



# **MANNERING COLLIERY**

## **ENVIRONMENTAL ASSESSMENT**

### **APPENDIX L** **TRAFFIC IMPACT ASSESSMENT**

# Traffic Impact Assessment Intersection of Rutleys Road and Mannering Colliery Access Road

## Mannering Colliery Continuation of Mining Environmental Assessment

December, 2006

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for Hansen Bailey

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# Contents

	<b>Page Number</b>
<b>1. Introduction .....</b>	<b>1</b>
1.1 Site description	1
<b>2. Existing Traffic Volumes .....</b>	<b>3</b>
2.1 Annual daily traffic	3
2.1.1 <i>Wyang Council data</i>	3
2.1.2 <i>Commissioned counts</i>	3
2.2 Mine traffic	4
2.3 Intersection counts	4
<b>3. Future traffic volumes .....</b>	<b>6</b>
3.1 Mine traffic	6
3.2 Rutleys Road	6
<b>4. Intersection modelling .....</b>	<b>7</b>
4.1 Intersection modelling	7
4.1.1 <i>Level of service</i>	7
4.1.2 <i>Degree of saturation</i>	7
4.1.3 <i>Delay</i>	7
4.1.4 <i>Queue length</i>	8
4.2 Existing performance	8
4.3 Future performance	8
<b>5. Recommendations.....</b>	<b>10</b>
<b>6. Conclusion .....</b>	<b>11</b>

## List of tables

Table 2-1: Wyong Council traffic data.....	3
Table 3-1: Projected traffic volumes on Rutleys Road (PCU) .....	6
Table 4-1: Intersection performance interpretation.....	7
Table 4-2: Existing intersection performance .....	8
Table 4-3: Future intersection performance.....	9

## List of figures

Figure 1-1: Site Location Plan.....	3
Figure 2-1: Existing morning peak hour intersection volumes (PCU) between 7.30AM and 8.30AM .....	5
Figure 2-2: Existing afternoon peak hour intersection volumes (PCU) between 3.00PM and 4.00PM.....	5

## List of appendices

Appendix A: Plates
Appendix B: Traffic survey data
Appendix C: SIDRA output files

# 1. Introduction

Centennial Coal Company Ltd currently operates Mannering Colliery (Mannering) near the town of Mannering Park, approximately 40km south of Newcastle. Mannering is located in both the Lake Macquarie and Wyong Local Government Areas. Mannering has been operating for over 45 years and in the 2005-06 financial year produced over 492,000 Run of Mine (ROM) tonnes of coal which was transported via overland conveyor to Vales Point Power Station.

Due to amendments to the *Environmental Planning and Assessment Act 1979* (EP&A Act) Mannering requires approval from the Department of Planning (DoP) for its surface facilities by August 2007 and to continue current mining operations beyond August 2010.

The Mannering Continuation of Mining Project (the Project) involves the continuation of mining from the Fassifern Coal Seam by bord and pillar mining methods producing up to 1.1 million tonnes per annum of coal. There will be no increase in the current staffing levels of approximately 90 employees. Transportation of the ROM coal from the site will continue to be via conveyor to Vales Point Power Station.

Parsons Brinckerhoff (PB) has undertaken a traffic engineering investigation to determine the performance of the intersection of the Mannering access road with Rutleys Road. Both employee access and all mine service vehicles are reliant on this intersection for access to Mannering. The intersection is within Wyong Shire Council.

Current traffic volumes on Rutleys Road and the mine access road were obtained, and predicted future traffic volumes superimposed on the network. With the use of Signalised and unsignalised Intersection Design and Research Aid (SIDRA) traffic analysis software, an analysis was undertaken to estimate the performance of the intersection using:

- current traffic volumes; and
- future traffic volumes with background growth.

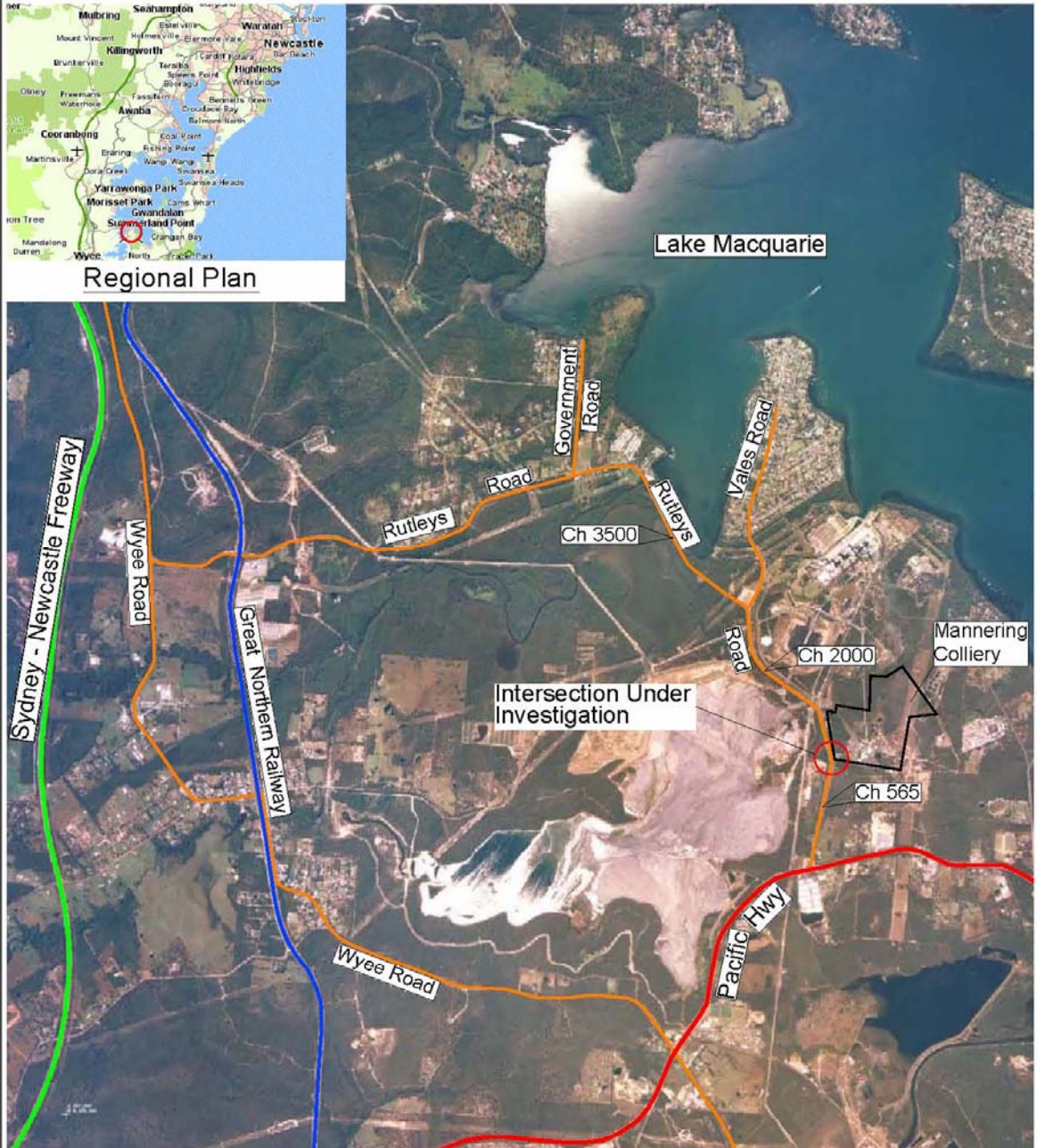
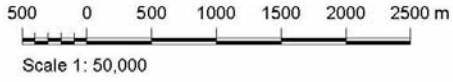
## 1.1 Site description

Mannering is accessed via a single entrance off Rutleys Road in the suburb of Mannering Park. Rutleys Road, classified as a local road by the Roads and Traffic Authority (RTA), connects with the Pacific Highway one kilometre to the south and Wye Road approximately 8 kilometres to the north west. It provides the only connection to the townships of Mannering Park via Vales Point Road and Wye Point via Government Road.

The section of Rutleys Road near the Mannering access road intersection is a two lane, two way road of a rural standard with an 80 km/h speed limit. The intersection is a simple T type located on the outside of a bend on Rutleys Road. The grade on either side varies but it is generally level at the intersection and there is good sight distance to the north and south. The lane widths of Rutleys Road on the approach and departure to the intersection vary between 4.0m and 4.8m with a maximum of 7.5m on the south bound side.

