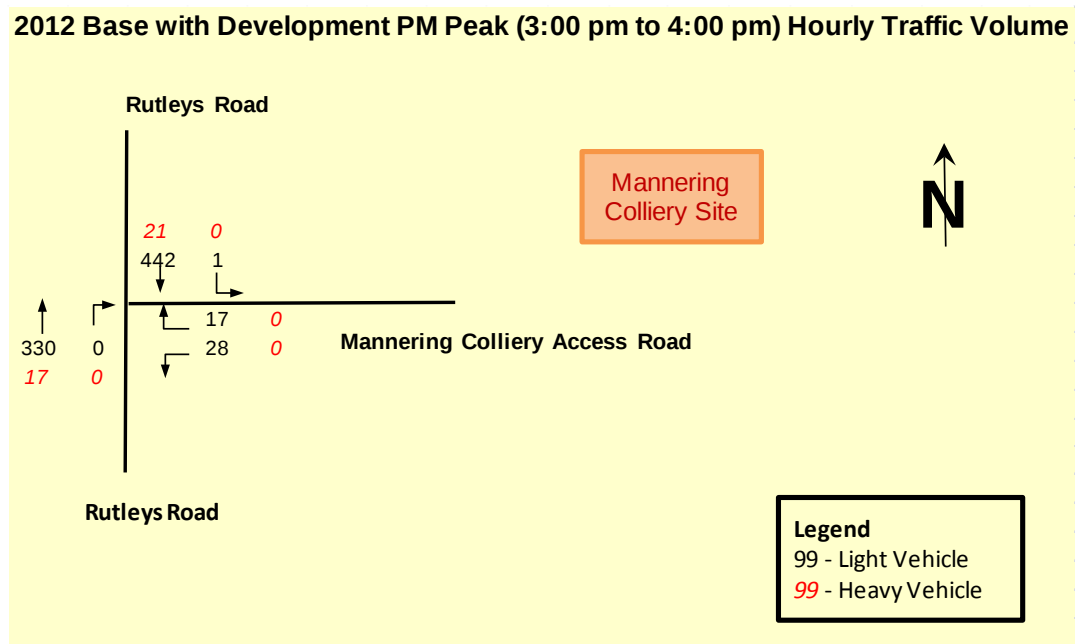


Figure 2.14 2012 Operational PM peak hour (3.00 pm–4.00 pm) traffic volume

The 2012 operational intersection performance forecasts for the existing intersection layout are shown in Table 2.5.

Table 2.5 2012 Operational intersection performance (increased employee traffic & existing intersection layout)

Peak hour	DoS	Average delay (sec/veh)	LoS	95th percentile Queue (m)
AM (6.00 am–7.00 am)	0.32	31	C	18
AM (7.00 am–8.00 am)	0.19	32	C	8
PM (2.00 pm–3.00 pm)	0.20	30	C	10
PM (3.00 pm–4.00 pm)	0.26	32	C	12

The analysis indicates that the intersection would operate within its design capacity, with enough spare capacity to maintain a satisfactory Level of Service, similar to existing conditions.

The longest queue of 18 m occurred on the southern approach of Rutleys Road for the through/right turn movements (due to this approach having a single lane with shared movements).

2.7.3 2012 operational traffic and new intersection layout

The proposed new intersection layout as modelled in SIDRA, is represented in Figure 2.15.

