Wallarah 2 Coal Project
Traffic Impact Study

September, 2010

Wyong Areas Coal Joint Venture

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Glossary

SIDRA	Intersection performance analysis software
AADT	Annual Average Daily Traffic
W2CP	Wallarah No. 2 Coal Project
WACJV	Wyong Areas Coal Joint Venture
Mtpa	Million tonnes per annum
LoS	Level of Service
DoS	Degree of Saturation
LV	Light vehicles (cars, van, motorbikes etc.)
HV	Heavy vehicles (rigid trucks, buses, B-doubles, semi-trailers etc.)

Executive summary

International Environmental Consultant, on behalf of The Wyong Areas Coal Joint Venture (WACJV), commissioned Parsons Brinckerhoff (PB) to undertake a traffic impact assessment for the proposed Wallarah No. 2 Coal Project (W2CP) to support the project application that is being lodged under Part 3A of the New South Wales Environmental Planning and Assessment Act (1979).

The construction and operation of the proposed Wallarah 2 Coal Project (W2CP) has the following impact on traffic:

- increased traffic associated with the construction and operation of the W2CP mine sites
- road safety implications.

All produced coal is anticipated to be transported by rail, via a new rail loop to be constructed to the north of the mine site. Therefore, road-based traffic movements would mainly be associated with:

- construction activity
- workforce
- deliveries and service vehicles once the mine is in operation.

Intersection performance analyses

The key intersections in the surrounding road network were surveyed and analysed using modelling software to determine the impact at traffic generated by the development. The following scenarios were assessed:

- Scenario 1: Do-nothing (2011)
- Scenario 2: Construction phase for the Tooheys Road site and Buttonderry site (2011)
- Scenario 3: Do-nothing (2014)
- Scenario 4: Mine operational phase of the Tooheys Road site and Buttonderry site (2014)
- Scenario 5: Mine operational phase of the Tooheys Road site and Buttonderry site, and operation of Precinct 14 (2014)
- Scenario 6: Do-nothing (2024)
- Scenario 7: Construction of the Western Shaft site, and mine operational phase of the Tooheys Road and Buttonderry sites (2024)
- Scenario 8: Construction of the Western Shaft site, mine operational phase of the Tooheys Road and Buttonderry sites, and operation of Precinct 14 (2024).

Traffic impacts of the proposed W2CP were also assessed considering different construction working hours in 2011 and 2024, due to daylight saving. It was determined that traffic impacts are very similar throughout the forecast years, during the months with or without daylight saving.

Three intersections are forecast to operate with unacceptable performance in future years. The deterioration in performance is largely due to the growth of background traffic. In order to maintain satisfactory intersection performance in the forecast years, PB recommends the following intersection upgrades:

- Construction of two-lane roundabout at the Sydney–Newcastle Freeway/Sparks Road interchange (western side)
- Construction of single lane roundabout at the Hue Hue Road/Wyee Road intersection
- Construction of single lane roundabout at the Hue Hue Road/Jilliby Road intersection.

The Sydney–Newcastle Freeway/Sparks Road interchange (eastern side) is the only intersection that would be affected by the W2CP related traffic in 2024. In order to maintain satisfactory intersection performance in the forecast years, PB recommends the construction of two-lane roundabout at the Sydney–Newcastle Freeway/Sparks Road interchange (eastern side).

Under the proposed layouts, these intersections would operate at a satisfactory LoS B or better, and operate with the design capacity, during both AM and PM peak hours. The 95th percentile queue of the turn movements would not overflow to adjacent through lanes. These results would satisfy Wyong Council's specified criteria.

The proposed layout at the newly created intersections, including the Tooheys Road and Buttonderry site accesses, and the two Precinct 14 accesses, is adequate to accommodate the estimated future traffic.

Impact of traffic as a result of the operation of Precinct 14 is marginal at most of the key intersections, compared to the traffic impacts caused by the W2CP. The only exception is the Sydney–Newcastle Freeway/ Sparks Road interchange (eastern side), where the intersection performance would be reduced from LoS C to F during the AM peak hour in 2024, when the Precinct 14 related trips were added to the W2CP related trips.

Road safety

The crash record at the Sydney–Newcastle Freeway/Sparks Road interchange as well as the Hue Hue Road/Sparks Road intersection is quite poor and included a high number of right turning/crossing crashes. W2CP related traffic would increase the risk exposure at this intersection and may increase the frequency of crashes.

The proposed roundabouts would reduce the potential safety risks by simplifying conflicts, reducing vehicle speed and by simplifying a driver's decision by providing by a clearer indication of the driver's right of way.

Consultation with Wyong Council indicated that the Hue Hue Road/Sparks Road intersection would be upgraded to a roundabout after 2015. This would significantly improve the road safety outcome at this intersection.

A number of road safety issues were identified in relation to deficiencies in signs and linemarking, delineation, pavement, guardrail and drainage, and a number of mitigation measures have been recommended to improve road safety during the construction and operation of the W2CP.

Public transport, pedestrian and cyclist facilities would be improved along the Sparks Road corridor, as a result of the Wyong Employee Zone project. However, the use of these facilities by mining employees is not anticipated to be significant.

The RTA has developed a strategic plan for an off-road cycleway on the southern side of Sparks Road.

Conclusion

- The proposed W2CP will generate additional traffic during its construction and operational phases during peak hours, that are not necessarily identical with the existing background traffic peak hours.
- The additional traffic of the proposed W2CP is expected to impose some impact at the Sydney–Newcastle Freeway/Sparks Road interchange (eastern side).
- PB recommends the construction of a two-lane roundabout at the Sydney–Newcastle Freeway/Sparks Road interchange (eastern side), to maintain satisfactory intersection performance in the forecast years. The proposed roundabouts would also reduce the potential safety risks by simplifying conflicts, reducing vehicle speed and by simplifying a driver's decision by providing by a clearer indication of the driver's right of way.
- The construction and operation of W2CP should be undertaken in compliance with accepted traffic engineering practices, as well as the mitigation measures recommended in this report (refer to Section 7).

1. Introduction

1.1 Background

International Environmental Consultant, on behalf of The Wyong Areas Coal Joint Venture (WACJV), commissioned Parsons Brinckerhoff (PB) to undertake a traffic impact assessment for the proposed Wallarah No. 2 Coal Project (W2CP) to support the project application that is being lodged under Part 3A of the New South Wales Environmental Planning and Assessment Act (1979).

The W2CP is located within the western area of the Wyong Coal Development Area, approximately 7 km to the north of Wyong, within the local government area of Wyong Shire Council.

Source: Google maps

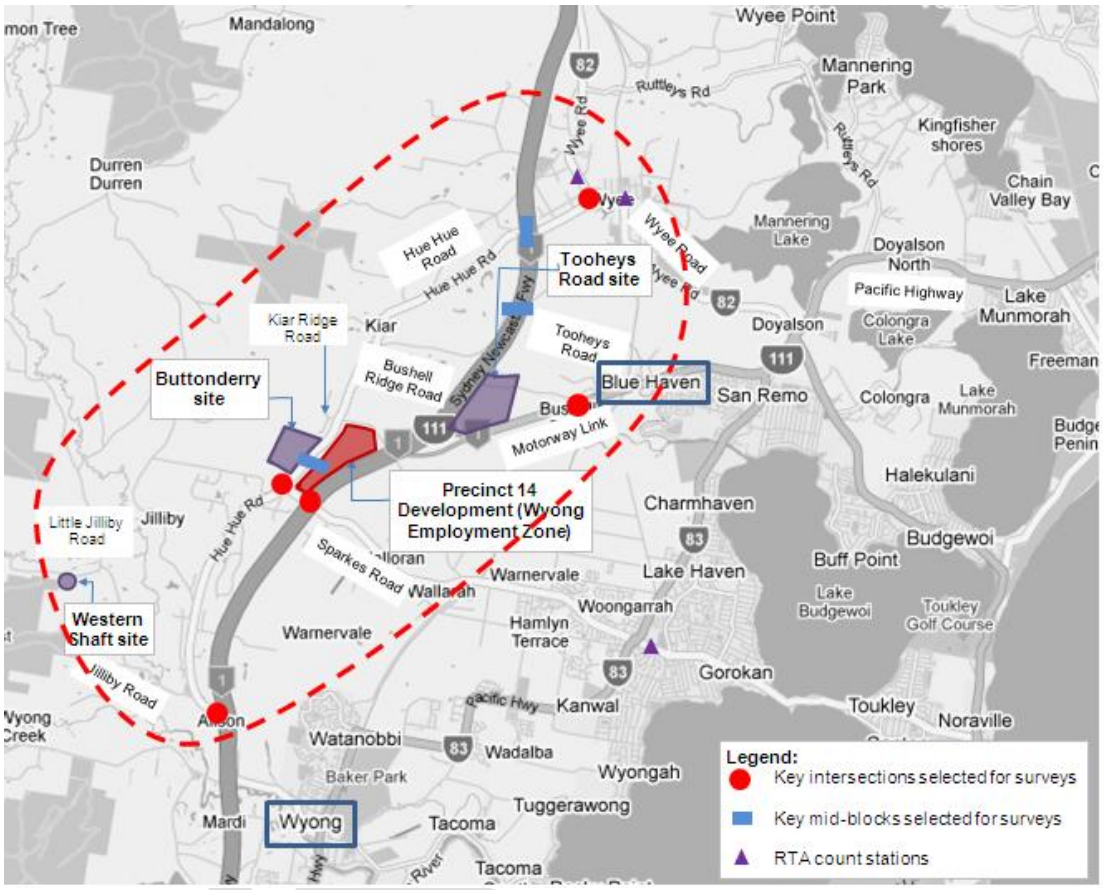
Figure 1.1 Location of Wallarah 2 Coal Project area

The WACJV is proposing to extract coal from the W2CP mine at a rate of 5 million tonnes per annum (Mtpa) for approximately 40 years.

All produced coal is anticipated to be transported by rail, via a new rail loop to be constructed to the north of the mining area. Therefore, road-based traffic movements would mainly be generated by the construction activity, as well as the workforce, deliveries and service vehicles once the mine is in operation.

1.2 Study area

The study area is located north of Wyong and west of Blue Haven (refer to Figure 1.2). The locality map also shows the proposed Tooheys Road, Buttonderry and Western Shaft sites.



Source: Google maps

Figure 1.2 Study area

The mine would consist of two main sites, Tooheys Road and Buttonderry. An additional area will be required for future mine ventilation, referred to as the Western Shaft site.

- The Tooheys Road site is located off Tooheys Road in Bushells Ridge, between the F3 Freeway (a main route between Sydney and Newcastle) and the Motorway Link Road that links the F3 to the Pacific Highway.
- The Buttonderry site is located to the west of Hue Hue Road, and to the north of its intersection with Sparks Road. Hue Hue Road connects Wyong to Wyee and is the main connection between the Toukley/Gorokan area and the F3.
- The Western Shaft site is located off Little Jilliby Road to the south-west of the Buttonderry site.

This study also considers Precinct 14 of the Wyong Employment Zone. Precinct 14 is located at Jilliby and is bounded by the F3 Freeway to the south-east, Sparks Road to the south-west, Hue Hue Road to the north-west and Kiar Ridge Road to the north-east.

1.3 Description of the mining sites

The mine development would comprise of three sites:

- The Tooheys Road site, which would have facilities for the raw coal storage, finished product stockpiling, and rail loop and loading infrastructure. Exploratory work indicated the coal is located approximately 500 m below ground level. The coal would be extracted using longwall mining involving a series of underground roadways below the Buttonderry site. The coal would then be removed by a conveyor along the drift line, bringing the coal to the surface at the Tooheys Road site.
- The Buttonderry site, which would be used for the main office facilities, bathhouse and employee access to and from the underground mine.
- The Western Shaft site, which would be required ten years after commencement of operation of the above two sites, to house a downcast shaft (i.e. air intake into the mine) and serve as a secondary emergency access and egress point.