The Mannering access road has two 3.8m wide lanes, kerb and guttering and a 20 km/h posted speed limit. A small 100mm high median separates the lanes and stops at 10.5m from the end of the access road. The access road has a large kerb return radius and opens out to a 25m width on the departure lane and an 18m width on the approach lane at the holding line. A site locality plan is provided as **Figure 1.1** and photographs in **Appendix A**.

Client: Hansen Bailey  
 Project: Mannering Colliery Traffic Study  
 Location: Mannering Park, Lake Macquarie, NSW



Plot Date: 16/12/06 - 10:00  
 Cad File: J:\AS02-1\K1\950\A2122740A\_Mannering\_Colliery\_CADD\DRAWINGS\Fig 1.dwg

**Locality Plan**  
 Figure 1.1

## 2. Existing Traffic Volumes

### 2.1 Annual daily traffic

#### 2.1.1 Wyong Council data

Wyong Council have obtained traffic volumes on various sections of Rutleys Road since February 2001 with the most recent being in October 2005. The counts were obtained on three different sections of the road 565m, 2000m and 3500m from the intersection of Rutleys Road with the Pacific Highway, represented by CH565, CH2000 and CH3500 (see **Figure 1.1**). The traffic count closest to the access road intersection and therefore of most interest is the data collected at CH565.

The location of the counts on Rutleys Road is:

- Chainage 565 is approximately halfway from the highway to the Mannering Colliery entrance;
- Chainage 2000 is north of the gates into the Vales Point power station entrance; and
- Chainage 3500 is approximately at Government Rd, Wyee Point

The Average Daily Traffic (ADT) data is summarised in **Table 2-1** below.

**Table 2-1: Wyong Council traffic data**

	2001	2004	2005	Growth Rate p.a
<b>CH 565</b>	6094	7372	-	6.6%
<b>CH 2000</b>	5885	7094	7348	5.7%
<b>CH 3500</b>	3394	4251	4625	8.0%

As shown in the table above, the growth rate on Rutleys Road varies between 5.7% and 8.0%; however data for Chainage 565 was not obtained in 2005.

#### 2.1.2 Commissioned counts

PB engaged a specialised sub consultant to gather traffic data on Rutleys Road and the Mannering access road. A seven day count was obtained from Wednesday 15 November until Tuesday 21 November 2006. The Rutleys Road results obtained can be summarised as follows:

- two way weekday average of 8282 vehicles / day;
- two way weekend average of 6828 vehicles / day; and a
- seven day average (ADT) of 7867 vehicles / day.

The results indicated a nearly even directional split between north and southbound traffic. Over the seven days surveyed, it was found that the morning peak occurred between 8AM to 9AM and the evening peak between 3PM to 4PM.

The Mannering access road results indicated:

- two way weekday average of 244 vehicles / day;
- two way weekend average of 73 vehicles / day; and a
- seven day average (ADT) of 195 vehicles / day.

The results indicated a 50 / 50 directional split between east and westbound traffic. Over the seven days surveyed, the morning peak of the Mannering access road occurred between 6AM to 7AM (42 vehicles) and the evening between 3PM and 4PM (26 vehicles).

## 2.2 Mine traffic

Mannering currently employs approximately 90 full time staff and operates in three 8-hour shifts from:

- 7AM to 3PM (36 workers);
- 3PM to 11PM (24 workers); and
- 11PM to 7AM (20 workers);
- plus 10 floating staff.

There is typically a 30 to 40 minute overlap between people arriving for, and departing from, their shift. The traffic stream also contains a variable number of contractors and service vehicles arriving at various times of the day and night.

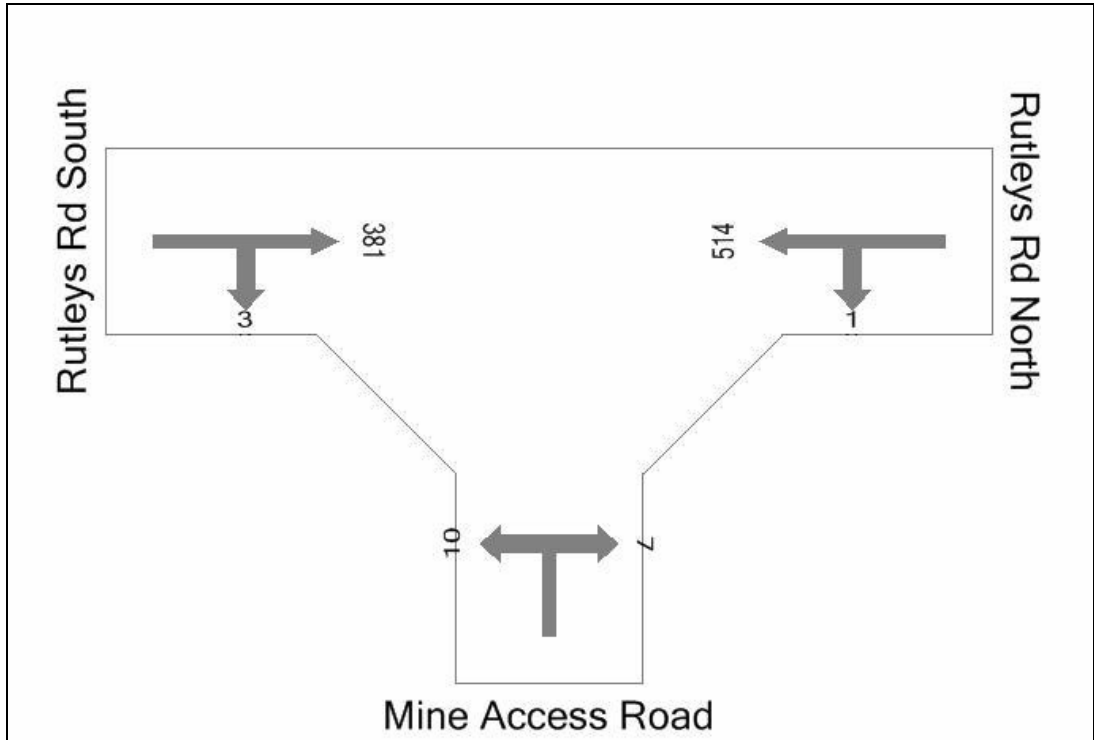
## 2.3 Intersection counts

PB commissioned peak period manoeuvre counts as part of this study at the intersection of Rutleys Road and the Mannering access road. The traffic counts provided a general indication of current traffic flows. The surveys were conducted on Wednesday, 22 November 2006, during the morning and evening peak periods and are provided in **Appendix B**.

The survey results indicated that the morning peak hour of the intersection; that is when the intersection experienced the most vehicles, occurred between 7:30AM and 8:30AM, with the evening peak hour occurring between 3:00PM and 4:00PM. **Figure 2-1** and **Figure 2-2** show the intersection turning movement volumes in Passenger Car Units (PCU) per hour, for the two peak periods surveyed (PCU = Cars + Heavy Vehicles x 3).

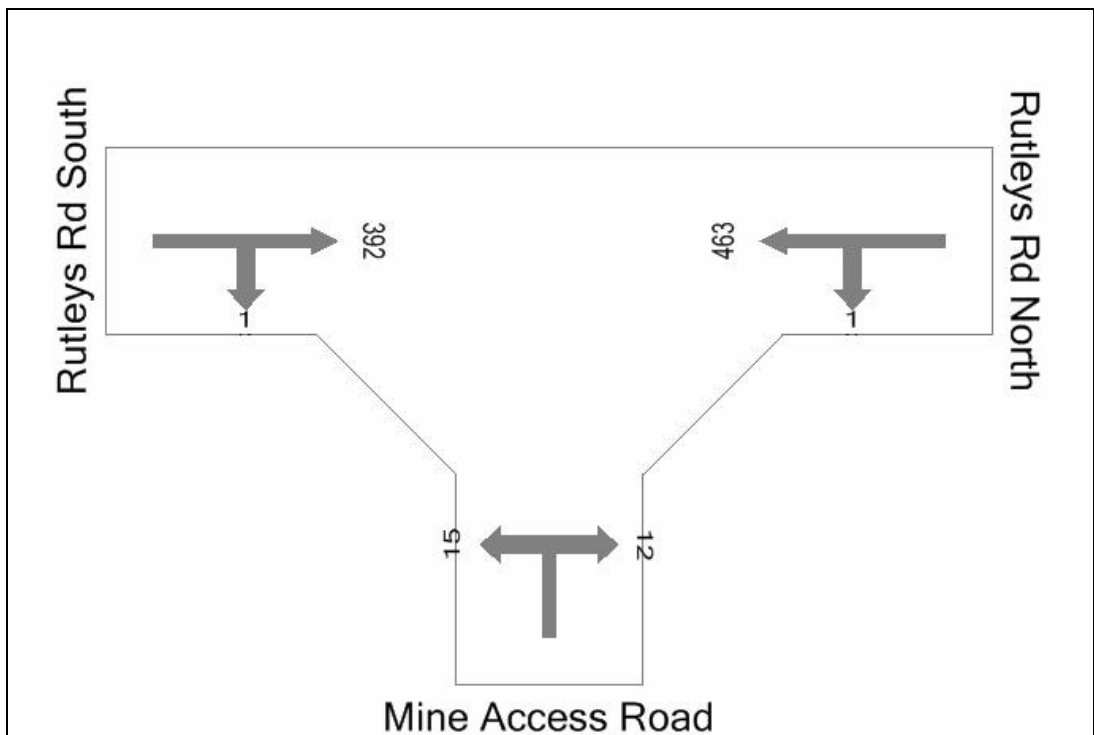
The traffic characteristics of the intersection can be summarised as follows:

- Rutleys Road, north of the intersection, carries 903 PCU in the morning peak hour and 856 PCU, two-way, in the evening peak hour;
- Rutleys Road, south of the intersection, carries 908 PCU in the morning peak hour and 859 PCU, two-way, in the evening peak hour; and
- The mine access road carries 21 PCU in the morning peak hour and 29 PCU, two-way, in the evening peak hour.