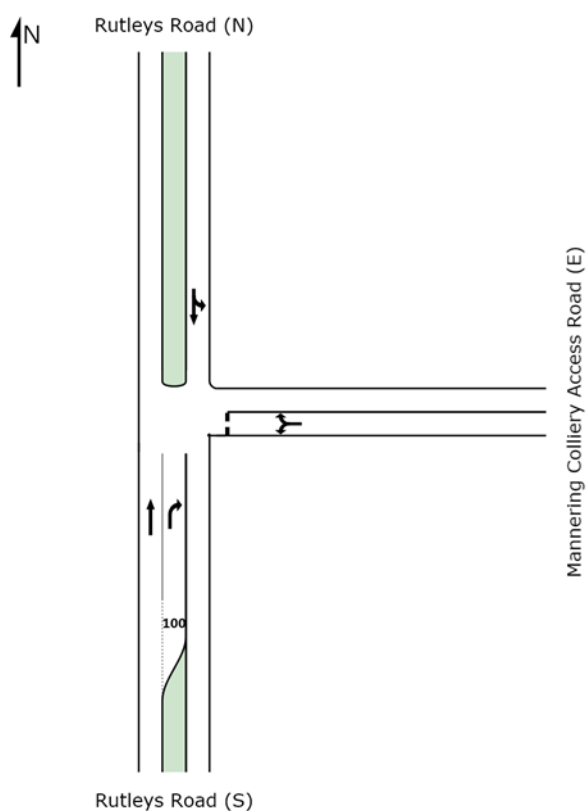


Figure 2.15 SIDRA layout of the proposed Rutleys Road/Mannering Colliery Access Road intersection upgrade

The 2012 forecast operational intersection performance, with the proposed intersection layout, is shown in Table 2.6.

Table 2.6 2012 Operational intersection performance (increased employee traffic & new intersection layout)

Peak hour	DoS	Average delay (sec/veh)	LoS	95 th percentile Queue (m)
AM (6.00 am–7.00 am)	0.28	30	C	1
AM (7.00 am–8.00 am)	0.19	30	C	2
PM (2.00 pm–3.00 pm)	0.17	30	C	1
PM (3.00 pm–4.00 pm)	0.26	31	C	2

The analysis indicates that the proposed intersection operates within its design capacity, with enough spare capacity to maintain a satisfactory Level of Service, similar to existing conditions. What would happen is that queue lengths are removed from the southern approach of Rutleys Road. The proposed intersection layout removes delays to through movements on the southern approach on Rutleys Road given the widening and a right turn bay of adequate length for storage.

2.8 Cycling and pedestrian access

The remote location of the intersection in relation to major townships does not encourage cycling or walking trips as a travel mode to work. 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 Rutleys Road/Mannering Colliery Access Road intersection. Cyclists who do choose to ride to work would be required to share the road with vehicular traffic.

3. Conclusions

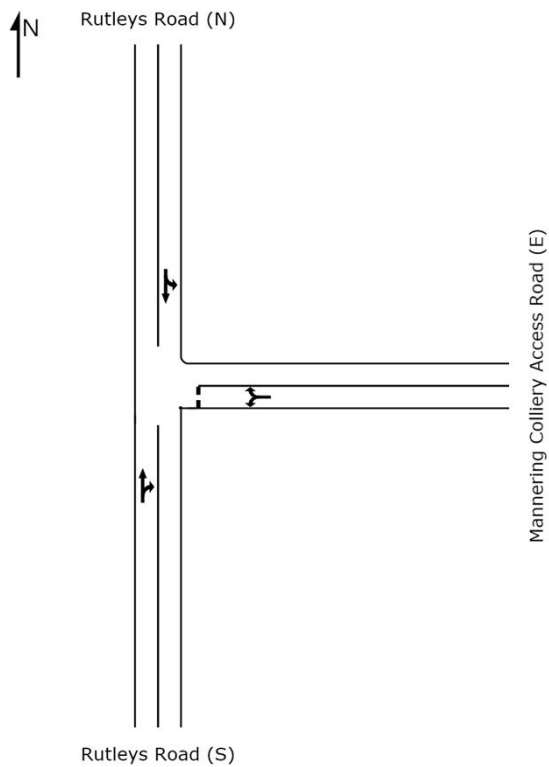
The traffic impact assessment has identified that impacts due to additional employee traffic associated with the extension of the Mannering Colliery are negligible. The additional employees would have minimal to no impact on performance of the existing road network and intersection in terms of capacity and operation. It remains at Level C under all scenarios.

The proposed upgrade of the Rutleys Road/Mannering Colliery Access Road would reduce through traffic delays and increase safety for right turning movements at this intersection. The proposed right turn lane on Rutleys Road, would provide enough space to store queuing vehicles, so turning vehicles would not obstruct through traffic, but the overall assessment of intersection performance remains at Level of Service C.