1.4 Study scope

The scope of this traffic impact assessment includes:

- an assessment of the existing traffic and road condition
- an assessment of the traffic generation during the operational and construction periods and its impact on the surrounding key intersections
- a cumulative assessment that includes Precinct 14 as part of the Wyong Employment Zone and its impact on the surrounding key intersections
- an assessment of potential road safety impacts
- mitigation measures to address the identified potential impacts.

This report was prepared in accordance to the Roads and Traffic Authority 2002*, Guide to Traffic Generating Developments*.

1.5 Surveys

The following surveys were commissioned to complete the traffic impact assessment:

- turning traffic counts at the five key intersections close to the Wallarah 2 Coal Mine (see Figure 1.2)
- a seven-day, 24-hour, traffic count was undertaken on key road sections to establish the baseline traffic volume.

Other traffic volume data was obtained from the permanent RTA count station located on the Motorway Link, Wyee Road and Sparks Road.

2. Existing road network and traffic demand

2.1 Road network

The Sydney-Newcastle Freeway (F3) is part of the Auslink National Network linking Sydney, the Central Coast and Newcastle. It is a six-lane divided road that, in 2004, carried approximately 38,494 vehicles/day at Wyee (RTA count station 05.222 located to the north of Sparks Road), and approximately 60,093 vehicles/day at Wyong (RTA count station 05.007 located to the south of the Motorway Link). The road has a posted speed limit of 110 km/h. The F3 intersects with Sparks Road at the Warnervale Interchange nearby the proposed mining area.

Sparks Road is a two-lane road intersecting the F3 at the Warnervale Interchange. The western part of the full diamond interchange has recently been upgraded to be traffic signal controlled. The eastern part of the interchange remain in a 'seagull' layout, where an acceleration lane is provided on Sparks Road for the right turning traffic from the southbound off ramp onto Sparks Road. Sparks Road has a posted speed limit of 70 km/h nearby the interchange whilst the further sections east of the intersection have a posted speed limit of 80 km/h to 90 km/h.

Hue Hue Road is a rural two-lane road connecting Wyee to the north and Mardi to the south. The posted speed limit is generally 80 to 90 km/h. Hue Hue Road carried 3,149 vehicles/day at Wyee (RTA count station 05.515 located west of Toukley Road) in 2004.

Wyee Road is a two-lane road connecting Morrisset to the north and Pacific Highway (Motorway Link) to the south. The road has a posted speed limit of 60 km/h on the urban section and 90 km/h on the rural section between the east of Bukkai Road and Pacific Highway. There is a 40 km/h school zone located to the east of Hue Hue Road.

Motorway Link is a divided road connecting the F3 Freeway with Pacific Highway at Doyalson. The Motorway Link carried 16,130 vehicles/day at Doyalson (RTA count station 05.302 south of Pacific Highway) in 2004.

Tooheys Road is a local, unsealed road about 6.5 m wide. At its eastern terminus, Tooheys Road intersects at Motorway Link forming a full diamond interchange. At the western terminus, Tooheys Road crosses the F3 Freeway via an underpass to connect to Tooheys Road North and Bushells Ridge Road. As there are no speed limit signs on display on Tooheys Road, the default speed limit is supposed to be 80 km/h on this rural road.

Bushells Ridge Road is a two-lane road linking Gosford Road to the east and Hue Hue Road to the west. The road has a posted speed limit of 80 km/h.

Jilliby Road is a two-lane road linking Little Jilliby Road to the north and Hue Hue Road to the south. The road has various posted speed limits of between 60 and 80 km/h. There is a 40 km/h school zone located to the north of the Jilliby Road/Little Jilliby Road intersection.

Little Jilliby Road is a two-lane local road intersecting Jilliby Road at a T-junction. The road is narrow and without line marking. There is a 40 km/h school zone located to the south of the Little Jilliby Road/Jilliby Road intersection. There is no posted speed limit sign on display.

2.2 2010 existing situation – traffic volumes

The existing traffic volumes and the traffic turning movements were identified from the AADT data published by the Road and Traffic Authority (RTA), and from the traffic count surveys at the following locations (refer to Figure 1.2):

- Sydney–Newcastle Freeway/Sparks Road interchange
- Sparks Road/Hue Hue Road intersection
- Hue Hue Road/Wyee Road intersection
- Motorway Link/Tooheys Road interchange
- Hue Hue Road/Jilliby Road intersection.

Turning traffic volumes were counted at the first four intersections on Thursday 3 June 2010 from 6:00 am to 7:00 pm, while an additional survey was conducted at the Hue Hue Road/Jilliby Road intersection on Thursday 1 July 2010 from 6:00 am to 7:00 pm.

2.2.1 Turning movement summary

Table 2.1 shows the traffic peak hours at the key intersections.

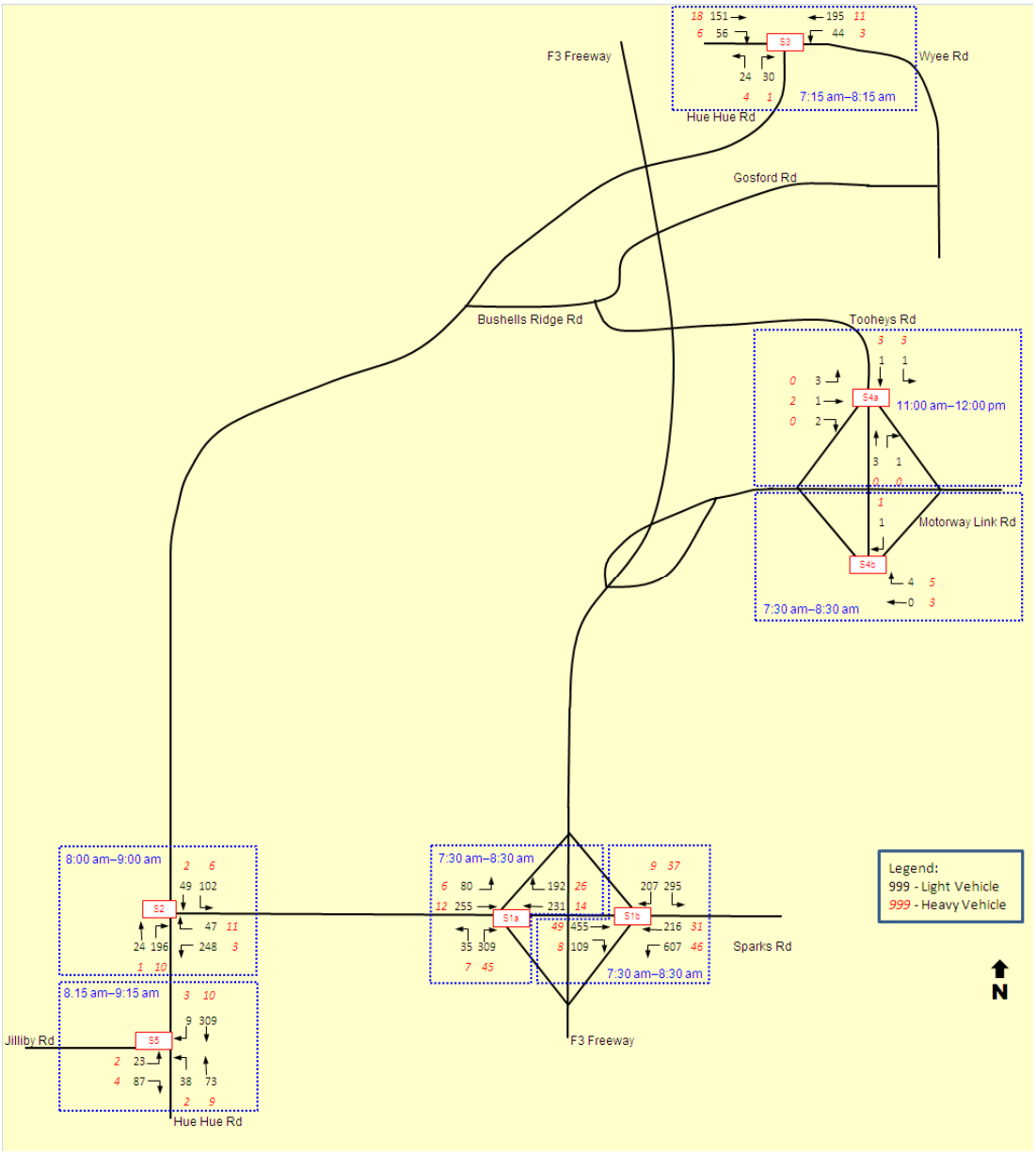
Table 2.1 Key intersection attributes

Intersections	Intersection control	Peak hours
Sydney–Newcastle Freeway/Sparks Road interchange (western side)	Signals	7:30 am–8:30 am 4:15 pm–5:15 pm
Sydney–Newcastle Freeway/Sparks Road interchange (eastern side)	Priority	7:30 am–8:30 am 2:45 pm–3:45 pm
Sparks Road/Hue Hue Road	Priority	8:00 am–9:00 am 4:00 pm–5:00 pm
Hue Hue Road/Wyee Road	Priority	7:15 am–8:15 am 3:15 pm–4:15 pm
Motorway Link Road/Tooheys Road interchange (north side of the interchange)	Priority	11:00 am–12:00 pm 3:15 pm–4:15 pm
Motorway Link Road/Tooheys Road interchange (south side of the interchange)	Priority	7:30 am–8:30 am 12:30 pm–1:30 pm
Hue Hue Road/Jilliby Road	Priority	8.15 am–9:15 am 3:15 pm–4:15 pm

Note: Interchanges were reported as two separate intersections

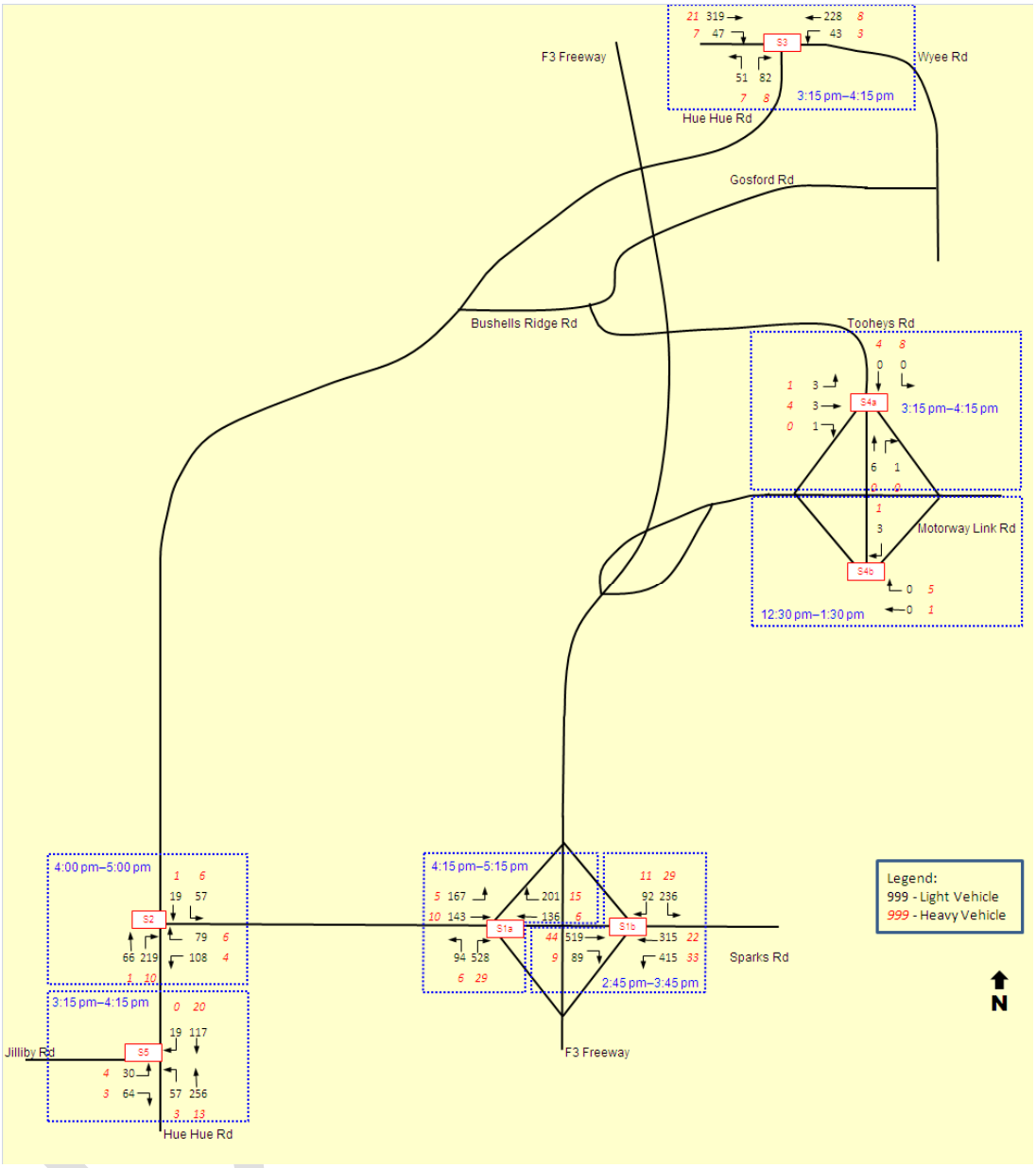
Figure 2.1 and Figure 2.2 show the morning and afternoon peak hour turning traffic movement volumes at the key intersections. The traffic volumes in this figure are in vehicles per hour (vph).