**Figure 2-1: Existing morning peak hour intersection volumes (PCU) between 7.30AM and 8.30AM**

Note: For the SIDRA analysis, cars and trucks are represented as PCU. PCU = Cars + 3 x Trucks



**Figure 2-2: Existing afternoon peak hour intersection volumes (PCU) between 3.00PM and 4.00PM**

## 3. Future traffic volumes

### 3.1 Mine traffic

Mannering has indicated that future mine operation does not require an increase in current staff levels or additional equipment requirements. The current workforce of approximately 90 full time employees will remain unchanged for the ongoing operation of Mannering into the future. Coal will also continue to be transported to Vales Point Power Station via a dedicated overland conveyor. No coal will be transported via road.

The traffic generated by Mannering is therefore not expected to increase. The current weekday peak of approximately 244 vehicles / day and peak hour of 42 vehicles on the access road is unlikely to change. The shift changeover times are also not expected to change.

### 3.2 Rutleys Road

Traffic data collected from Wyong Council since 2001 has indicated an annual growth rate of between 6.6% and 8.0% on Rutleys Road. The higher growth has been experienced on the northern end of the road around 2.5 km from the mine entrance with the lower rate near the mine. The average rate is 6.8% per annum; however this growth rate does not correlate with the results from the commissioned counts, which found that traffic volumes increased by only 3% per year since 2004.

It was considered that the exceptionally high growth rate of 6% would not be sustainable into the future. For the purposes of an analytical traffic assessment, PB has adopted a more realistic growth rate of 3% per annum for Rutleys Road traffic. The results of applying this growth rate to the existing traffic volumes on Rutleys Road are presented in **Table 3-1** below. It is assumed the proportion of heavy vehicles remains constant. The volumes are two way and given in PCU.

**Table 3-1: Projected traffic volumes on Rutleys Road (PCU)**

	2006	2016	2026
<b>Morning peak hour</b>			
- Northbound	381	458	534
- Southbound	514	620	725
<b>Evening peak hour</b>			
- Northbound	392	487	582
- Southbound	463	574	685

## 4. Intersection modelling

### 4.1 Intersection modelling

The operation of the intersection of Rutleys Road and the Mannering Access Road was assessed using the SIDRA intersection modelling software package. SIDRA calculates intersection performance measures such as:

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

#### 4.1.1 Level of service

Level of service (LoS) is one of the basic performance parameters used to describe the operation of an intersection. The levels of service range from A (indicating good intersection operation) to F (indicating over saturated conditions with long delays and queues). At signalised and roundabout intersections, the LoS criteria are related to average intersection delay (seconds per vehicle). At priority controlled intersections, the LoS is based on the average delay (seconds per vehicle) for the worst movement. See **Table 4-1**.

**Table 4-1: Intersection performance interpretation**

Level of Service	Average delay per vehicle (sec/veh)	Give Way and Stop Sign
A	<14	Good operation
B	15 to 28	Acceptable delays and spare capacity
C	29 to 42	Satisfactory, but accident study required
D	43 to 56	Near capacity and accident study required
E	57 to 70	At capacity, requires other control modes
F	>70	Above capacity, requires other control modes

Source: RTA Guide to Traffic Generating Developments, 2002.

#### 4.1.2 Degree of saturation

Degree of saturation (DoS) is defined as 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 ratio for all types of intersection.

#### 4.1.3 Delay

Delay is the difference between interrupted and uninterrupted travel times through the intersection and is measured in seconds per vehicle. The delays include queued vehicles decelerating and accelerating to and/or from stop, as well as delays experienced by all vehicles negotiating the intersection. At signalised and roundabout intersections, the average intersection delay is usually reported and is taken as the weighted average delay by

summing the product of the individual movement traffic volume and its corresponding calculated delays and dividing by the total traffic volume at the intersection. At priority controlled intersections, the average delay for the worse movement is usually reported.

#### 4.1.4 Queue length

Queue length is the number of vehicles waiting at the stop line and is usually quoted as the 95<sup>th</sup> percentile back of queue, which is the value below which 95 percent of all observed queue lengths fall. It is measured as the number of 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.

## 4.2 Existing performance

The results of the operational performance analysis of the existing circumstances for the intersection of Rutleys Road and Mannering access road are provided in **Table 4-2**.

**Table 4-2: Existing intersection performance**

Peak Hour	DoS	Ave Delay (sec)	Current LoS	Max Queue (m)
AM peak	0.28	19	B	20
PM peak	0.25	19	B	19

The intersection of Rutleys Road and the Mannering access road operates as a sign controlled priority intersection. The departure lane from the access road is wide enough for two vehicles to sit adjacent at the holding line, however, a conservative approach was adopted by assuming one departure lane.

The intersection is currently operating exceptionally well with level of service B and degree of saturation of less than 0.3 during both peak periods. Currently, traffic exiting the mine site experiences the highest delay in both peak periods – in the order of approximately 20 seconds. The right turn traffic from Rutleys Road into the mine site experiences the next longest delays at this intersection – approximately 10 to 15 seconds. Other movements at this intersection experience little or no delays.

Rutleys Road northbound traffic experiences queues of up to 20m in both peak periods. This is due to the fact that the approach is a shared lane for through and right turning traffic, therefore, a vehicle waiting to turn right would block the through traffic.

The intersection is currently operating with ample spare capacity, minimal delays and virtually no queues, except for the right turn movement into the access road. See **Appendix C** for SIDRA output files.

## 4.3 Future performance

Intersection analysis was repeated for 2016 and 2026 based on predicted future traffic volumes shown in **Table 3-1**. The predicted future traffic volumes were estimated by assuming a 3% pa growth of through traffic on Rutleys Road. The results are summarised in **Table 4-3** below.

**Table 4-3: Future intersection performance**

Peak Hour	DoS	Ave Delay (sec)	Current LoS	Max Queue (m)
<b>2016 future cases</b>				
AM peak	0.34	26	B	29
PM peak	0.33	27	B	29
<b>2026 future cases</b>				
AM peak	0.39	37	C	46
PM peak	0.37	46	D	49

As can be seen from **Table 4-3**, under 2016 predicted traffic conditions, the intersection would continue to operate exceptionally well with minimal delays and queuing. Existing level of service B operation would continue in 2016 for both peak periods. Degree of saturation would be in the order of 0.35 or less. The critical movements would continue to be traffic exiting the mine site, which would experience delays of up to 30 seconds during peak periods. The longest queue of 29m at this intersection in 2016 would continue to be experienced by the northbound Rutleys Road traffic (including the right turning traffic). The intersection would continue to experience ample capacity resulting in minimal delays and queues.

Under 2026 condition, this intersection would operate satisfactorily with level of service D or better in both peak periods. The longest delays would be in the order of 45 seconds or less, which would be experienced by traffic leaving the mine site. Right turning traffic entering the mine site would experience delays in the order of 15 seconds. The maximum queue length would continue to increase (to approximately 50m) and would be experienced by Rutleys Road northbound traffic. The intersection would continue to have ample capacity in 2026.

Although the intersection would continue to operate satisfactory in both peak periods in 2016 and 2026, there would be a slight deterioration in the operating conditions in the future. However, the delays and queues that would be experienced by motorists would still be within a tolerable threshold and not to the extent that would require treatment. It also should be noted that the change in the performance of the intersection would be due to natural growth of Rutleys Road traffic. The future mine operation is not expected to generate additional traffic demand. See **Appendix C** for SIDRA output files for future conditions.