Appendix A

SIDRA movement summaries

Rutleys Road/Mannering Colliery Access Road



AM movement summary (6-7)

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
							Vehicles veh	Distance m			
South: Rutleys Road (S)											
11	T	543	1.6	0.303	1.5	LOS A	2.4	17.0	0.50	0.00	64.4
12	R	29	0.0	0.303	30.5	LOS C	2.4	17.0	0.50	0.82	58.5
Approach		573	1.5	0.303	3.0	NA	2.4	17.0	0.50	0.04	64.2
East: Mannering Colliery Access Road (E)											
1	L	1	0.0	0.004	6.6	LOS A	0.0	0.1	0.49	0.42	18.9
3	R	1	0.0	0.004	6.3	LOS A	0.0	0.1	0.49	0.57	19.0
Approach		2	0.0	0.004	6.5	LOS A	0.0	0.1	0.49	0.50	18.9
North: Rutleys Road (N)											
4	L	16	0.0	0.157	29.1	LOS C	0.0	0.0	0.00	0.95	59.5
5	T	268	11.8	0.157	0.0	LOS A	0.0	0.0	0.00	0.00	80.0
Approach		284	11.1	0.157	1.6	NA	0.0	0.0	0.00	0.05	78.9
All Vehicles		859	4.7	0.303	2.5	NA	2.4	17.0	0.34	0.05	68.1

AM movement summary (7-8)

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
							Vehicles veh	Distance m			
South: Rutleys Road (S)											
11	T	272	6.6	0.147	1.5	LOS A	1.0	7.5	0.47	0.00	65.5
12	R	2	0.0	0.147	30.5	LOS C	1.0	7.5	0.47	0.83	58.5
Approach		274	6.5	0.147	1.7	NA	1.0	7.5	0.47	0.01	65.5
East: Mannering Colliery Access Road (E)											
1	L	7	0.0	0.022	5.8	LOS A	0.1	0.6	0.50	0.50	19.1
3	R	5	20.0	0.022	5.5	LOS A	0.1	0.6	0.50	0.62	19.1
Approach		13	8.3	0.022	5.7	LOS A	0.1	0.6	0.50	0.55	19.1
North: Rutleys Road (N)											
4	L	3	33.3	0.190	32.4	LOS C	0.0	0.0	0.00	0.94	59.5
5	T	355	5.0	0.190	0.0	LOS A	0.0	0.0	0.00	0.00	80.0
Approach		358	5.3	0.190	0.3	NA	0.0	0.0	0.00	0.01	79.8
All Vehicles		644	5.9	0.190	1.0	NA	1.0	7.5	0.21	0.02	70.2

Intersection performance in 2011 base

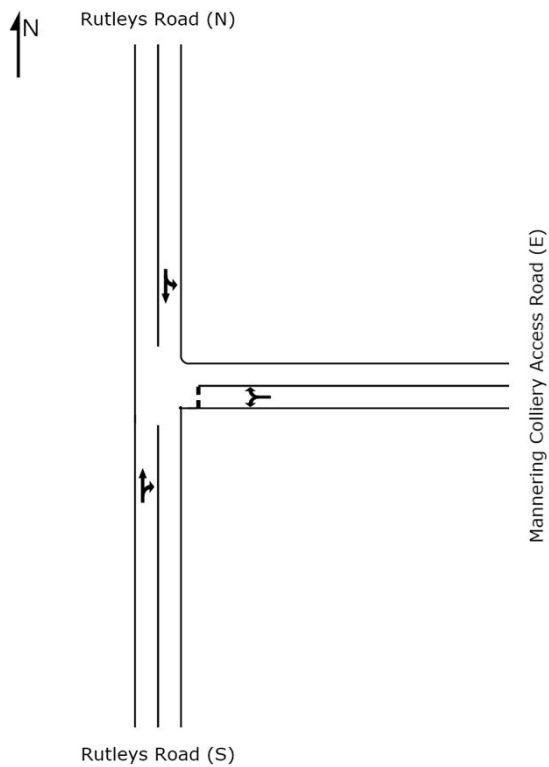
PM movement summary (2-3)