It should be noted that the observed peak hours at the key intersections are different as shown on the following figures.



Note: different observed peak hours at the key intersections

Figure 2.1 Existing AM peak hour traffic volumes at the key intersections (vph)



Note: different observed peak hours at the key intersections

Figure 2.2 Existing PM peak hour traffic volumes at the key intersections (vph)

2.3 Surveyed queue length

Table 2.2 summarises the 95th percentile back of queue calculated from the survey data collected on Thursday 3 June 2010 at the signal controlled intersection on the western side of Sydney–Newcastle Freeway/Sparks Road interchange.

Table 2.2 Observed 95th percentile back of queue

Intersection	Peak hour	Approach	95th percentile back of queue (vehicles)
Sydney–Newcastle Freeway/Sparks Road interchange (western side)	AM (7:30 am–8:30 am)	South	12
		East	8
		West	15
	PM (4:15 pm–5:15 pm)	South	16
		East	9
		West	12

2.4 Operation of traffic signals

2.4.1 Operation of controllers

The Sydney–Newcastle Freeway/Sparks Road interchange (western side) is controlled by traffic signals. Consultation with the RTA indicated that the intersection runs in an isolated mode, so intersection data available was limited to basic local times (e.g. min and max greens, approach timing, yellow and all red times). This intersection does not run under any form of masterlink control.

Appendix A shows the Intersection Diagnostic Monitor (IDM) data recorded between 6:00 am and 6:00 pm on Thursday 3 June 2010.

2.4.2 Signal phasing

Figure 2.5 shows the three-phase single diamond overlap arrangement in operation by the signal controller during the surveyed morning and afternoon peak hours.

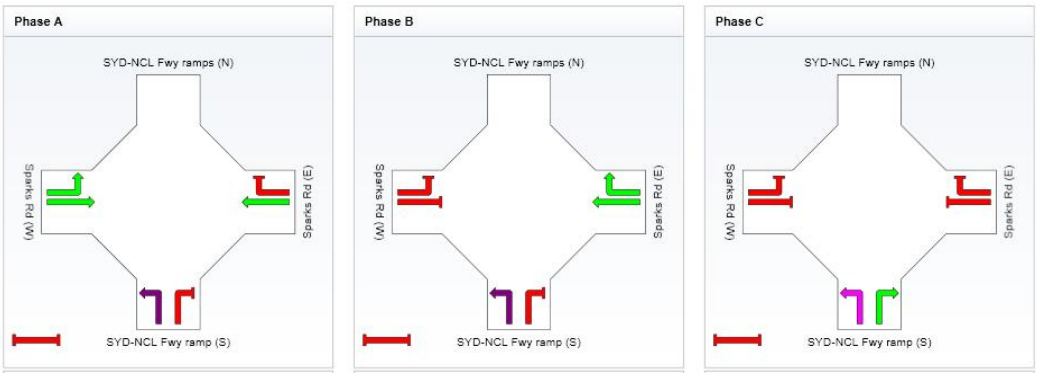


Figure 2.3 Existing signal phasing

2.4.3 Cycle time

Based on the IDM data, the cycle time was 61 seconds between 7:30 am and 8:30 am and 63 seconds between 4:15 pm and 5:15 pm on the survey day.

2.5 Regional traffic growth

In order to determine the future traffic growth rates, the historical rates of traffic growth on the surrounding roads were analysed.

Annual average daily traffic (AADT) data was available for 1995 to 2004 (from the RTA count stations) for key roads in the vicinity of the proposed mine sites (refer to Figure 1.2).

Table 2.3 summarises the AADT at three RTA counting stations nearby the proposed sites.

Table 2.3 Historical traffic flows on nearby roads

RTA station ID	Location	Year				Annual growth (95-04)
		1995	1998	2001	2004	
05.642	Wyee Road (MR454), east of Toronto Road at railway bridge	5,816	6,295	6,503	7,391	2.7%
05.514	Wyee Road (MR454) at Wyee Creek bridge	4,867	5,716	6,011	6,695	3.6%
05.165	Sparks Road (MR509), east of Pacific Hwy	17,056	17,722	19,114	22,168	3.0%

Source: RTA Traffic Volume Data for Hunter and Northern Regions (2004)

All count stations recorded a consistent increase in traffic volumes between 1995 and 2004. Annual growth rate at individual locations were used for calculating the future background traffic growth for the construction phase and operational phases. The following annual growth rates were applied to the key intersections based on their proximity to the count stations:

- 2.7% per annum at the Hue Hue Road/Wyee Road intersection
- 3.0% per annum at the Sydney-Newcastle Freeway/Sparks Road intersection.

An assumption was made to the following key intersection based on the RTA count station data:

- 2.7% per annum at the Hue Hue Road/Jilliby Road intersection.

A consultation with Wyong City Council indicated the following annual growth rates:

- 3.0% per annum at the Hue Hue Road/Sparks Road intersection
- 1.0% per annum at the Motorway Link Road/Tooheys Road interchange.

2.6 Provision of public transport

Bus service is provided along Sparks Road and Hue Hue Road. The bus service operates seven days a week. The routes include stops such as at the Lake Haven Shops, Warnervale Station, Wyong Station and Tuggerah Westfield, all providing access to transport to further destinations.

The following bus services are currently available:

- Bus route 10 – Wyee to Tuggerah via Wyong
- Bus route 11 – Lake Haven to Tuggerah via Warnervale and Wyong
- Bus route 13 – Dooralong to Tuggerah via Wyong.

The following school bus services are provided in the study area:

- School bus route 1 – Wyong High School to Jilliby Public School and Wadalba Community School
- School bus route 2 – Wyong Highway school to Lakes Grammar College
- School bus route 3 – Bushells Ridge Road to Lakes Grammar College
- School bus route 4 – Lakes Grammar College to Warnervale
- School bus route 5 – Lakes Grammar College to Tuggerah Westfield.

Bus movements have been captured in the intersection counts and included in the intersection analyses.

2.7 Pedestrian and cyclist activities and facilities

The pedestrian and cyclist activities seem to be low in the study area, with the exception of the urban section of Wyee Road (generally between Hue Hue Road and Bungaree Street) where dwellings and school are located along the road.

No pedestrian and bicycle facilities are provided on the rural roads within the study area. However, there are pedestrian footpath provided on Wyee Road between Hue Hue Road and Bungaree Street, and an on-road cycle lane provided on Sparks Road.

3. Existing performance of the key intersections

3.1 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 to determine the level of intersection performance.

3.1.1 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 3.1).

Table 3.1 Level of service criteria for intersections

Level of Service	Average delay (seconds per vehicle)	Traffic signals, roundabout	Give Way and Stop signs
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

3.1.2 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 DoS greater than 1.0, a small increment in traffic volumes would result in an exponential increase in delays and queue length. The intersection DoS is based on the movement with the highest ratio for all types of intersection.

3.1.3 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.

3.1.4 Queue length

Queue length is measured in metres reflecting 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 reflects 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.

3.2 Assessment criteria

Consultation with Wyong Council indicated the following acceptable intersection performance criteria:

- LoS C or better (vehicles' average delays less than or equal to 42 seconds).

An addition criterion is required for assessing the performance of intersection improvement options and newly created intersections. The 95th percentile queues should not overflow and block adjacent through lanes.

3.3 SIDRA modelling and model calibration

The operation of the intersection was assessed using the SIDRA 4.0 intersection modelling software.

The SIDRA model was calibrated using the following parameters for the Sydney–Newcastle Freeway/Sparks Road interchange (western side):

- lane saturation flow based on the maximum flows (MFs) provided by the RTA
- all red time based on IDM data.

Figure 3.1 shows the sensitivity test for model calibration.