## 5. Recommendations

The critical movements identified by the SIDRA analysis were the right turn into and the right turn out of the Mannering access road. The following treatments may need to be considered as required:

- Seagull intersection treatment providing a sheltered right turn into and right turn out of the Mannering access road; and / or
- Auxiliary Right Turn (AUR) treatment to allow through traffic to pass vehicles turning right into the Mannering access road.

Austrroads Guide to Traffic Engineering Practice (2005) also recommends that for the turning and through traffic volumes currently experienced from 6.00AM to 7.00AM, that an auxiliary lane treatment is recommended (Figure 6.41 – Warrants for Rural Turn Lanes). However this treatment would not be warranted during the morning (8.00AM - 9.00AM) and afternoon peak hours (3.00PM – 4.00PM) as the turning traffic volumes due to the activities at Mannering are not substantial.

## 6. Conclusion

PB has undertaken a traffic engineering investigation to determine the performance of the intersection of the Mannering access road with Rutleys Road. The intersection is within the Wyong Shire Council and vehicle usage on the access road is restricted to mine employees and service vehicles.

There is not expected to be any increase in current staffing levels of approximately 90 employees due to the Project. The Project will not result in any increase in traffic movements or change in the current traffic mix.

Current traffic volumes on Rutleys Road and the Mannering access road were obtained, and predicted future traffic volumes superimposed on the network. With the use of SIDRA traffic analysis software, an analysis was undertaken to estimate the performance of the intersection.

The analysis revealed that the intersection currently operates at an acceptable level with only small delays experienced on the right turn into and out of the Mannering access road. The analysis also revealed that under future conditions (in 2016 and 2026), the intersection would continue to enjoy satisfactory operation. There would be a slight decrease in the operating conditions of the intersection, but not to the extent that would warrant treatment. The future performance change is due to the natural growth of Rutleys Road and not due to activities resulting from the Project.

However, from a safety perspective a detailed accident study may need to be undertaken in the future, together with consultation with council and the RTA to determine whether an auxiliary right turn or seagull design are the most appropriate treatments for the intersection.