Mov ID	Turn	Demand Flow	HV	Deg.	Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%		v/c	sec		Vehicles	Distance		per veh	km/h
South: Rutleys Road (S)												
11	T	316	6.3	0.181		1.3	LOS A	1.2	9.1	0.45	0.00	65.8
12	R	17	0.0	0.181		30.4	LOS C	1.2	9.1	0.45	0.82	58.9
Approach		333	6.0	0.181		2.7	NA	1.2	9.1	0.45	0.04	65.5
East: Mannering Colliery Access Road (E)												
1	L	5	0.0	0.012		4.6	LOS A	0.0	0.3	0.44	0.45	19.3
3	R	3	0.0	0.012		4.3	LOS A	0.0	0.3	0.44	0.55	19.4
Approach		8	0.0	0.012		4.5	LOS A	0.0	0.3	0.44	0.48	19.4
North: Rutleys Road (N)												
4	L	9	0.0	0.162		29.1	LOS C	0.0	0.0	0.00	0.95	59.5
5	T	285	11.1	0.162		0.0	LOS A	0.0	0.0	0.00	0.00	80.0
Approach		295	10.7	0.162		0.9	NA	0.0	0.0	0.00	0.03	79.3
All Vehicles		636	8.1	0.181		1.9	NA	1.2	9.1	0.24	0.04	69.7

PM movement summary (3-4)

Mov ID	Turn	Demand Flow	HV	Deg.	Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%		v/c	sec		Vehicles	Distance		per veh	km/h
South: Rutleys Road (S)												
11	T	362	4.9	0.193		2.3	LOS A	1.6	11.6	0.58	0.00	62.9
12	R	1	0.0	0.193		31.4	LOS C	1.6	11.6	0.58	0.88	56.9
Approach		363	4.9	0.193		2.4	NA	1.6	11.6	0.58	0.00	62.9
East: Mannering Colliery Access Road (E)												
1	L	11	0.0	0.035		6.9	LOS A	0.1	0.8	0.56	0.58	18.8
3	R	7	0.0	0.035		6.5	LOS A	0.1	0.8	0.56	0.71	18.9
Approach		18	0.0	0.035		6.7	LOS A	0.1	0.8	0.56	0.63	18.9
North: Rutleys Road (N)												
4	L	1	0.0	0.256		29.1	LOS C	0.0	0.0	0.00	0.95	59.5
5	T	483	4.6	0.256		0.0	LOS A	0.0	0.0	0.00	0.00	80.0
Approach		484	4.6	0.256		0.1	NA	0.0	0.0	0.00	0.00	80.0
All Vehicles		865	4.6	0.256		1.2	NA	1.6	11.6	0.25	0.02	68.9

Rutleys Road/Mannering Colliery Access Road



AM movement summary (6-7)

Mov ID	Turn	Demand Flow 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 per veh	Average Speed km/h
South: Rutleys Road (S)											
11	T	548	1.5	0.306	1.5	LOS A	2.4	17.3	0.51	0.00	64.3
12	R	29	0.0	0.306	30.6	LOS C	2.4	17.3	0.51	0.82	58.5
Approach		578	1.5	0.306	3.0	NA	2.4	17.3	0.51	0.04	64.1
East: Mannering Colliery Access Road (E)											
1	L	1	0.0	0.004	6.7	LOS A	0.0	0.1	0.50	0.43	18.9
3	R	1	0.0	0.004	6.4	LOS A	0.0	0.1	0.50	0.57	19.0
Approach		2	0.0	0.004	6.5	LOS A	0.0	0.1	0.50	0.50	18.9
North: Rutleys Road (N)											
4	L	16	0.0	0.158	29.1	LOS C	0.0	0.0	0.00	0.95	59.5
5	T	271	11.7	0.158	0.0	LOS A	0.0	0.0	0.00	0.00	80.0
Approach		286	11.0	0.158	1.6	NA	0.0	0.0	0.00	0.05	78.9
All Vehicles		866	4.6	0.306	2.5	NA	2.4	17.3	0.34	0.05	68.0

AM movement summary (7-8)

Mov ID	Turn	Demand Flow 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 per veh	Average Speed km/h
South: Rutleys Road (S)											
11	T	274	6.5	0.148	1.5	LOS A	1.0	7.6	0.47	0.00	65.5
12	R	2	0.0	0.148	30.6	LOS C	1.0	7.6	0.47	0.83	58.5
Approach		276	6.5	0.148	1.7	NA	1.0	7.6	0.47	0.01	65.4
East: Mannering Colliery Access Road (E)											
1	L	7	0.0	0.023	5.9	LOS A	0.1	0.6	0.50	0.50	19.0
3	R	5	20.0	0.023	5.6	LOS A	0.1	0.6	0.50	0.62	19.1
Approach		13	8.3	0.023	5.8	LOS A	0.1	0.6	0.50	0.55	19.1
North: Rutleys Road (N)											
4	L	3	33.3	0.192	32.4	LOS C	0.0	0.0	0.00	0.94	59.5
5	T	358	5.0	0.192	0.0	LOS A	0.0	0.0	0.00	0.00	80.0
Approach		361	5.2	0.192	0.3	NA	0.0	0.0	0.00	0.01	79.8
All Vehicles		649	5.8	0.192	1.0	NA	1.0	7.6	0.21	0.02	70.2