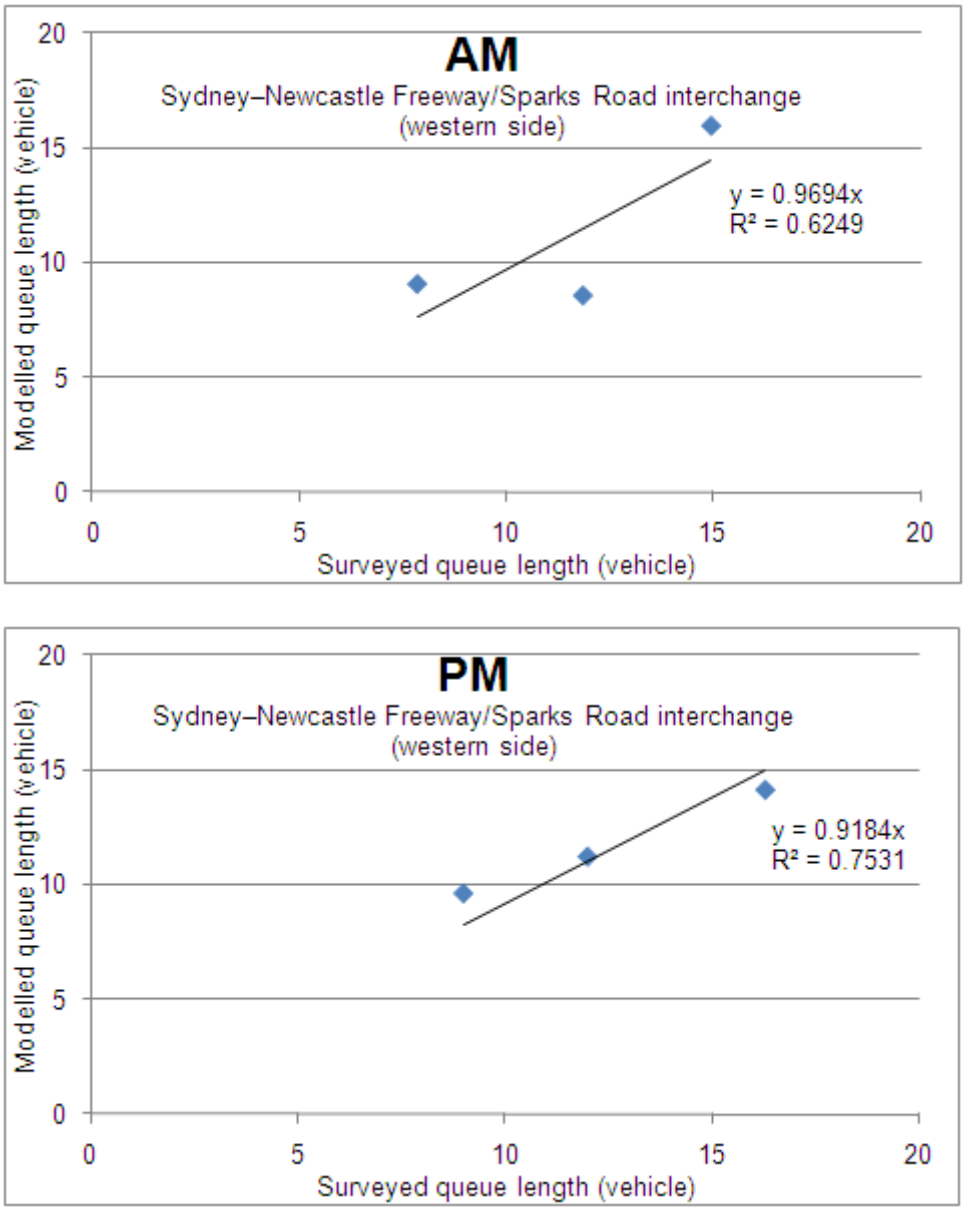


Figure 3.1 Sensitivity test for model calibration

The R^2 value shows a reasonable correlation between the modelled and surveyed 95th percentile back of queue. The model slightly underestimates the existing queue in AM peak (y = 0.9694x) and PM peak (y = 0.9184x) peak hours. However, the difference is small indicating the existing intersection has been reflected adequately in the calibrated model.

3.4 2010 current situation – performance of key intersections

Table 3.2 shows the SIDRA modelling results of the key intersections' performance under the current traffic condition.

Table 3.2 Existing intersection performance (2010)

Intersection	Intersection control type		Peak hour	DoS	Delay	LoS	Queue (m)
Sydney–Newcastle Freeway/Sparks Road interchange (western side)	Signals	AM	7:30 am–8:30 am	0.99	39	C	116
		PM	4:15 pm–5:15 pm	0.98	43	D	103
Sydney–Newcastle Freeway/Sparks Road interchange (eastern side)	Priority (seagull)	AM	7:30 am–8:30 am	0.40	19	B	20
		PM	2:45 pm–3:45 pm	0.32	20	B	11
Sparks Road/Hue Hue Road	Priority	AM	8:00 am–9:00 am	0.41	12	A	9
		PM	4:00 pm–5:00 pm	0.26	16	B	8
Hue Hue Road/Wyee Road	Priority	AM	7:15 am–8:15 am	0.12	14	A	3
		PM	3:15 pm–4:15 pm	0.35	22	B	14
Motorway Link Road/Tooheys Road interchange (north side of the interchange)	Priority	AM	11:00 am–12:00 pm	0.01	12	A	1
		PM	3:15 pm–4:15 pm	0.01	16	B	1
Motorway Link Road/Tooheys Road interchange (south side of the interchange)	Priority	AM	7:30 am–8:30 am	0.02	10	A	1
		PM	12:30 pm–1:30 pm	0.01	15	B	1
Hue Hue Road/Jilliby Road	Priority	AM	8.15 am–9:15 am	0.31	24	B	16
		PM	3:15 pm–4:15 pm	0.27	28	B	10

Note: Interchanges were reported as two separate intersections

The analysis indicates most of the key intersections operate at an acceptable LoS C and have spare capacity in both peak hours, except the Sydney–Newcastle Freeway/Sparks Road interchange (western side) which operate at an unacceptable LoS D and has reached its capacity during both AM and PM peak hours.

Specific movement results at the Sydney-Newcastle Freeway/Sparks Road interchange (western side) include:

- during the AM peak hour, DoS of 0.99 occurs in the eastbound through lane. It indicates the intersection is operating at the practical capacity
- during the PM peak hour, DoS of 0.98 occurs in the eastbound left turn lane. It indicates the traffic volume is operating at the practical capacity
- during the AM peak hour, the highest delay (68 seconds) is experienced by the eastbound through traffic on Sparks Road

- during the PM peak hour, the highest delay (77 seconds) is experienced by the eastbound left turn traffic from Sparks Road onto F3 Freeway
- 116 m long queue in the eastbound left turn movement occurred on Sparks Road during the AM peak, exceeding the available turn bay length of only 70 m
- 103 m long queue in the eastbound left turn movement occurred on Sparks Road during the PM peak, exceeding the available turn bay length of only 70 m.

4. Construction of the W2CP

Construction is anticipated to begin in early 2011, depending on project approval time-frame.

An indicative construction plan and method for the civil works associated with the surface infrastructure at Tooheys Road site, Buttonderry site, and Western Shaft site, are outlined in this report.

4.1 Major construction activities

The following traffic generation estimates intend to provide a worst case scenario by considering major construction activities including haulage of spoil, and delivery of construction equipment and concrete. A further investigation may be required when more construction details become available.

It is expected that most spoil excavated during construction will largely remain on site. The most spoil will be generated at the Tooheys Road site; however, this will be re-used on the site. There is potential to remove 13,660 m^3 of spoil from the Buttonderry site to the Tooheys Road site over its construction period of 26 months. The Western Shaft, which will not be required until around year 10 of mining, will generate 5,700 m^3 of spoil over its construction period of 60 weeks.

The maximum concrete pour is expected to be for the construction of the drift invert road slab at the Tooheys Road site. This will require 2,000 m^3 of concrete to be delivered over 10 weeks, which works out to 34 concrete trucks each week.

Equipment and vehicles that potentially would need to be delivered and would be operating on any of the sites during the construction period include 30–45T Excavators, D6–D10 dozers, shotcrete robot, rock bolting machine, flat bed trucks, mobile cranes, haul trucks, concrete trucks, concrete pump truck, roadheader (approx. 300 kW power rating), tipper trucks, 15 t bogie trucks, graders, 10 t vibratory rollers, 815–825 compactor, skid steer loaders, asphalt pavers, water carts, track laying machine, tamping machine, ballast regulator, rail grinding machine, hi-rail excavator with sleeper grabs, forklifts and drill rig.

4.2 Tooheys Road site

Construction at the Tooheys Road site is expected to take about 80 weeks to complete. Construction elements for the site can be split into the following groups:

- decline tunnel (drift)
- civil infrastructure
- rail loop and spur
- administration buildings and facilities
- mine operations dam and water treatment reverse osmosis plant.

Construction vehicle traffic would be at the highest intensity during the main earthworks and civil construction as follows:

- Access to the work areas would be provided off Tooheys Road and by the existing vehicle gates along the railway corridor.
- Construction materials, such as premix concrete, reinforcement, concrete blocks, ballast, sleepers, pavement materials and portal/culvert/bridge units, would be transported to the work areas using trucks, concrete mixers and excavators.
- Construction vehicle traffic would generally travel by the most direct route; however, consideration would be given to RTA road weight restrictions, bridge height clearances and sensitive land uses.
- The workforce would arrive in their cars and would park at or near the work area. Traffic movements related to the workforce would be limited to personal journeys (i.e. for lunch) and trips to a trade store for building materials.

4.3 Buttonderry site

Construction at the Buttonderry site is expected to take approximately two years to complete. Construction elements for the site can be split into the following groups:

- shaft construction
- pit top facilities and associated infrastructure
- upgrade of the existing power supply and HV power to the site and other services to the site
- construction of power cabling and telecommunications to link Buttonderry site and Tooheys Road site.

Construction vehicle traffic would be at the highest intensity during the main earthworks and buildings works as follows:

- Access to the work areas would be provided off Hue Hue Road.
- Construction materials, such as reinforcement and pre-fabricated units for lining the shaft, pavement gravels and culvert units, would be transported to the work areas using trucks.
- The workforce would arrive in their cars and would park at or near the work area. Traffic movements related to the workforce would be limited to personal journeys (i.e. for lunch) and trips to a trade store for building materials.

4.4 Western Shaft site

Due to the shaft's location in relation to the underground workings, it will be constructed at a later date, but some time before year 10 of mining when it will be required. Construction is expected to take about 60 weeks to complete and would be carried out in the following stages:

- Stage 1: Partial upgrade of Brothers Forest Road
- Stage 2: Construction of a 5 m diameter concrete lined ventilation shaft of 485 m deep
- Stage 3: Installation of car winder and erection of associated buildings.

Construction traffic would access the work area off Little Jilliby Road. It would be preferable for Brothers Forest Road to be closed while it is upgraded and the ventilation shaft is constructed. This would have to be agreed with the relevant authorities.

Approximately 5,700 m^3 of excess material from the shaft excavation would have to be taken off site by road. At this stage the destination of this material has not been identified; however, efforts would be made to minimise the construction traffic on the local road network.

5. Forecast traffic demand

5.1 Future years scenarios

To determine the impact of the mine's construction and operation, 'do-nothing' scenarios have been analysed to determine what the situation would be if the mine project did not proceed.

The Precinct 14 development has been included in a cumulative traffic impact assessment at the request of Wyong Shire Council, as the site is located in the vicinity of the W2CP area.

The following scenarios were analysed:

- Scenario 1: Do-nothing (2011)
- Scenario 2: Construction phase for the Tooheys Road and Buttonderry sites (2011)
- Scenario 3: Do-nothing (2014)
- Scenario 4: Mine operational phase of the Tooheys Road site and Buttonderry site (2014)
- Scenario 5: Mine operational phase of the Tooheys Road site and Buttonderry site, and operation of Precinct 14 (2014)
- Scenario 6: Do-nothing (2024)
- Scenario 7: Construction of the Western Shaft site, and mine operational phase of the Tooheys Road site and Buttonderry site (2024)
- Scenario 8: Construction of the Western Shaft site, mine operational phase of the Tooheys Road site and Buttonderry site, and operation of Precinct 14 (2024).

5.2 Trip generation during the construction phase

5.2.1 Daily traffic generation

As described in Section 4, the construction would generate employee traffic and construction material delivery traffic. Table 5.1 shows the estimated construction traffic associated with major construction activities, including haulage of spoil, and delivery of construction equipment and concrete. These traffic flow volumes include different vehicle types from the Tooheys Road and Buttonderry sites. Both sites would be undergoing construction at the same time in 2011.

Table 5.1 Estimated construction vehicle trips per day at the Tooheys Road site and Buttonderry site in 2011

Site	Vehicle type	Number/day (one-way)
Tooheys Road	Light (employees)	150
	Light (deliveries)	60
	Rigid truck	20
	Articulated truck	20
	Total	**250**
Buttonderry	Light (employees)	75
	Light (deliveries)	40
	Rigid truck	10
	Articulated truck	20
	Total	**145**

The Western Shaft site will be required in about ten years after the mine becomes operational. Table 5.2 shows the estimated construction vehicle trips of different vehicles types from the Western Shaft site in 2024 (depending on project approval), based on the anticipated construction activities, including haulage of spoil, and delivery of construction equipment and concrete.

Table 5.2 Estimated construction vehicle trips per day at the Western Shaft site in 2024

Vehicle type	Number/day (one-way)
Light (employees)	25
Light (deliveries)	10
Rigid truck	5
Articulated truck	5
Total	**45**

5.2.2 Hourly traffic generation

The construction working hours would depend on the construction contractor but generally would extend over daylight hours and would therefore change slightly during the year. The construction working hours are between 6:00 am and 6:00 pm during the months with daylight saving, and between 7:00 am and 4:00 pm during the months without daylight saving. Therefore, construction employees were assumed to arrive at the site between 5:00 am and 6:00 am, and depart between 6:00 pm and 7:00 pm during the months with daylight saving. During the months without daylight saving, construction employees were assumed to arrive at the site between 6:00 am and 7:00 am, and depart between 4:00 pm and 5:00 pm.