# Appendix A

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Plates



**Photo 1: Mannering Colliery Access Road**



**Photo 2: Mannering Colliery Access Road Westbound**



**Photo 3: Rutleys Road Northbound**

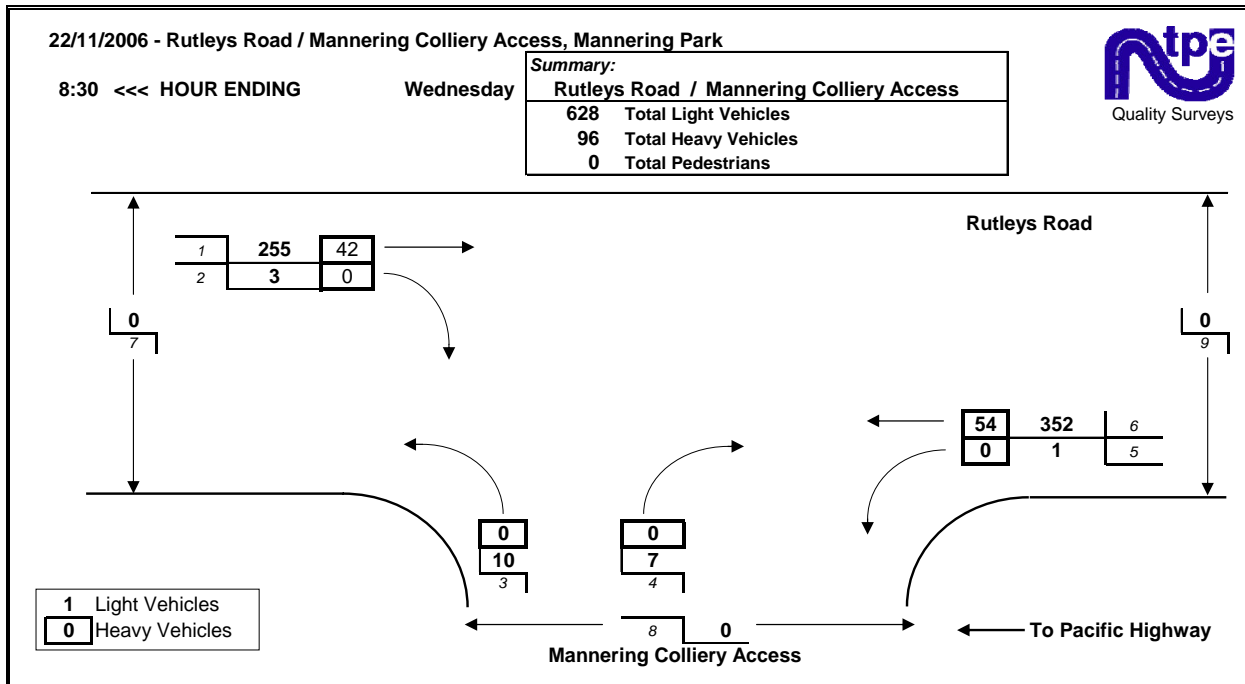


**Photo 4: Rutleys Road Southbound**

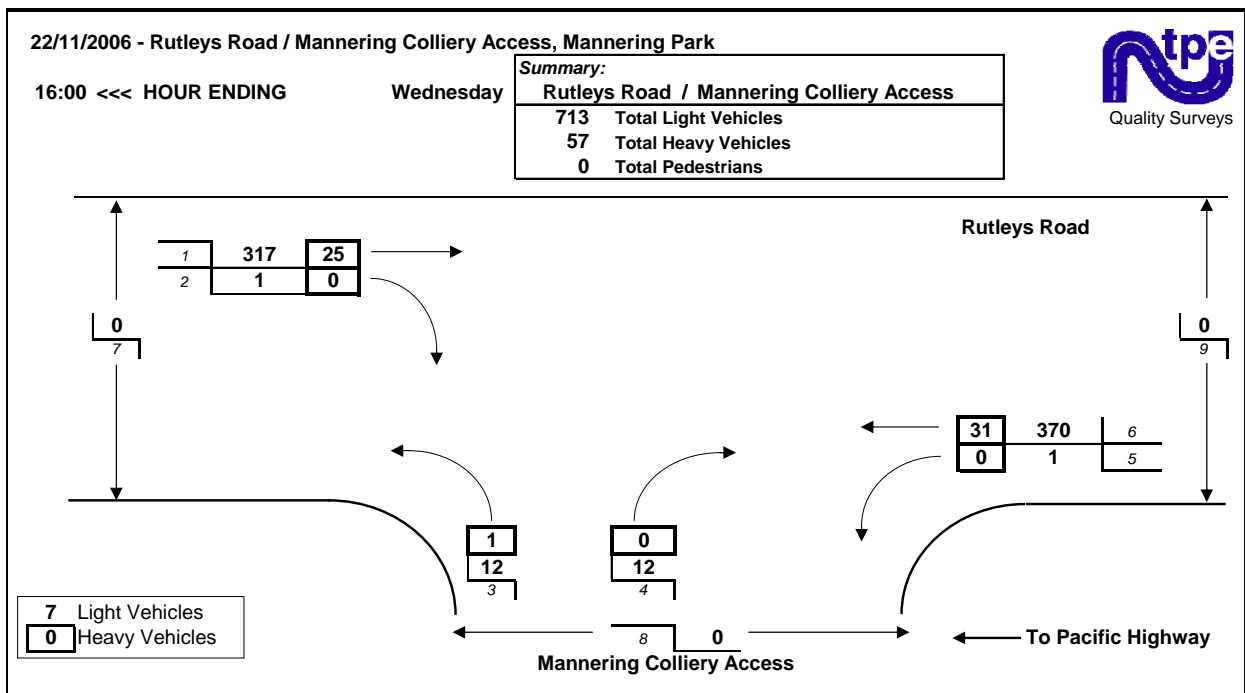
## **Appendix B**

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Traffic survey data



Morning peak hour traffic movements

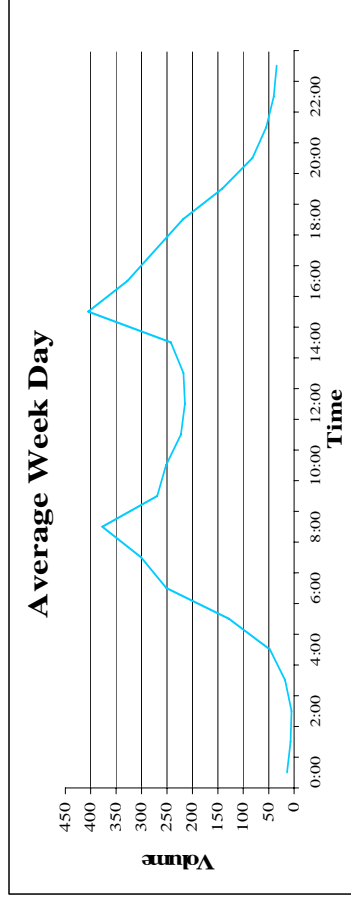


Afternoon peak hour traffic movements

**Rutleys Road North of Mantering Colliery Access, Mantering Park**

**Southbound**

Day Time	Wed 15-Nov-06	Thu 16-Nov-06	Fri 17-Nov-06	Sat 18-Nov-06	Sun 19-Nov-06	Mon 20-Nov-06	Tue 21-Nov-06	W/Day Ave.	W/End Ave.	7 Day Ave
0:00	19	14	19	22	28	8	9	14	25	17
1:00	9	6	7	9	27	5	9	7	18	10
2:00	7	5	4	9	13	4	5	5	11	7
3:00	20	22	14	22	15	17	14	17	19	18
4:00	57	49	54	22	15	36	43	48	19	39
5:00	134	126	124	61	29	130	127	128	45	104
6:00	250	258	249	101	62	236	262	251	82	203
7:00	305	299	286	137	93	309	305	301	115	248
8:00	383	365	377	261	156	358	403	377	209	329
9:00	265	255	284	266	249	258	283	269	258	266
10:00	258	247	264	322	270	257	233	252	296	264
11:00	199	214	250	312	289	220	231	223	301	245
12:00	231	216	217	261	252	205	204	215	257	227
13:00	229	202	228	236	245	211	218	218	241	224
14:00	232	219	241	228	240	255	265	242	234	240
15:00	416	402	417	243	233	387	402	405	238	357
16:00	330	286	329	267	229	322	371	328	248	305
17:00	278	242	275	267	217	273	299	273	242	264
18:00	192	233	266	229	170	209	194	219	200	213
19:00	141	127	189	148	116	112	139	142	132	139
20:00	76	85	96	111	72	77	77	82	92	85
21:00	50	56	81	48	46	39	49	55	47	53
22:00	35	39	51	54	25	37	39	40	40	40
23:00	38	29	49	63	13	30	25	34	38	35
<b>Total</b>	<b>4154</b>	<b>3996</b>	<b>4371</b>	<b>3699</b>	<b>3104</b>	<b>3995</b>	<b>4206</b>	<b>4144</b>	<b>3402</b>	<b>3932</b>



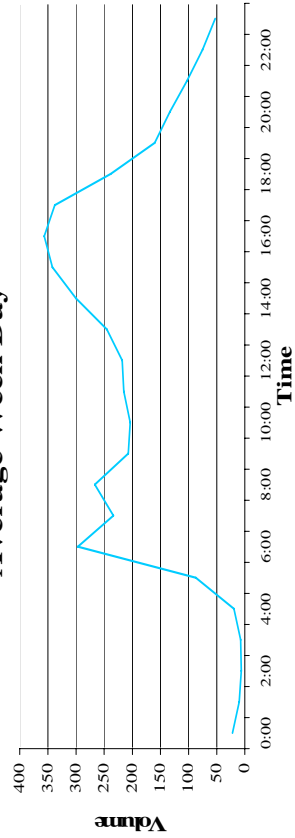
<b>Summary</b>	from	to
<b>AM Peak</b>	8:00 AM	9:00 AM
<b>PM Peak</b>	3:00 PM	4:00 PM
<b>Week Day Average</b>	<b>4144</b>	
<b>Weekend Day Average</b>	<b>3402</b>	
<b>7 Day Average</b>	<b>3932</b>	

**Rutleys Road North of Mannering Colliery Access, Mannering Park**

**Northbound**

Day Time	Wed 15-Nov-06	Thu 16-Nov-06	Fri 17-Nov-06	Sat 18-Nov-06	Sun 19-Nov-06	Mon 20-Nov-06	Tue 21-Nov-06	W/Day Ave.	W/End Ave.	7 Day Ave
0:00	23	20	23	39	46	20	23	22	43	28
1:00	8	12	15	26	38	6	10	10	32	16
2:00	6	11	8	17	13	3	3	6	15	9
3:00	7	7	8	12	19	10	6	8	16	10
4:00	19	17	18	15	21	18	24	19	18	19
5:00	92	76	85	42	39	95	87	87	41	74
6:00	301	299	283	105	74	281	321	297	90	238
7:00	250	241	214	133	78	235	229	234	106	197
8:00	248	258	256	201	98	271	301	267	150	233
9:00	219	180	222	211	184	214	201	207	198	204
10:00	202	193	202	268	219	207	216	204	244	215
11:00	198	209	227	318	245	196	245	215	282	234
12:00	235	229	212	312	296	195	220	218	304	243
13:00	261	218	253	287	243	238	256	245	265	251
14:00	289	293	319	265	267	291	309	300	266	290
15:00	332	324	395	269	241	313	345	342	255	317
16:00	407	344	348	266	241	349	335	357	254	327
17:00	331	300	356	272	183	363	340	338	228	306
18:00	227	250	260	195	155	249	207	239	175	220
19:00	146	148	209	119	137	142	157	160	128	151
20:00	105	138	162	121	99	123	138	133	110	127
21:00	86	121	126	123	69	81	99	103	96	101
22:00	72	97	85	79	47	50	71	75	63	72
23:00	57	45	77	86	19	39	46	53	53	53
<b>Total</b>	<b>4121</b>	<b>4030</b>	<b>4363</b>	<b>3781</b>	<b>3071</b>	<b>3989</b>	<b>4189</b>	<b>4138</b>	<b>3426</b>	<b>3935</b>

**Average Week Day**

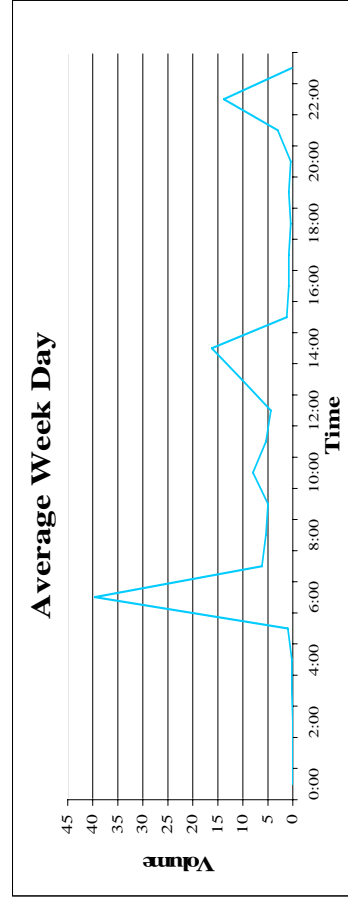


Summary	
from	to
AM Peak	6:00 AM to 7:00 AM
PM Peak	4:00 PM to 5:00 PM
Week Day Average	
Weekend Day Average	
7 Day Average	
	<b>321</b>
	<b>407</b>
	<b>4138</b>
	<b>3426</b>
	<b>3935</b>