Intersection performance in 2012 base

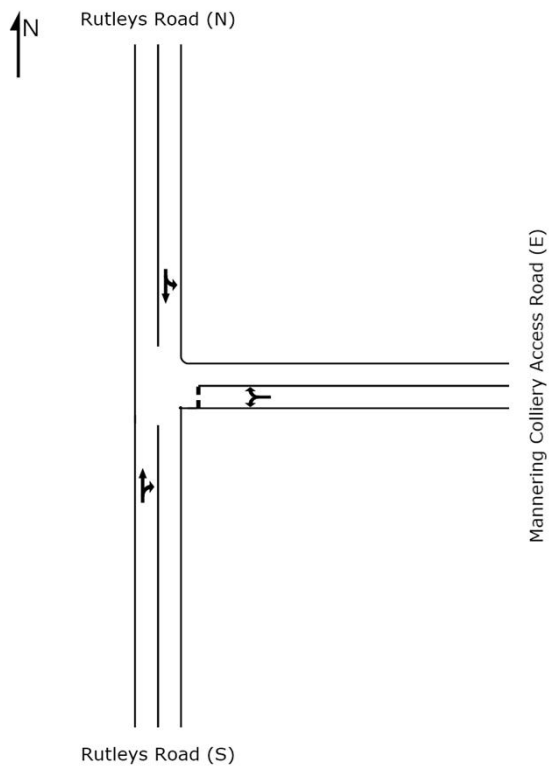
PM movement summary (2-3)

Mov ID	Turn	Demand Flow	HV	Deg.	Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%		v/c	sec		veh	m		per veh	km/h
South: Rutleys Road (S)												
11	T	319	6.3	0.183		1.3	LOS A	1.2	9.2	0.45	0.00	65.8
12	R	17	0.0	0.183		30.4	LOS C	1.2	9.2	0.45	0.82	58.8
Approach		336	6.0	0.183		2.7	NA	1.2	9.2	0.45	0.04	65.5
East: Mannering Colliery Access Road (E)												
1	L	5	0.0	0.012		4.7	LOS A	0.0	0.3	0.44	0.45	19.3
3	R	3	0.0	0.012		4.3	LOS A	0.0	0.3	0.44	0.55	19.4
Approach		8	0.0	0.012		4.5	LOS A	0.0	0.3	0.44	0.49	19.3
North: Rutleys Road (N)												
4	L	9	0.0	0.163		29.1	LOS C	0.0	0.0	0.00	0.95	59.5
5	T	287	11.0	0.163		0.0	LOS A	0.0	0.0	0.00	0.00	80.0
Approach		297	10.6	0.163		0.9	NA	0.0	0.0	0.00	0.03	79.3
All Vehicles		641	8.0	0.183		1.9	NA	1.2	9.2	0.24	0.04	69.6

PM movement summary (3-4)

Mov ID	Turn	Demand Flow	HV	Deg.	Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%		v/c	sec		veh	m		per veh	km/h
South: Rutleys Road (S)												
11	T	365	4.9	0.194		2.4	LOS A	1.6	11.8	0.58	0.00	62.9
12	R	1	0.0	0.194		31.5	LOS C	1.6	11.8	0.58	0.88	56.9
Approach		366	4.9	0.194		2.5	NA	1.6	11.8	0.58	0.00	62.8
East: Mannering Colliery Access Road (E)												
1	L	11	0.0	0.035		7.0	LOS A	0.1	0.8	0.56	0.58	18.8
3	R	7	0.0	0.035		6.6	LOS A	0.1	0.8	0.56	0.71	18.9
Approach		18	0.0	0.035		6.8	LOS A	0.1	0.8	0.56	0.64	18.9
North: Rutleys Road (N)												
4	L	1	0.0	0.258		29.1	LOS C	0.0	0.0	0.00	0.95	59.5
5	T	487	4.5	0.258		0.0	LOS A	0.0	0.0	0.00	0.00	80.0
Approach		488	4.5	0.258		0.1	NA	0.0	0.0	0.00	0.00	80.0
All Vehicles		873	4.6	0.258		1.2	NA	1.6	11.8	0.26	0.02	68.9