The light deliveries were assumed to be made throughout the day and would be equally distributed between the working hours. There would be 12 working hours during the months with daylight saving, and 9 working hours during the months without daylight saving.

The delivery of construction material by trucks, concrete mixers and excavators were also assumed to be made throughout the day and would be equally distributed between the working hours.

At the Tooheys Road site, the construction delivery trips would be made by five light vehicles and four heavy vehicles, therefore nine vehicles per hour would enter the site and nine vehicles per hour would depart during the months with daylight saving. During the months without daylight saving, the construction delivery trips would be made by seven light vehicles and five heavy vehicles, therefore 12 vehicles per hour would enter the site and 12 vehicles per hour would depart.

At the Buttonderry site, the construction delivery trips would be made by four light vehicles and three heavy vehicles, therefore seven vehicles per hour would enter the site and seven vehicles per hour would depart during the months with daylight saving. During the months without daylight saving, the construction delivery trips would be made by five light vehicles and four heavy vehicles, therefore nine vehicles per hour would enter the site and nine vehicles per hour would depart.

Due to the lack of information about vehicle occupancy rate, a conservative rate of 1.0 person per vehicle was adopted to convert construction employee numbers to the numbers of generated vehicles. This assumption was made on the basis that although the future public transport services may improve along Sparks Road as part of the Concept Plan for the Wyong Employee Zone (refer to Section 6.9), it may not directly benefit the mine employees because the bus stops are not located in the vicinity of the proposed mining sites, and employees' arrival and departure times for the evening and night shifts are generally outside the public transport service hours.

Tables 5.3 and 5.4 show the number of hourly trips generated by these two proposed mine sites during the construction period.

Table 5.3 Estimated hourly construction vehicle trips at the Tooheys Road site in 2011

Working hours	Direction of traffic	Trip type	Time	Contributors
Between 6:00 am and 6:00 pm (construction working hours during the months with daylight saving)	Inbound traffic	Construction employee trip	5:00 am to 6:00 am	▪ 150 construction employee trips by light vehicles at the start of their work
	Inbound and outbound traffic	Construction vehicle trip	Throughout the day between 6:00 am and 6:00 pm	▪ five inbound and five outbound trips per hour for delivery by light vehicles throughout the day ▪ four inbound and four outbound heavy vehicle trips per hour throughout the day
	Outbound traffic	Construction employee trip	6:00 pm to 7:00 pm	▪ 150 construction employee trips by light vehicles at the end of their work
Between 7:00 am and 4:00 pm (construction working hours during the months without daylight saving)	Inbound traffic	Construction employee trip	6:00 am to 7:00 am	▪ 150 construction employee trips by light vehicles at the start of their work
	Inbound and outbound traffic	Construction vehicle trip	Throughout the day between 7:00 am and 4:00 pm	▪ seven inbound and seven outbound trips per hour for delivery by light vehicles throughout the day ▪ five inbound and five outbound heavy vehicle trips per hour throughout the day
	Outbound traffic	Construction employee trip	4:00 pm to 5:00 pm	▪ 150 construction employee trips by light vehicles at the end of their work

Table 5.4 Estimated hourly construction traffic at the Buttonderry site in 2011

Working hours	Direction of traffic	Trip type	Time	Contributors
Between 6:00 am and 6:00 pm (construction working hours during the months with daylight saving)	Inbound traffic	Construction employee trip	5:00 am to 6:00 am	▪ 75 construction employee trips at the start of their work
	Inbound and outbound traffic	Construction vehicle trip	Throughout the day between 6:00 am and 6:00 pm	▪ four inbound and four outbound trips per hour for delivery by light vehicles throughout the day ▪ three inbound and three outbound heavy vehicle trips per hour throughout the day
	Outbound traffic	Construction employee trip	6:00 pm to 7:00 pm	▪ 75 construction employee trips at the end of their work
Between 7:00 am and 4:00 pm (construction working hours during the months without daylight saving)	Inbound traffic	Construction employee trip	6:00 am to 7:00 am	▪ 75 construction employee trips at the start of their work
	Inbound and outbound traffic	Construction vehicle trip	Throughout the day between 7:00 am and 4:00 pm	▪ five inbound and five outbound trips per hour for delivery by light vehicles throughout the day ▪ four inbound and four outbound heavy vehicle trips per hour throughout the day
	Outbound traffic	Construction employee trip	4:00 pm to 5:00 pm	▪ 75 construction employee trips at the end of their work

At the Western Shaft site, the construction delivery trips would be made by one light vehicle and one heavy vehicle, therefore two vehicles per hour would enter the site and two vehicles per hour would depart during the months with daylight saving. During the months without daylight saving, the construction delivery trips would be made by two light vehicles and two heavy vehicles, therefore four vehicles per hour would enter the site and four vehicles per hour would depart.

Table 5.5 shows the number of hourly trips generated by the Western Shaft site during the construction period in 2024.

Table 5.5 Estimated hourly construction traffic at the Western Shaft site in 2024

Working hours	Direction of traffic	Trip type	Time	Contributors
Between 6:00 am and 6:00 pm (construction working hours during the months with daylight saving)	Inbound traffic	Construction employee trip	5:00 am to 6:00 am	▪ 25 construction employee trips at the start of their work
	Inbound and outbound traffic	Construction vehicle trip	Throughout the day between 6:00 am and 6:00 pm	▪ one inbound and one outbound trips per hour for delivery by light vehicles throughout the day ▪ one inbound and one outbound heavy vehicle trips per hour throughout the day
	Outbound traffic	Construction employee trip	6:00 pm to 7:00 pm	▪ 25 construction employee trips at the end of their work
Between 7:00 am and 4:00 pm (construction working hours during the months without daylight saving)	Inbound traffic	Construction employee trip	6:00 am to 7:00 am	▪ 25 construction employee trips at the start of their work
	Inbound and outbound traffic	Construction vehicle trip	Throughout the day between 7:00 am and 4:00 pm	▪ two inbound and two outbound trips per hour for delivery by light vehicles throughout the day ▪ two inbound and two outbound heavy vehicle trips per hour throughout the day
	Outbound traffic	Construction employee trip	4:00 pm to 5:00 pm	▪ 25 construction employee trips at the end of their work

5.3 Trip generation during the operational phase

All movements of coal from the site would be by rail. Therefore under normal day-to-day operation, the Tooheys Road and Buttonderry sites would only generate external traffic accessing Hue Hue Road and the Motorway Link Road. The external traffic during operation is expected to be from employee, and service and delivery vehicles.

The WACJV has provided an initial estimate of the maximum traffic that would be generated by the proposed mine in a typical week throughout the life of the mine under the normal day-to-day operation.

5.3.1 Employee traffic

It is anticipated that the two proposed mine sites would generate up to 300 full-time positions. Approximately 280 employees will work at the Buttonderry site while only about 20 workers will have their work based at the Tooheys Road site.

The proposed hours of operation for the coal mine would be 24 hours a day, seven days a week. Shut-downs may occur from time to time to allow for major equipment upgrades. On-site employees will likely be rostered over three daily working shifts as shown in Table 5.6.

Table 5.6 Predicted number of employees under normal operation

Employment type	Times	Number of employees at sites	
		Tooheys Road site	Buttonderry site
Daytime office	8:00 am to 5:00 pm	0	20
Mine operation day shift	7:00 am to 3:00 pm	15	100
Mine operation afternoon shift	3:00 pm to 11:00 pm	3	80
Mine operation evening shift	11:00 pm to 7:00 am (the next day)	2	80
Total		**20**	**280**

Due to the lack of information about vehicle occupancy rate, a conservative rate of 1.0 person per vehicle was adopted to convert mine operation employee numbers to the numbers of generated vehicles. This assumption was made on the basis that although the future public transport services may improve along Sparks Road as part of the Concept Plan for the Wyong Employee Zone (refer to Section 6.9), it may not directly benefit the mine employees because the bus stops are not located in the vicinity of the proposed mining sites, and employees' arrival and departure times for the evening and night shifts are generally outside the public transport service hours.

5.3.2 Service and delivery vehicles

According to the proponent service vehicles and deliveries are expected to be as follows:

- approximately three trucks a week are expected to deliver fuel, oil and stores to the Buttonderry site
- approximately two trucks a day are expected to deliver material and fuel supplies to Tooheys Road site.

However, it is expected that there will be a number of delivery and service vehicles operating throughout the week. Table 5.7 and Table 5.8 consider a worst case scenario of up to 10 service and delivery vehicles (heavy vehicles) per hour arriving and departing during the day.

Delivery of materials and services can occur continuously for 24 hours over seven days, however, it will generally be between 7:00 am to 5:00 pm on weekdays.

5.3.3 Hourly traffic generation

The proposed sites will continuously operate 24 hours a day, seven days a week. As shown in Tables 5.7 and 5.8, trips by employees were split into inbound and outbound trips based on different shift hours by different employment types. It is anticipated that service and delivery vehicles (heavy vehicles) would arrive and depart from the site throughout the day.

Table 5.7 shows the number of trips generated by the Tooheys Road site under the normal day-to-day operation.

Table 5.7 Inbound and outbound trips for operation at the Tooheys Road site

Direction of traffic	Employee type	Time	Contributors
Inbound traffic	Day shift mine operation employee	6:00 am to 7:00 am	100 day shift mine operation employee trips at the start of the their day shift
Outbound traffic	Night shift mine operation employee	7:00 am to 8:00 am	80 night shift mine operation employee trips after the end of the night shift
Inbound and outbound traffic	Contractors for delivery of materials and services	Throughout the day between 7:00 am and 5:00 pm	10 delivery and service vehicles per hour arriving and departing the site throughout the day
Inbound traffic	Afternoon shift mine operation employee	2:00 pm to 3:00 pm	80 afternoon shift mine operation employee trips at the start of the their afternoon shift
Outbound traffic	Day shift mine operation employee	3:00 pm to 4:00 pm	100 day shift mine operation employee trips after the end of the day shift
Inbound traffic	Night shift mine operation employee	10:00 pm to 11:00 pm	80 night shift mine operation employee trips at the start of the their night shift
Outbound traffic	Afternoon shift mine operation employee	11:00 pm to 12:00 am (the next day)	80 afternoon shift mine operation employee trips after the end of the afternoon shift
Outbound traffic	Day shift mine operation employee	3:00 pm to 4:00 pm	100 day shift mine operation employee trips after the end of the day shift

Table 5.8 shows the number of trips generated by the Buttonderry site under the normal day-to-day operation.

Table 5.8 Inbound and outbound trips for operation at the Buttonderry site

Direction of traffic	Trip type	Time	Contributors
Inbound traffic	Day shift mine operation employee	6:00 am to 7:00 am	100 day shift mine operation employee trips at the start of the their day shift
Outbound traffic	Night shift mine operation employee	7:00 am to 8:00 am	80 night shift mine operation employee trips after the end of the night shift
Inbound traffic	Daytime office employee	7:00 am to 8:00 am	20 daytime office employee trips at the start of the their work day
Inbound and outbound traffic	Contractors for delivery of materials and services	Throughout the day between 7:00 am and 5:00 pm	10 delivery and service vehicles per hour arriving and departing the site throughout the day

Direction of traffic	Trip type	Time	Contributors
Inbound traffic	Afternoon shift mine operation employee	2:00 pm to 3:00 pm	80 afternoon shift mine operation employee trips at the start of the their afternoon shift
Outbound traffic	Day shift mine operation employee	3:00 pm to 4:00 pm	100 day shift mine operation employee trips after the end of the day shift
Outbound traffic	Daytime office employee	5:00 pm to 6:00 pm	20 daytime office employee trips at the end of the their work day
Inbound traffic	Night shift mine operation employee	10:00 pm to 11:00 pm	80 night shift mine operation employee trips at the start of the their night shift
Outbound traffic	Afternoon shift mine operation employee	11:00 pm to 12:00 am (the next day)	80 afternoon shift mine operation employee trips after the end of the afternoon shift
Outbound traffic	Day shift mine operation employee	3:00 pm to 4:00 pm	100 day shift mine operation employee trips after the end of the day shift

5.4 Trip distribution

5.4.1 Access routes

Table 5.9 describes the likely routes taken by construction vehicles, employee traffic and delivery and service vehicles travelling to the sites, during the construction and operating phases.