**Manning Colliery Access East of Rutleys Road, Mannering Park**

**Eastbound**

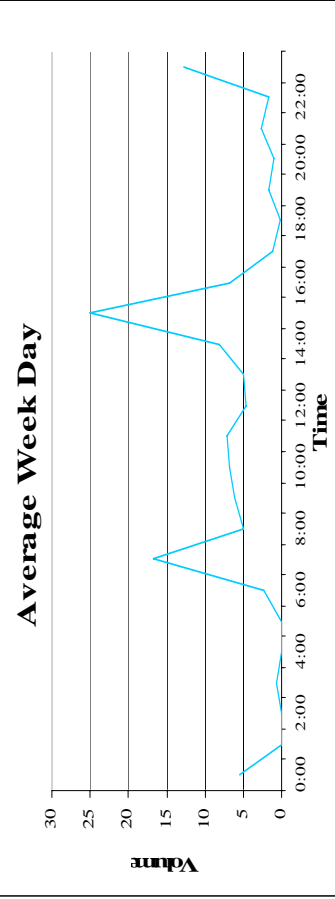
Day Time	Wed 15-Nov-06	Thu 16-Nov-06	Fri 17-Nov-06	Sat 18-Nov-06	Sun 19-Nov-06	Mon 20-Nov-06	Tue 21-Nov-06	W/Day Ave.	W/End Ave.	7 Day Ave
0:00	0	0	0	0	1	0	0	0	1	0
1:00	0	0	0	0	0	0	0	0	0	0
2:00	0	0	0	2	0	0	0	0	1	0
3:00	0	0	0	0	0	0	1	0	0	0
4:00	0	0	0	0	0	0	1	0	0	0
5:00	1	1	1	5	0	1	1	1	3	1
6:00	42	39	37	2	2	39	41	40	2	29
7:00	6	7	6	2	5	9	3	6	4	5
8:00	6	3	7	7	2	5	6	5	5	5
9:00	5	3	5	4	1	6	6	5	3	4
10:00	5	11	5	2	1	6	13	8	2	6
11:00	14	4	1	1	0	5	3	5	1	4
12:00	3	5	5	1	2	2	7	4	2	4
13:00	7	11	21	2	4	6	6	10	3	8
14:00	22	19	0	1	2	21	19	16	2	12
15:00	2	1	3	1	1	0	0	1	1	1
16:00	2	0	0	1	0	2	0	1	1	1
17:00	1	0	1	2	0	0	2	1	1	1
18:00	0	1	0	0	0	0	1	0	0	0
19:00	0	1	1	1	8	1	1	1	5	2
20:00	1	1	0	0	0	0	0	0	0	0
21:00	1	0	12	0	0	1	1	3	0	2
22:00	17	17	0	0	10	18	17	14	5	11
23:00	0	0	1	0	0	0	0	0	0	0
<b>Total</b>	<b>135</b>	<b>124</b>	<b>106</b>	<b>34</b>	<b>39</b>	<b>122</b>	<b>129</b>	<b>123</b>	<b>37</b>	<b>98</b>



Summary	
from	to
6:00 AM	7:00 AM
<b>AM Peak</b>	<b>42</b>
2:00 PM	3:00 PM
<b>PM Peak</b>	<b>22</b>
<b>Week Day Average</b>	
	<b>123</b>
<b>Weekend Day Average</b>	
	<b>37</b>
<b>7 Day Average</b>	
	<b>98</b>

**Manning Colliery Access East of Rutleys Road, Manning Park**

Day Time	Manning Park							Westbound		
	Wed 15-Nov-06	Thu 16-Nov-06	Fri 17-Nov-06	Sat 18-Nov-06	Sun 19-Nov-06	Mon 20-Nov-06	Tue 21-Nov-06	W/Day Ave.	W/End Ave.	7 Day Ave
0:00	10	9	0	1	1	0	8	5	1	4
1:00	0	0	0	0	0	0	0	0	0	0
2:00	0	0	0	0	0	0	0	0	0	0
3:00	1	0	0	1	0	0	2	1	1	1
4:00	0	0	0	0	0	0	0	0	0	0
5:00	0	0	0	4	0	0	0	0	2	1
6:00	2	2	2	5	1	3	3	2	3	3
7:00	19	14	18	4	0	18	15	17	2	13
8:00	6	6	3	1	0	3	7	5	1	4
9:00	6	2	8	5	1	7	8	6	3	5
10:00	3	9	6	1	1	6	10	7	1	5
11:00	10	4	3	4	1	8	11	7	3	6
12:00	8	4	2	3	1	3	6	5	2	4
13:00	5	9	4	2	4	5	2	5	3	4
14:00	7	10	8	2	2	7	9	8	2	6
15:00	22	34	31	0	1	21	17	25	1	18
16:00	14	0	1	9	0	9	10	7	5	6
17:00	1	1	2	3	0	1	1	1	2	1
18:00	0	0	0	0	0	1	0	0	0	0
19:00	0	1	1	2	9	1	5	2	6	3
20:00	0	2	0	0	2	2	1	1	1	1
21:00	3	3	5	0	0	1	1	3	0	2
22:00	0	0	7	0	0	0	1	2	0	1
23:00	15	20	7	0	0	11	11	13	0	9
<b>Total</b>	<b>132</b>	<b>130</b>	<b>108</b>	<b>47</b>	<b>24</b>	<b>107</b>	<b>128</b>	<b>121</b>	<b>36</b>	<b>97</b>



Summary	
from	to
<b>AM Peak</b>	7:00 AM to 8:00 AM
<b>PM Peak</b>	3:00 PM to 4:00 PM
<b>Week Day Average</b>	
<b>Weekend Day Average</b>	
<b>7 Day Average</b>	
<b>19</b>	<b>34</b>
<b>121</b>	<b>36</b>
<b>97</b>	

## **Appendix C**

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SIDRA output files

*Intersection Summary*  
*Mannering TIA*  
*Existing 2006 AM*

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<b>Performance Measure</b>	<b>Vehicles</b>	<b>Persons</b>
<b>Demand Flows - Total</b>	964 veh/h	1446 pers/h
<b>Percent Heavy Vehicles</b>	0.0 %	
<b>Degree of Saturation</b>	0.278	
<b>Effective Intersection Capacity</b>	3468 veh/h	
<b>95% Back of Queue (m)</b>	20 m	
<b>95% Back of Queue (veh)</b>	2.8 veh	
<b>Control Delay (Total)</b>	0.53 veh-h/h	0.79 pers-h/h
<b>Control Delay (Average)</b>	2.0 s/veh	2.0 s/pers
<b>Level of Service</b>	Not Applicable	
<b>Level of Service (Worst Movement)</b>	LOS B	
<b>Total Effective Stops</b>	19 veh/h	28 pers/h
<b>Effective Stop Rate</b>	0.02 per veh	0.02 per pers
<b>Proportion Queued</b>	0.30	0.30
<b>Travel Distance (Total)</b>	584.5 veh-km/h	876.8 pers-km/h
<b>Travel Distance (Average)</b>	606 m	606 m
<b>Travel Time (Total)</b>	10.5 veh-h/h	15.8 pers-h/h
<b>Travel Time (Average)</b>	39.2 secs	39.2 secs
<b>Travel Speed</b>	55.7 km/h	55.7 km/h
<b>Operating Cost (Total)</b>	354 \$/h	354 \$/h
<b>Fuel Consumption (Total)</b>	49.5 L/h	
<b>Carbon Dioxide (Total)</b>	123.9 kg/h	
<b>Hydrocarbons (Total)</b>	0.190 kg/h	
<b>Carbon Monoxide (Total)</b>	6.50 kg/h	
<b>NOX (Total)</b>	0.258 kg/h	

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*Movement Summary*  
*Mannering TIA*  
*Existing 2006 AM*

Give-way

**Vehicle Movements**

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
<b>Mine Access Road</b>										
1	L	11	0.0	0.062	19.0	LOS B	2	0.70	0.83	39.4
3	R	7	0.0	0.062	19.2	LOS B	2	0.70	0.91	39.1
<b>Approach</b>		<b>18</b>	<b>0.0</b>	<b>0.063</b>	<b>19.1</b>	<b>LOS B</b>	<b>2</b>	<b>0.70</b>	<b>0.86</b>	<b>39.3</b>
<b>Ruttleys Rd East</b>										
4	L	1	0.0	0.250	8.2	LOS A	0	0.00	0.67	49.0
5	T	541	0.0	0.278	0.0	LOS A	0	0.00	0.00	60.0
<b>Approach</b>		<b>542</b>	<b>0.0</b>	<b>0.278</b>	<b>0.0</b>	<b>LOS A</b>		<b>0.00</b>	<b>0.00</b>	<b>60.0</b>
<b>Ruttleys Rd West</b>										
11	T	401	0.0	0.210	3.8	LOS A	20	0.68	0.00	51.7
12	R	3	0.0	0.214	12.2	LOS A	20	0.68	0.88	44.8
<b>Approach</b>		<b>404</b>	<b>0.0</b>	<b>0.210</b>	<b>3.8</b>	<b>LOS A</b>	<b>20</b>	<b>0.68</b>	<b>0.01</b>	<b>51.6</b>
<b>All Vehicles</b>		<b>964</b>	<b>0.0</b>	<b>0.278</b>	<b>2.0</b>	<b>Not Applicable</b>	<b>20</b>	<b>0.30</b>	<b>0.02</b>	<b>55.7</b>