Rutleys Road/Mannering Colliery Access Road



AM movement summary (6-7)

Mov ID	Turn	Demand Flow	HV	Deg.	Satn	Average Delay	Level of Service	95% Back of Queue	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%		v/c	sec		Vehicles Distance		per veh	km/h
South: Rutleys Road (S)											
11	T	548	1.5		0.320	1.6	LOS A	2.6	18.3	0.52	63.7
12	R	48	0.0		0.320	30.7	LOS C	2.6	18.3	0.52	58.3
Approach		597	1.4		0.320	3.9	NA	2.6	18.3	0.52	63.4
East: Mannering Colliery Access Road (E)											
1	L	1	0.0		0.004	6.9	LOS A	0.0	0.1	0.50	18.8
3	R	1	0.0		0.004	6.6	LOS A	0.0	0.1	0.50	18.9
Approach		2	0.0		0.004	6.8	LOS A	0.0	0.1	0.50	18.9
North: Rutleys Road (N)											
4	L	26	0.0		0.163	29.1	LOS C	0.0	0.0	0.00	59.5
5	T	271	11.7		0.163	0.0	LOS A	0.0	0.0	0.00	80.0
Approach		297	10.6		0.163	2.6	NA	0.0	0.0	0.00	78.2
All Vehicles		896	4.5		0.320	3.5	NA	2.6	18.3	0.35	67.3

AM movement summary (7-8)

Mov ID	Turn	Demand Flow	HV	Deg.	Satn	Average Delay	Level of Service	95% Back of Queue	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%		v/c	sec		Vehicles Distance		per veh	km/h
South: Rutleys Road (S)											
11	T	274	6.5		0.148	1.5	LOS A	1.0	7.6	0.47	65.5
12	R	2	0.0		0.148	30.6	LOS C	1.0	7.6	0.47	58.5
Approach		276	6.5		0.148	1.7	NA	1.0	7.6	0.47	65.4
East: Mannering Colliery Access Road (E)											
1	L	26	0.0		0.060	5.0	LOS A	0.2	1.5	0.48	19.2
3	R	15	7.1		0.060	4.7	LOS A	0.2	1.5	0.48	19.3
Approach		41	2.6		0.060	4.9	LOS A	0.2	1.5	0.48	19.3
North: Rutleys Road (N)											
4	L	3	33.3		0.192	32.4	LOS C	0.0	0.0	0.00	59.5
5	T	358	5.0		0.192	0.0	LOS A	0.0	0.0	0.00	80.0
Approach		361	5.2		0.192	0.3	NA	0.0	0.0	0.00	79.8
All Vehicles		678	5.6		0.192	1.1	NA	1.0	7.6	0.22	65.1

Intersection performance in 2012 base with development traffic

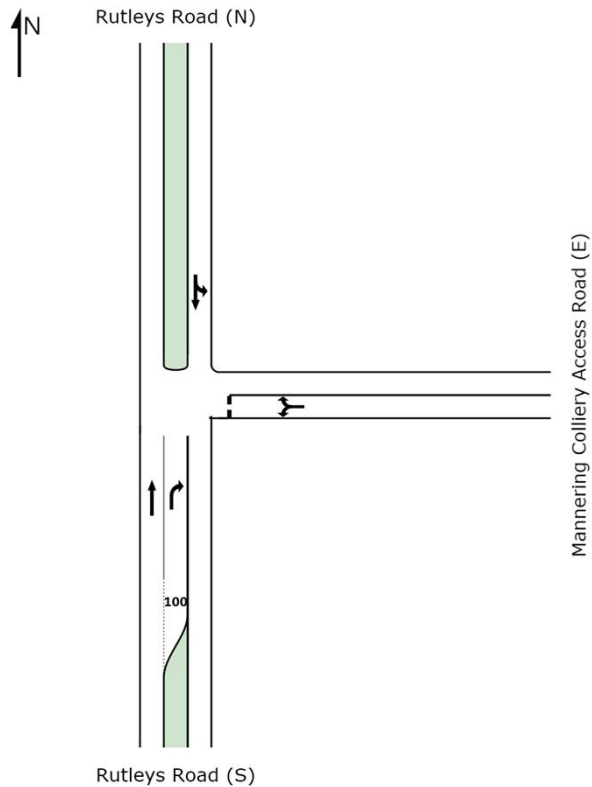
PM movement summary (2-3)