Table 5.9 Site access points and access routes

Site	Main access point	Access to/from via			
		North	South	East	West
Tooheys Road (construction and operational phases)	Off Tooheys Road	F3 Freeway, turn back via Sparks Road	F3 Freeway	Motorway Link Road	Hue Hue Road, Bushells Ridge Road and Tooheys Road
Buttonderry (construction and operational phases)	Off Hue Hue Road, directly north of intersection with Sparks Road	Hue Hue Road/F3 Freeway	Hue Hue Road/F3 Freeway	Sparks Road, Hue Hue Road	Sandra Street, Hue Hue Road
Western Shaft (construction phase only)	Off Little Jilliby Road	Jilliby Road	Jilliby Road, Hue Hue Road	Jilliby Road, Hue Hue Road	Little Jilliby Road

For the Tooheys Road site, the connection to the north of the site (such as Lake Macquarie) is not well served using Sydney–Newcastle Freeway, as there is no turnoff at the Motorway Link Road for southbound traffic. Therefore, the southbound traffic would travel to the Sparks Road off ramp, then northbound on Sydney–Newcastle Freeway, and then would turnoff at Motorway Link to access the Tooheys Road site. This would be the same for outbound traffic which would travel to the north (such as Lake Macquarie) using Sydney–Newcastle Freeway.

5.4.2 Construction phase

5.4.2.1 Employee workforce trips

The proponent assumed that approximately 70% of employees would be taken by local applicants from the Central Coast and immediately adjacent region. International Environmental Consultant provided the distribution of the employee workforce trips to/from the proposed mine sites. These assumptions are summarised in Figure 5.1.

The employee workforce trips of the Tooheys Road site would be made up of:

- 35% to/from the north, using Sydney–Newcastle Freeway/Motorway Link/Tooheys Road
- 30% to/from the south, using Sydney–Newcastle Freeway/Motorway Link/Tooheys Road
- 30% to/from the east, using Sparks Road/ Sydney–Newcastle Freeway/Motorway Link/Tooheys Road
- 5% to/from the north, using Wyee Rd/Hue Hue Road/Bushells Ridge Road/Tooheys Road.

The employee workforce trips of the Buttonderry site would be made up of:

- 35% to/from north, using Sydney–Newcastle Freeway/Sparks Road/Hue Hue Road
- 30% to/from south, using Sydney–Newcastle Freeway/Sparks Road/Hue Hue Road
- 15% to/from east, using Sparks Road/Hue Hue Road
- 10% to/from north, using Wyee Road/Hue Hue Road
- 10% to/from south, using Hue Hue Road.

The employee workforce trips of the West Shaft site would be made up of:

- 35% to/from north, using Sydney–Newcastle Freeway/Sparks Road/Hue Hue Road
- 30% to/from south, using Sydney–Newcastle Freeway/Sparks Road/Hue Hue Road
- 15% to/from east, using Sparks Road/Hue Hue Road
- 10% to/from north, using Wyee Road/Hue Hue Road
- 10% to/from south, using Hue Hue Road.

The Western Shaft employees would go to the Buttonderry site for signing on and off before and after working hours. The only route between the Buttonderry site and the Western Shaft site is via Hue Hue Road, Jilliby Road, Little Jilliby Road and Brothers Road.

Figure 5.1 shows the assumed trip distribution of the construction employee trips accessing the proposed mine sites during construction phase.

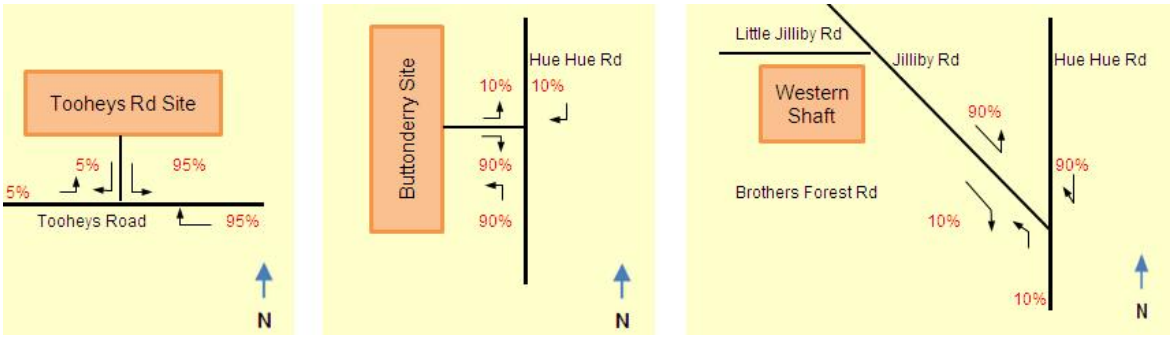


Figure 5.1 Traffic distribution for construction employee trips during construction phase

5.4.2.2 Construction and service vehicle trips

At this stage, it is uncertain where construction and service vehicles would come from as it depends on which supplier wins the each supply contract. International Environmental Consultant provided the distribution of the construction and service vehicle trips to/from the proposed mine sites. These assumptions are summarised in Figure 5.2.

For Tooheys Road site, the trips would be made up of:

- 10% to/from north, using Sydney–Newcastle Freeway/Motorway Link/Tooheys Road
- 20% to/from south, using Sydney–Newcastle Freeway/Motorway Link/Tooheys Road
- 35% to/from east, using Sparks Road/Sydney–Newcastle Freeway/Motorway Link/Tooheys Road
- 35% to/from east, using Motorway Link/Tooheys Road.

For Buttonderry site, the construction vehicle trips would be made up of:

- 10% to/from north, using Sydney–Newcastle Freeway/Sparks Road/Hue Hue Road
- 20% to/from south, using Sydney–Newcastle Freeway/Sparks Road/Hue Hue Road
- 35% to/from east, using Sparks Road/Hue Hue Road
- 35% to/from east, using Motorway Link/Sparks Road/Hue Hue Road.

For Western Shaft site, the construction vehicle trips would be made up of:

- 40% to/from north, using Sydney–Newcastle Freeway/Sparks Road/Hue Hue Road
- 10% to/from north, using Wyee Road/Hue Hue Road

- 40% to/from south, using Sydney–Newcastle Freeway/Sparks Road/Hue Hue Road
- 10% to/from south, using Old Maitland Road–Yarramalong Road–Hue Hue Road.

Figure 5.2 shows the assumed trip distribution of the construction and service vehicles trips accessing the proposed mine sites during construction phase.

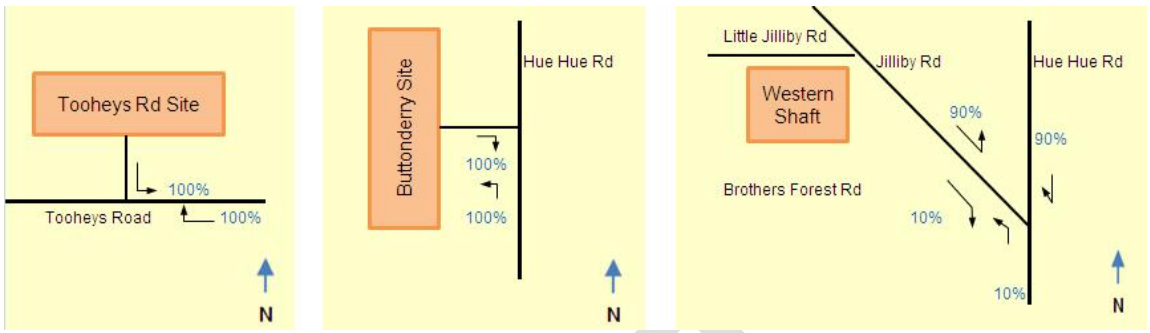


Figure 5.2 Traffic distribution for construction and service vehicle trips during construction phase

5.4.3 Operational phase

The proponent assumed that approximately 70% of employees would be taken by local applicants from the Central Coast and immediately adjacent region.

International Environmental Consultant assumed the trip distribution of employee workforce during the operational phase would be the same as that used in the construction phase. All service and delivery traffic is assumed to use the Sydney–Newcastle Freeway to access to and from the proposed mine sites.

Figure 5.3 shows the assumed trip distribution of the mine employee trips accessing the proposed mine sites during operational phase.

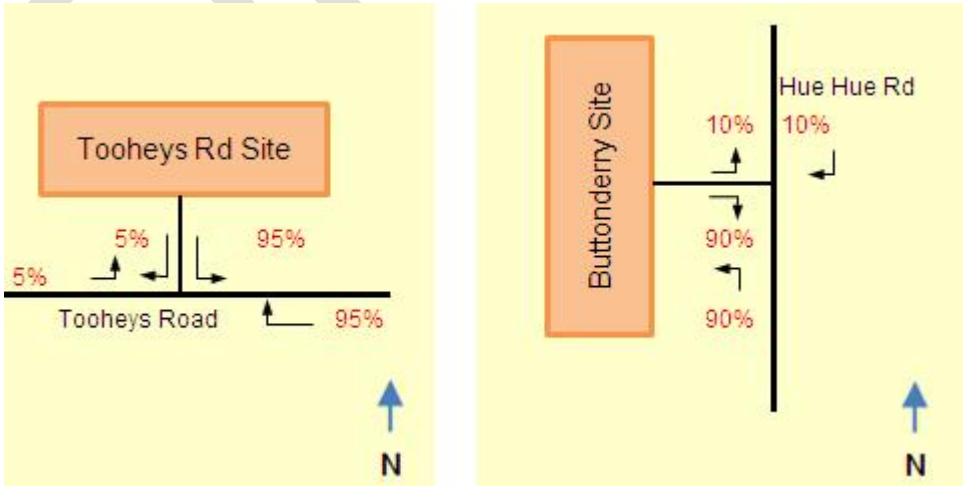


Figure 5.3 Traffic distribution for mine employee trips during operational phase

Figure 5.4 shows the assumed trip distribution of the service and delivery trips accessing the proposed mine sites during operational phase.

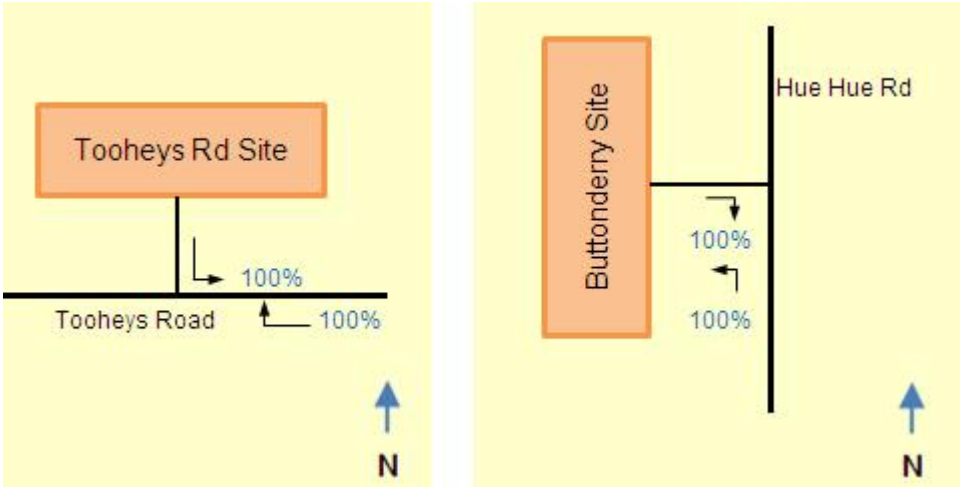


Figure 5.4 Traffic distribution for service and delivery trips during operational phase

5.5 Additional generated traffic from the Precinct 14 development

Precinct 14 is a private commercial area, part of the Wyong Employment Zone development. Wyong Shire Council (WSC) required the Precinct 14 development to be included in a cumulative traffic impact assessment due to the development's location nearby to the W2CP area.