*Intersection Summary*  
*Mannering TIA*  
*Existing 2006 PM*

---

<b>Performance Measure</b>	<b>Vehicles</b>	<b>Persons</b>
<b>Demand Flows - Total</b>	931 veh/h	1397 pers/h
<b>Percent Heavy Vehicles</b>	0.0 %	
<b>Degree of Saturation</b>	0.250	
<b>Effective Intersection Capacity</b>	3720 veh/h	
<b>95% Back of Queue (m)</b>	19 m	
<b>95% Back of Queue (veh)</b>	2.7 veh	
<b>Control Delay (Total)</b>	0.53 veh-h/h	0.79 pers-h/h
<b>Control Delay (Average)</b>	2.0 s/veh	2.0 s/pers
<b>Level of Service</b>	Not Applicable	
<b>Level of Service (Worst Movement)</b>	LOS B	
<b>Total Effective Stops</b>	27 veh/h	40 pers/h
<b>Effective Stop Rate</b>	0.03 per veh	0.03 per pers
<b>Proportion Queued</b>	0.31	0.31
<b>Travel Distance (Total)</b>	564.5 veh-km/h	846.7 pers-km/h
<b>Travel Distance (Average)</b>	606 m	606 m
<b>Travel Time (Total)</b>	10.2 veh-h/h	15.3 pers-h/h
<b>Travel Time (Average)</b>	39.5 secs	39.5 secs
<b>Travel Speed</b>	55.3 km/h	55.3 km/h
<b>Operating Cost (Total)</b>	344 \$/h	344 \$/h
<b>Fuel Consumption (Total)</b>	48.3 L/h	
<b>Carbon Dioxide (Total)</b>	120.6 kg/h	
<b>Hydrocarbons (Total)</b>	0.186 kg/h	
<b>Carbon Monoxide (Total)</b>	6.44 kg/h	
<b>NOX (Total)</b>	0.252 kg/h	

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*Movement Summary*  
*Mannering TIA*  
*Existing 2006 PM*

Give-way

**Vehicle Movements**

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
<b>Mine Access Road</b>										
1	L	16	0.0	0.099	18.9	LOS B	3	0.69	0.83	39.4
3	R	13	0.0	0.098	19.2	LOS B	3	0.69	0.91	39.2
<b>Approach</b>		<b>29</b>	<b>0.0</b>	<b>0.099</b>	<b>19.0</b>	<b>LOS B</b>	<b>3</b>	<b>0.69</b>	<b>0.87</b>	<b>39.3</b>
<b>Ruttleys Rd East</b>										
4	L	1	0.0	0.250	8.2	LOS A	0	0.00	0.67	49.0
5	T	487	0.0	0.250	0.0	LOS A	0	0.00	0.00	60.0
<b>Approach</b>		<b>488</b>	<b>0.0</b>	<b>0.250</b>	<b>0.0</b>	<b>LOS A</b>		<b>0.00</b>	<b>0.00</b>	<b>60.0</b>
<b>Ruttleys Rd West</b>										
11	T	413	0.0	0.213	3.2	LOS A	19	0.65	0.00	52.0
12	R	1	0.0	0.200	11.7	LOS A	19	0.65	0.85	45.3
<b>Approach</b>		<b>414</b>	<b>0.0</b>	<b>0.213</b>	<b>3.2</b>	<b>LOS A</b>	<b>19</b>	<b>0.65</b>	<b>0.00</b>	<b>52.0</b>
<b>All Vehicles</b>		<b>931</b>	<b>0.0</b>	<b>0.250</b>	<b>2.0</b>	<b>Not Applicable</b>	<b>19</b>	<b>0.31</b>	<b>0.03</b>	<b>55.3</b>

*Intersection Summary*  
*Mannering TIA*  
*Future 2016 AM*

---

<b>Performance Measure</b>	<b>Vehicles</b>	<b>Persons</b>
<b>Demand Flows - Total</b>	1157 veh/h	1736 pers/h
<b>Percent Heavy Vehicles</b>	0.0 %	
<b>Degree of Saturation</b>	0.335	
<b>Effective Intersection Capacity</b>	3450 veh/h	
<b>95% Back of Queue (m)</b>	29 m	
<b>95% Back of Queue (veh)</b>	4.1 veh	
<b>Control Delay (Total)</b>	0.88 veh-h/h	1.32 pers-h/h
<b>Control Delay (Average)</b>	2.7 s/veh	2.7 s/pers
<b>Level of Service</b>	Not Applicable	
<b>Level of Service (Worst Movement)</b>	LOS B	
<b>Total Effective Stops</b>	20 veh/h	31 pers/h
<b>Effective Stop Rate</b>	0.02 per veh	0.02 per pers
<b>Proportion Queued</b>	0.34	0.34
<b>Travel Distance (Total)</b>	701.6 veh-km/h	1052.4 pers-km/h
<b>Travel Distance (Average)</b>	606 m	606 m
<b>Travel Time (Total)</b>	12.7 veh-h/h	19.1 pers-h/h
<b>Travel Time (Average)</b>	39.6 secs	39.6 secs
<b>Travel Speed</b>	55.1 km/h	55.1 km/h
<b>Operating Cost (Total)</b>	430 \$/h	430 \$/h
<b>Fuel Consumption (Total)</b>	60.7 L/h	
<b>Carbon Dioxide (Total)</b>	151.6 kg/h	
<b>Hydrocarbons (Total)</b>	0.235 kg/h	
<b>Carbon Monoxide (Total)</b>	8.32 kg/h	
<b>NOX (Total)</b>	0.320 kg/h	

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*Movement Summary*  
*Mannering TIA*  
*Future 2016 AM*

Give-way

**Vehicle Movements**

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
<b>Mine Access Road</b>										
1	L	11	0.0	0.095	25.7	LOS B	3	0.80	0.93	35.1
3	R	7	0.0	0.095	25.9	LOS B	3	0.80	0.94	34.9
<b>Approach</b>		<b>18</b>	<b>0.0</b>	<b>0.095</b>	<b>25.8</b>	<b>LOS B</b>	<b>3</b>	<b>0.80</b>	<b>0.94</b>	<b>35.0</b>
<b>Ruttleys Rd East</b>										
4	L	1	0.0	0.333	8.2	LOS A	0	0.00	0.67	49.0
5	T	653	0.0	0.335	0.0	LOS A	0	0.00	0.00	60.0
<b>Approach</b>		<b>654</b>	<b>0.0</b>	<b>0.335</b>	<b>0.0</b>	<b>LOS A</b>		<b>0.00</b>	<b>0.00</b>	<b>60.0</b>
<b>Ruttleys Rd West</b>										
11	T	482	0.0	0.252	5.5	LOS A	29	0.78	0.00	50.7
12	R	3	0.0	0.250	14.0	LOS A	29	0.78	0.94	43.3
<b>Approach</b>		<b>485</b>	<b>0.0</b>	<b>0.252</b>	<b>5.6</b>	<b>LOS A</b>	<b>29</b>	<b>0.78</b>	<b>0.01</b>	<b>50.6</b>
<b>All Vehicles</b>		<b>1157</b>	<b>0.0</b>	<b>0.335</b>	<b>2.7</b>	<b>Not Applicable</b>	<b>29</b>	<b>0.34</b>	<b>0.02</b>	<b>55.1</b>

*Intersection Summary*  
*Mannering TIA*  
*Future 2016 PM*

---

<b>Performance Measure</b>	<b>Vehicles</b>	<b>Persons</b>
<b>Demand Flows - Total</b>	1148 veh/h	1722 pers/h
<b>Percent Heavy Vehicles</b>	0.0 %	
<b>Degree of Saturation</b>	0.333	
<b>Effective Intersection Capacity</b>	3444 veh/h	
<b>95% Back of Queue (m)</b>	29 m	
<b>95% Back of Queue (veh)</b>	4.1 veh	
<b>Control Delay (Total)</b>	0.92 veh-h/h	1.38 pers-h/h
<b>Control Delay (Average)</b>	2.9 s/veh	2.9 s/pers
<b>Level of Service</b>	Not Applicable	
<b>Level of Service (Worst Movement)</b>	LOS B	
<b>Total Effective Stops</b>	29 veh/h	43 pers/h
<b>Effective Stop Rate</b>	0.03 per veh	0.03 per pers
<b>Proportion Queued</b>	0.36	0.36
<b>Travel Distance (Total)</b>	696.1 veh-km/h	1044.1 pers-km/h
<b>Travel Distance (Average)</b>	606 m	606 m
<b>Travel Time (Total)</b>	12.8 veh-h/h	19.1 pers-h/h
<b>Travel Time (Average)</b>	40.0 secs	40.0 secs
<b>Travel Speed</b>	54.6 km/h	54.6 km/h
<b>Operating Cost (Total)</b>	431 \$/h	431 \$/h
<b>Fuel Consumption (Total)</b>	61.0 L/h	
<b>Carbon Dioxide (Total)</b>	152.5 kg/h	
<b>Hydrocarbons (Total)</b>	0.238 kg/h	
<b>Carbon Monoxide (Total)</b>	8.58 kg/h	
<b>NOX (Total)</b>	0.324 kg/h	

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*Movement Summary*  
*Mannering TIA*  
*Future 2016 PM*