Mov ID	Turn	Demand Flow 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 per veh	Average Speed km/h
South: Rutleys Road (S)											
11	T	319	6.3	0.197	1.4	LOS A	1.4	9.9	0.46	0.00	65.1
12	R	36	0.0	0.197	30.4	LOS C	1.4	9.9	0.46	0.83	58.7
Approach		355	5.6	0.197	4.3	NA	1.4	9.9	0.46	0.08	64.6
East: Mannering Colliery Access Road (E)											
1	L	5	0.0	0.012	4.8	LOS A	0.0	0.3	0.45	0.45	19.3
3	R	3	0.0	0.012	4.5	LOS A	0.0	0.3	0.45	0.56	19.4
Approach		8	0.0	0.012	4.7	LOS A	0.0	0.3	0.45	0.49	19.3
North: Rutleys Road (N)											
4	L	20	0.0	0.169	29.1	LOS C	0.0	0.0	0.00	0.95	59.5
5	T	287	11.0	0.169	0.0	LOS A	0.0	0.0	0.00	0.00	80.0
Approach		307	10.3	0.169	1.9	NA	0.0	0.0	0.00	0.06	78.7
All Vehicles		671	7.7	0.197	3.2	NA	1.4	9.9	0.25	0.08	68.9

PM movement summary (3-4)

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		Vehicles veh	Distance m			
South: Rutleys Road (S)											
11	T	365	4.9	0.194	2.4	LOS A	1.6	11.8	0.58	0.00	62.9
12	R	1	0.0	0.194	31.5	LOS C	1.6	11.8	0.58	0.88	56.9
Approach		366	4.9	0.194	2.5	NA	1.6	11.8	0.58	0.00	62.8
East: Mannering Colliery Access Road (E)											
1	L	29	0.0	0.090	7.0	LOS A	0.3	2.1	0.57	0.63	18.8
3	R	18	0.0	0.090	6.6	LOS A	0.3	2.1	0.57	0.71	18.9
Approach		47	0.0	0.090	6.8	LOS A	0.3	2.1	0.57	0.66	18.9
North: Rutleys Road (N)											
4	L	1	0.0	0.258	29.1	LOS C	0.0	0.0	0.00	0.95	59.5
5	T	487	4.5	0.258	0.0	LOS A	0.0	0.0	0.00	0.00	80.0
Approach		488	4.5	0.258	0.1	NA	0.0	0.0	0.00	0.00	80.0
All Vehicles		902	4.4	0.258	1.4	NA	1.6	11.8	0.27	0.04	64.9

Rutleys Road/Mannering Colliery Access Road



AM movement summary (6-7)

Mov ID	Turn	Demand Flow	HV	Deg.	Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%		v/c	sec		Vehicles	Distance		per veh	km/h
South: Rutleys Road (S)												
11	T	548	1.5	0.284	0.0	LOS A		0.0	0.0	0.00	0.00	80.0
12	R	48	0.0	0.036	30.1	LOS C		0.2	1.1	0.39	0.78	58.9
Approach		597	1.4	0.284	2.4	NA		0.2	1.1	0.03	0.06	78.3
East: Mannering Colliery Access Road (E)												
1	L	1	0.0	0.004	6.4	LOS A		0.0	0.1	0.49	0.43	18.9
3	R	1	0.0	0.004	6.2	LOS A		0.0	0.1	0.49	0.57	19.0
Approach		2	0.0	0.004	6.3	LOS A		0.0	0.1	0.49	0.50	19.0
North: Rutleys Road (N)												
4	L	26	0.0	0.163	29.1	LOS C		0.0	0.0	0.00	0.95	59.5
5	T	271	11.7	0.163	0.0	LOS A		0.0	0.0	0.00	0.00	80.0
Approach		297	10.6	0.163	2.6	NA		0.0	0.0	0.00	0.08	78.2
All Vehicles		896	4.5	0.284	2.5	NA		0.2	1.1	0.02	0.07	77.8