A consultation with WSC has confirmed the following traffic assumptions:

- the occupancy rate of the Precinct 14 development by 2014 and 2024
- peak hour and off-peak traffic generation
- intersection layout at the proposed access points
- heavy vehicle percentage of the total traffic generated by the development.

Precinct 14 is located on the eastern side of Hue Hue Road between Sparks Road and Kiar Ridge Road. There would be two proposed access points to Precinct 14:

- a roundabout on Sparks Road
- a channelised intersection on Hue Hue Road.

5.5.1 Traffic generation

When the Precinct 14 development is fully developed in 2024, it is expected to generate about 430 vehicles during the AM peak hour between 8:00 am and 9:00 am, and during the PM peak hour between 4:00 pm and 5:00 pm. In 2014, the development is expected to be 15% operational and is therefore estimated to generate about 65 vehicles during the same AM and PM peak hours.

The development is also expected to generate traffic outside the morning and afternoon peak hours. For the purposes of this traffic impact assessment, it was assumed that 15% of the peak traffic would be travelling into and out of the development during the off-peak hours (between 7:00 am and 8:00 am, between 9:00 and to 4:00 pm, and between 5:00 pm and 7:00 pm). The traffic distribution by time of day was considered in selecting future traffic peak hours (refer to Section 5.6).

During the AM peak hour, the traffic generated by the site is expected to be 80% inbound and 20% outbound. A reverse pattern in the PM peak hour is expected: 80% of the trips would be inbound and 20% would be outbound. During the off-peak hours, the generated traffic is expected to be 50% inbound and 50% outbound.

It was assumed that 10% of traffic generated by the development consists of heavy vehicles.

5.5.2 Traffic distribution

PB was provided with traffic distribution information that 70% of trips would use the Sparks Road access, while 30% would use the Hue Hue Road access.

The traffic distribution is based on the *Wyong Employment Zone Sparks Road Intersection Analysis 2005* into and out of the development, and PB's additional assumptions made for the trips to/from the external road network. WSC has confirmed these assumptions.

The traffic distribution adopted in the analysis includes:

- inbound trips: 30% from F3 (south), 35% from F3 (north), 15% from Sparks Road (east), 6% from Hue Hue Road (north), and 14% from Hue Hue Road (south)
- outbound trips: 30% to F3 (south), 35% to F3 (north), 15% to Sparks Road (east), 7% to Hue Hue Road (north), and 13% to Hue Hue Road (south).

Figure 5.5 shows the traffic distribution for inbound trips arriving the Precinct 14 development.

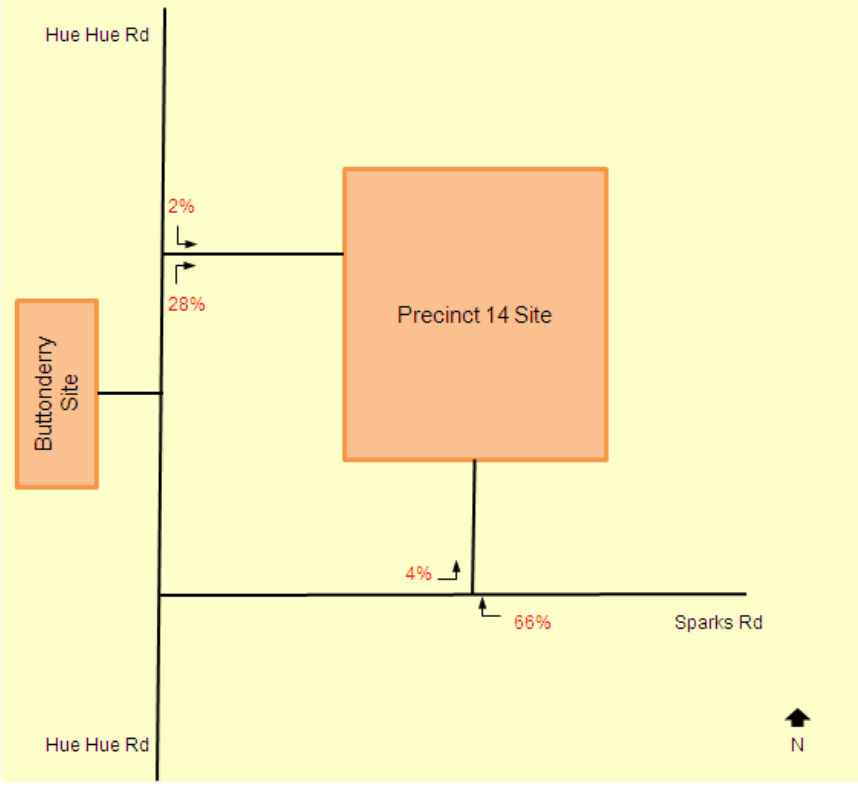


Figure 5.5 Traffic distribution for inbound trips arriving at the Precinct 14 development

Figure 5.6 shows the traffic distribution for outbound trips departing the Precinct 14 development.

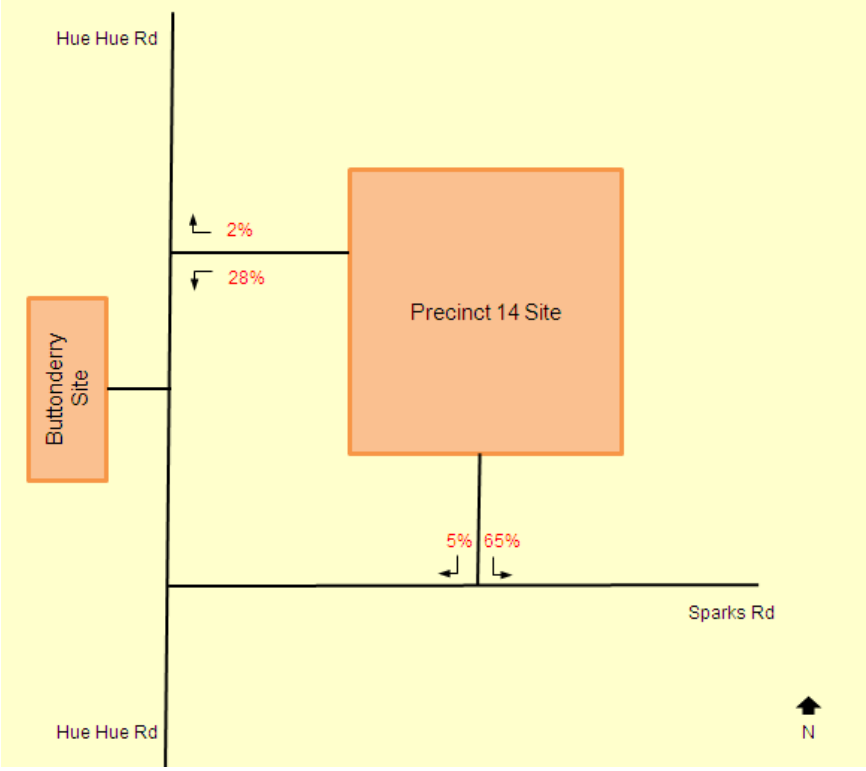


Figure 5.6 Traffic distribution for outbound trips departing from the Precinct 14 development

5.6 Distribution by time of day

The peak hour of development traffic generation may not necessarily coincide with the peak hours of background traffic. Therefore the selection of the peak hours for this traffic impact assessment was based on the sum of background traffic and traffic generated by the mine sites and Precinct 14 in one-hour intervals at the individual key intersections.

Figure 5.7 shows an example of peak hour selection for the western side of Sydney–Newcastle Freeway/Sparks Road interchange. The intersection volumes are the sum of traffic in all six movements in one-hour intervals. The hourly traffic trips associated with the Buttonderry site and Tooheys Road site are added to the hourly background traffic between 5:00 am and 7:00 pm. There are more W2CP related traffic between 5:00 am and 6:00 am when mine employees arrive to the site, and between 6:00 pm and 7:00 pm when they depart from the site. Construction and service vehicle trips are also added to the background traffic during the day. It can be seen that the peak hours would occur between 8:00 am and 9:00 am, and 3:00 pm and 4:00 pm in the assessed scenario.

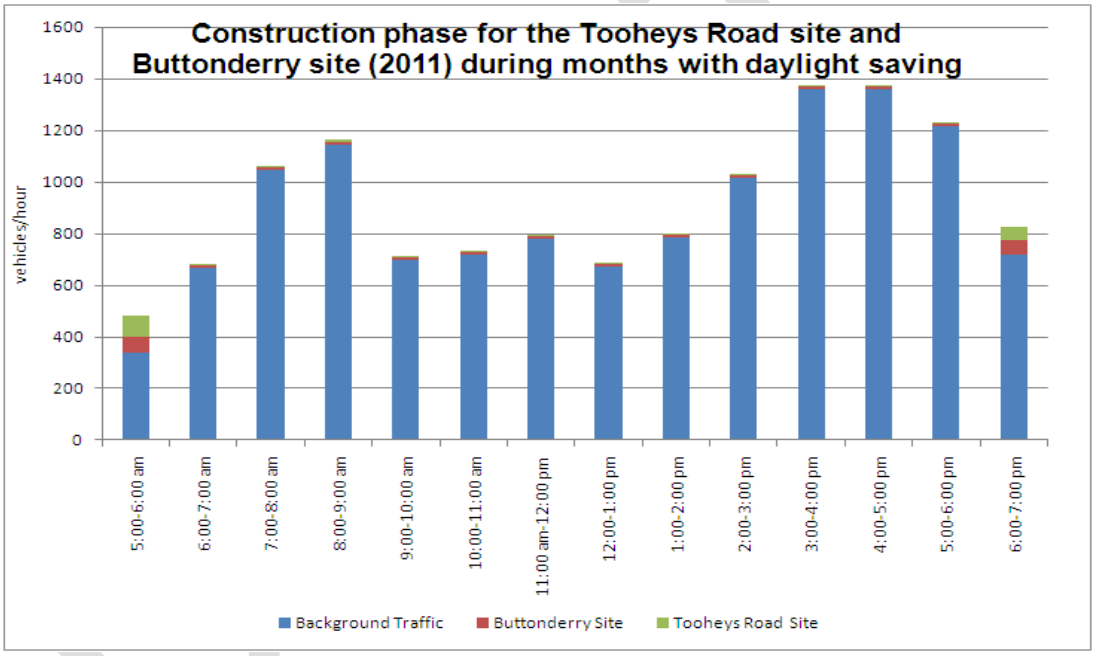


Figure 5.7 Example of selecting peak hours

Refer to Appendix B for the full graphic analysis of the peak hour selection at all intersections.

Table 5.10 shows the selected peak hours at the key intersections, based on the sum of various traffic sources in years 2011, 2014 and 2024: background traffic growth, the construction and operational traffic generated by the proposed sites (during months with and without daylight saving), as well as the traffic generated by Precinct 14 development.