Give-way

**Vehicle Movements**

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
<b>Mine Access Road</b>										
1	L	16	0.0	0.157	26.7	LOS B	4	0.81	0.94	34.5
3	R	13	0.0	0.157	27.0	LOS B	4	0.81	0.94	34.3
<b>Approach</b>		<b>29</b>	<b>0.0</b>	<b>0.157</b>	<b>26.9</b>	<b>LOS B</b>	<b>4</b>	<b>0.81</b>	<b>0.94</b>	<b>34.4</b>
<b>Ruttleys Rd East</b>										
4	L	1	0.0	0.333	8.2	LOS A	0	0.00	0.67	49.0
5	T	604	0.0	0.310	0.0	LOS A	0	0.00	0.00	60.0
<b>Approach</b>		<b>605</b>	<b>0.0</b>	<b>0.310</b>	<b>0.0</b>	<b>LOS A</b>		<b>0.00</b>	<b>0.00</b>	<b>60.0</b>
<b>Ruttleys Rd West</b>										
11	T	513	0.0	0.264	4.9	LOS A	29	0.77	0.00	50.8
12	R	1	0.0	0.250	13.3	LOS A	29	0.77	0.93	43.8
<b>Approach</b>		<b>514</b>	<b>0.0</b>	<b>0.264</b>	<b>4.9</b>	<b>LOS A</b>	<b>29</b>	<b>0.77</b>	<b>0.00</b>	<b>50.8</b>
<b>All Vehicles</b>		<b>1148</b>	<b>0.0</b>	<b>0.333</b>	<b>2.9</b>	<b>Not Applicable</b>	<b>29</b>	<b>0.36</b>	<b>0.03</b>	<b>54.6</b>



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*Intersection Summary*  
*Mannering TIA*  
*Future 2026 AM*

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<b>Performance Measure</b>	<b>Vehicles</b>	<b>Persons</b>
<b>Demand Flows - Total</b>	1347 veh/h	2021 pers/h
<b>Percent Heavy Vehicles</b>	0.0 %	
<b>Degree of Saturation</b>	0.392	
<b>Effective Intersection Capacity</b>	3437 veh/h	
<b>95% Back of Queue (m)</b>	46 m	
<b>95% Back of Queue (veh)</b>	6.6 veh	
<b>Control Delay (Total)</b>	1.49 veh-h/h	2.24 pers-h/h
<b>Control Delay (Average)</b>	4.0 s/veh	4.0 s/pers
<b>Level of Service</b>	Not Applicable	
<b>Level of Service (Worst Movement)</b>	LOS C	
<b>Total Effective Stops</b>	21 veh/h	32 pers/h
<b>Effective Stop Rate</b>	0.02 per veh	0.02 per pers
<b>Proportion Queued</b>	0.38	0.38
<b>Travel Distance (Total)</b>	816.8 veh-km/h	1225.2 pers-km/h
<b>Travel Distance (Average)</b>	606 m	606 m
<b>Travel Time (Total)</b>	15.1 veh-h/h	22.7 pers-h/h
<b>Travel Time (Average)</b>	40.4 secs	40.4 secs
<b>Travel Speed</b>	54.1 km/h	54.1 km/h
<b>Operating Cost (Total)</b>	511 \$/h	511 \$/h
<b>Fuel Consumption (Total)</b>	72.3 L/h	
<b>Carbon Dioxide (Total)</b>	180.8 kg/h	
<b>Hydrocarbons (Total)</b>	0.284 kg/h	
<b>Carbon Monoxide (Total)</b>	10.35 kg/h	
<b>NOX (Total)</b>	0.386 kg/h	

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*Movement Summary*  
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*Future 2026 AM*

Give-way

**Vehicle Movements**

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
<b>Mine Access Road</b>										
1	L	11	0.0	0.151	37.1	LOS C	4	0.88	0.96	29.7
3	R	7	0.0	0.152	37.3	LOS C	4	0.88	0.96	29.5
<b>Approach</b>		<b>18</b>	<b>0.0</b>	<b>0.152</b>	<b>37.2</b>	<b>LOS C</b>	<b>4</b>	<b>0.88</b>	<b>0.96</b>	<b>29.6</b>
<b>Ruttleys Rd East</b>										
4	L	1	0.0	0.333	8.2	LOS A	0	0.00	0.67	49.0
5	T	763	0.0	0.392	0.0	LOS A	0	0.00	0.00	60.0
<b>Approach</b>		<b>764</b>	<b>0.0</b>	<b>0.392</b>	<b>0.0</b>	<b>LOS A</b>		<b>0.00</b>	<b>0.00</b>	<b>60.0</b>
<b>Ruttleys Rd West</b>										
11	T	562	0.0	0.294	8.3	LOS A	46	0.89	0.00	48.9
12	R	3	0.0	0.300	16.7	LOS B	46	0.89	1.02	41.0
<b>Approach</b>		<b>565</b>	<b>0.0</b>	<b>0.294</b>	<b>8.3</b>	<b>LOS A</b>	<b>46</b>	<b>0.89</b>	<b>0.01</b>	<b>48.8</b>
<b>All Vehicles</b>		<b>1347</b>	<b>0.0</b>	<b>0.392</b>	<b>4.0</b>	<b>Not Applicable</b>	<b>46</b>	<b>0.38</b>	<b>0.02</b>	<b>54.1</b>



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<b>Performance Measure</b>	<b>Vehicles</b>	<b>Persons</b>
<b>Demand Flows - Total</b>	1365 veh/h	2047 pers/h
<b>Percent Heavy Vehicles</b>	0.0 %	
<b>Degree of Saturation</b>	0.370	
<b>Effective Intersection Capacity</b>	3686 veh/h	
<b>95% Back of Queue (m)</b>	49 m	
<b>95% Back of Queue (veh)</b>	7.0 veh	
<b>Control Delay (Total)</b>	1.69 veh-h/h	2.54 pers-h/h
<b>Control Delay (Average)</b>	4.5 s/veh	4.5 s/pers
<b>Level of Service</b>	Not Applicable	
<b>Level of Service (Worst Movement)</b>	LOS D	
<b>Total Effective Stops</b>	31 veh/h	46 pers/h
<b>Effective Stop Rate</b>	0.02 per veh	0.02 per pers
<b>Proportion Queued</b>	0.41	0.41
<b>Travel Distance (Total)</b>	827.7 veh-km/h	1241.5 pers-km/h
<b>Travel Distance (Average)</b>	606 m	606 m
<b>Travel Time (Total)</b>	15.5 veh-h/h	23.2 pers-h/h
<b>Travel Time (Average)</b>	40.8 secs	40.8 secs
<b>Travel Speed</b>	53.4 km/h	53.4 km/h
<b>Operating Cost (Total)</b>	524 \$/h	524 \$/h
<b>Fuel Consumption (Total)</b>	74.5 L/h	
<b>Carbon Dioxide (Total)</b>	186.3 kg/h	
<b>Hydrocarbons (Total)</b>	0.295 kg/h	
<b>Carbon Monoxide (Total)</b>	10.99 kg/h	
<b>NOX (Total)</b>	0.401 kg/h	

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Give-way

**Vehicle Movements**

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
<b>Mine Access Road</b>										
1	L	16	0.0	0.271	45.7	LOS D	8	0.90	1.00	26.6
3	R	13	0.0	0.271	45.9	LOS D	8	0.90	0.99	26.4
<b>Approach</b>		<b>29</b>	<b>0.0</b>	<b>0.272</b>	<b>45.8</b>	<b>LOS D</b>	<b>8</b>	<b>0.90</b>	<b>1.00</b>	<b>26.5</b>
<b>Ruttleys Rd East</b>										
4	L	1	0.0	0.333	8.2	LOS A	0	0.00	0.67	49.0
5	T	721	0.0	0.370	0.0	LOS A	0	0.00	0.00	60.0
<b>Approach</b>		<b>722</b>	<b>0.0</b>	<b>0.370</b>	<b>0.0</b>	<b>LOS A</b>		<b>0.00</b>	<b>0.00</b>	<b>60.0</b>
<b>Ruttleys Rd West</b>										
11	T	613	0.0	0.316	7.7	LOS A	49	0.88	0.00	49.5
12	R	1	0.0	0.333	16.2	LOS B	49	0.88	1.02	41.4
<b>Approach</b>		<b>614</b>	<b>0.0</b>	<b>0.316</b>	<b>7.8</b>	<b>LOS A</b>	<b>49</b>	<b>0.88</b>	<b>0.00</b>	<b>49.5</b>
<b>All Vehicles</b>		<b>1365</b>	<b>0.0</b>	<b>0.370</b>	<b>4.5</b>	<b>Not Applicable</b>	<b>49</b>	<b>0.41</b>	<b>0.02</b>	<b>53.4</b>



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