AM movement summary (7-8)

Mov ID	Turn	Demand Flow	HV	Deg.	Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%		v/c	sec		Vehicles	Distance		per veh	km/h
South: Rutleys Road (S)												
11	T	274	6.5	0.146	0.0	LOS A		0.0	0.0	0.00	0.00	80.0
12	R	2	0.0	0.002	30.2	LOS C		0.0	0.0	0.41	0.72	58.8
Approach		276	6.5	0.146	0.2	NA		0.0	0.0	0.00	0.01	79.8
East: Mannering Colliery Access Road (E)												
1	L	26	0.0	0.059	4.9	LOS A		0.2	1.5	0.47	0.52	19.3
3	R	15	7.1	0.059	4.7	LOS A		0.2	1.5	0.47	0.63	19.3
Approach		41	2.6	0.059	4.8	LOS A		0.2	1.5	0.47	0.56	19.3
North: Rutleys Road (N)												
4	L	3	33.3	0.192	32.4	LOS C		0.0	0.0	0.00	0.94	59.5
5	T	358	5.0	0.192	0.0	LOS A		0.0	0.0	0.00	0.00	80.0
Approach		361	5.2	0.192	0.3	NA		0.0	0.0	0.00	0.01	79.8
All Vehicles		678	5.6	0.192	0.5	NA		0.2	1.5	0.03	0.04	70.4

PM movement summary (2-3)

Mov ID	Turn	Demand Flow	HV	Deg.	Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%		v/c			Vehicles	Distance			
						sec		veh	m		per veh	km/h
South: Rutleys Road (S)												
11	T	319	6.3	0.170		0.0	LOS A	0.0	0.0	0.00	0.00	80.0
12	R	36	0.0	0.027		30.1	LOS C	0.1	0.8	0.39	0.78	58.9
Approach		355	5.6	0.170		3.0	NA	0.1	0.8	0.04	0.08	77.9
East: Mannering Colliery Access Road (E)												
1	L	5	0.0	0.012		4.6	LOS A	0.0	0.3	0.44	0.45	19.3
3	R	3	0.0	0.012		4.4	LOS A	0.0	0.3	0.44	0.55	19.4
Approach		8	0.0	0.012		4.6	LOS A	0.0	0.3	0.44	0.49	19.3
North: Rutleys Road (N)												
4	L	20	0.0	0.169		29.1	LOS C	0.0	0.0	0.00	0.95	59.5
5	T	287	11.0	0.169		0.0	LOS A	0.0	0.0	0.00	0.00	80.0
Approach		307	10.3	0.169		1.9	NA	0.0	0.0	0.00	0.06	78.7
All Vehicles		671	7.7	0.170		2.5	NA	0.1	0.8	0.03	0.08	76.2

PM movement summary (3-4)

Mov ID	Turn	Demand Flow	HV	Deg.	Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%		v/c			Vehicles	Distance			
						sec		veh	m		per veh	km/h
South: Rutleys Road (S)												
11	T	365	4.9	0.193		0.0	LOS A	0.0	0.0	0.00	0.00	80.0
12	R	1	0.0	0.001		30.8	LOS C	0.0	0.0	0.48	0.71	58.1
Approach		366	4.9	0.193		0.1	NA	0.0	0.0	0.00	0.00	79.9
East: Mannering Colliery Access Road (E)												
1	L	29	0.0	0.086		6.6	LOS A	0.3	2.1	0.56	0.63	18.9
3	R	18	0.0	0.086		6.4	LOS A	0.3	2.1	0.56	0.71	19.0
Approach		47	0.0	0.086		6.5	LOS A	0.3	2.1	0.56	0.66	18.9
North: Rutleys Road (N)												
4	L	1	0.0	0.258		29.1	LOS C	0.0	0.0	0.00	0.95	59.5
5	T	487	4.5	0.258		0.0	LOS A	0.0	0.0	0.00	0.00	80.0
Approach		488	4.5	0.258		0.1	NA	0.0	0.0	0.00	0.00	80.0
All Vehicles		902	4.4	0.258		0.4	NA	0.3	2.1	0.03	0.04	71.5