Table 5.10 Selected peak hours at the key intersections by assessment years

Intersection	Construction phase in 2011		Operational phase in 2014	Construction and operational phase in 2024	
	Construction working hours during the months with daylight saving (between 6:00 am and 6:00 pm)	Construction working hours during the months without daylight saving (between 7:00 am and 4:00 pm)		Construction working hours during the months with daylight saving (between 6:00 am and 6:00 pm)	Construction working hours during the months without daylight saving (between 7:00 am and 4:00 pm)
Sydney–Newcastle Freeway/Sparks Road interchange (western side)	8:00 am–9:00 am 4:00 pm–5:00 pm	8:00 am–9:00 am 4:00 pm–5:00 pm	8:00 am–9:00 am 3:00 pm–4:00 pm	8:00 am–9:00 am 3:00 pm–4:00 pm (without Precinct 14) 4:00 pm–5:00 pm (with Precinct 14)	8:00 am–9:00 am 3:00 pm–4:00 pm (without Precinct 14) 4:00 pm–5:00 pm (with Precinct 14)
Sydney-Newcastle Freeway/Sparks Road interchange (eastern side)	8:00 am–9:00 am 3:00 pm–4:00 pm	8:00 am–9:00 am 4:00 pm–5:00 pm	8:00 am–9:00 am 3:00 pm–4:00 pm	8:00 am–9:00 am 3:00 pm–4:00 pm	8:00 am–9:00 am 3:00 pm–4:00 pm
Sparks Road/Hue Hue Road	8:00 am–9:00 am 4:00 pm–5:00 pm	8:00 am–9:00 am 4:00 pm–5:00 pm	8:00 am–9:00 am 3:00 pm–4:00 pm	8:00 am–9:00 am 4:00 pm–5:00 pm	8:00 am–9:00 am 4:00 pm–5:00 pm
Hue Hue Road/Wyee Road	7:00 am–8:00 am 3:00 pm–4:00 pm	7:00 am–8:00 am 3:00 pm–4:00 pm	7:00 am–8:00 am 3:00 pm–4:00 pm	7:00 am–8:00 am 3:00 pm–4:00 pm	7:00 am–8:00 am 3:00 pm–4:00 pm
Motorway Link Road/ Tooheys Road interchange (north side of the interchange)	5:00 am–6:00 am 6:00 pm–7:00 pm	6:00 am–7:00 am 4:00 pm–5:00 pm	11:00 am–12:00 pm 3:00 pm–4:00 pm	11:00 am–12:00 pm 3:00 pm–4:00 pm	11:00 am–12:00 pm 3:00 pm–4:00 pm
Motorway Link Road/Tooheys Road interchange (south side of the interchange)	8:00 am–9:00 am 6:00 pm–7:00 pm	8:00 am–9:00 am 4:00 pm–5:00 pm	8:00 am – 9:00 am 3:00 pm – 4:00 pm	8:00 am–9:00 am 3:00 pm–4:00 pm	8:00 am–9:00 am 3:00 pm–4:00 pm
Hue Hue Road/Jilliby Road	8:00 am–9:00 am 3:00 pm–4:00 pm	8:00 am–9:00 am 3:00 pm–4:00 pm	8:00 am–9:00 am 3:00 pm–4:00 pm	8:00 am–9:00 am 3:00 pm–4:00 pm	8:00 am–9:00 am 3:00 pm–4:00 pm

Note: The traffic generated by the Precinct 14 development has been considered in the peak hour selection. It can be seen that the above selected peak hours are the same with and without the presence of Precinct 14 development, unless otherwise stated.

Table 5.10 shows that the peak hours during the months with and without daylight saving are mostly the same, with the exception of:

- Sydney–Newcastle Freeway/ Sparks Road interchange (western side) in 2011
- Motorway Link Road/ Tooheys Road interchange (north side of the interchange) in 2011
- Motorway Link Road/ Tooheys Road interchange (south side of the interchange) in 2011.

The following sections show the forecast traffic demand and traffic impacts during these selected peak hours.

5.7 Forecast traffic demand

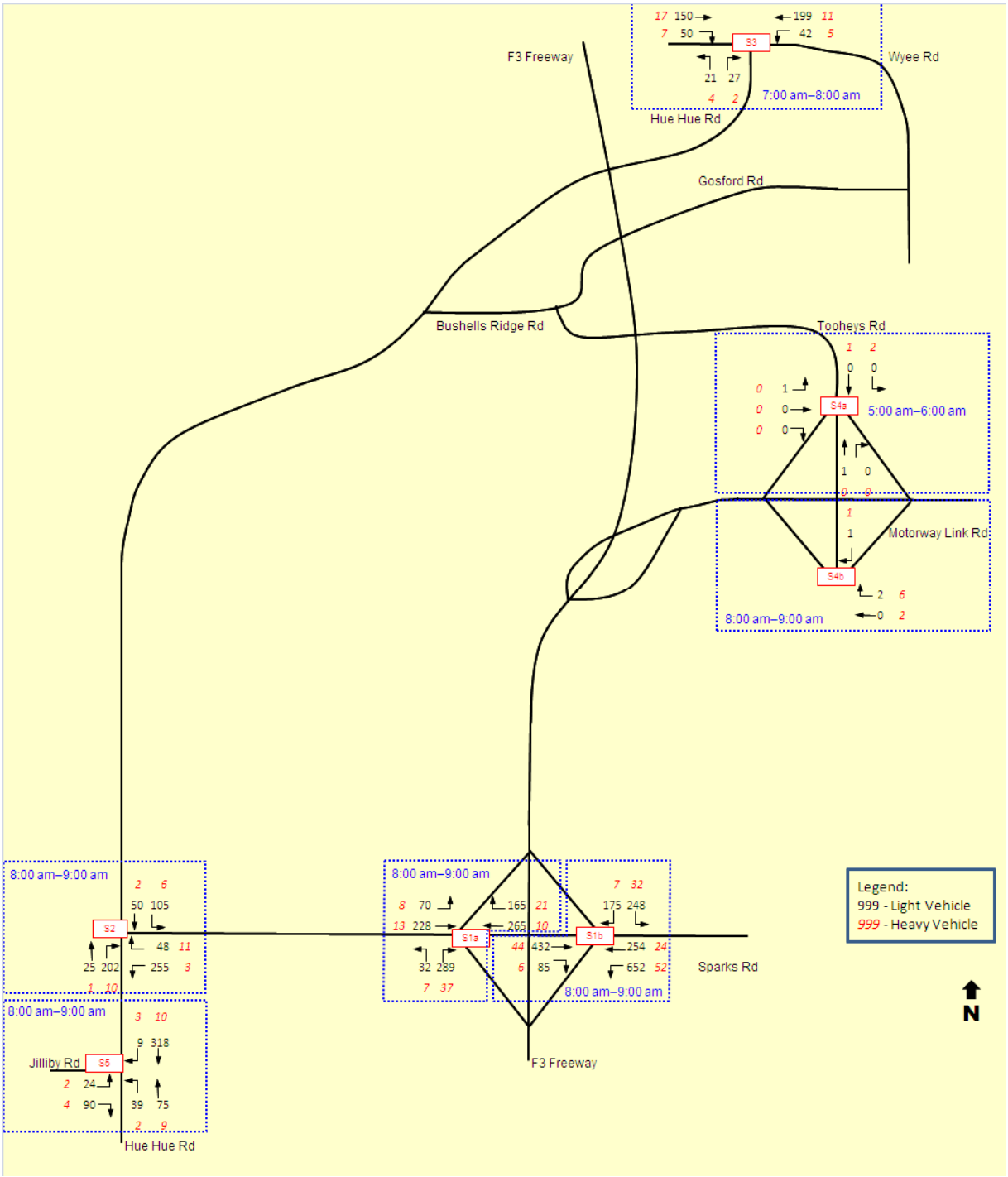
The peak hour traffic volumes for each assessment scenario are shown in the following sections. Traffic impacts at key intersections between the do-nothing cases and with-development cases were assessed for the future years during the selected peak hours shown in Table 5.10.

It should be noted that intersection traffic volumes may not add up at mid-block locations in the figures shown in the following sections, because the peak hours at each intersection are different.

5.7.1 Scenario 1: Do-nothing case (2011)

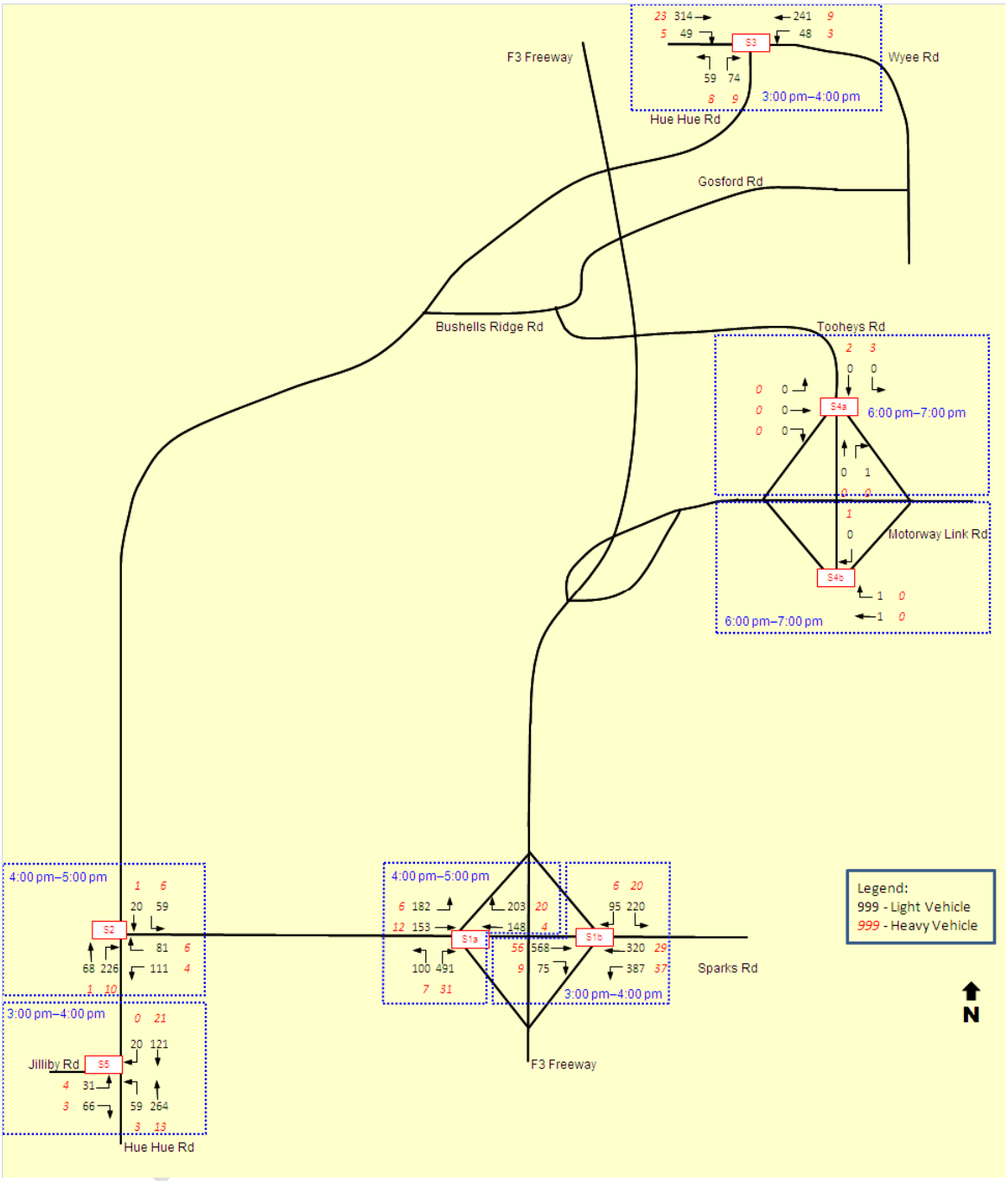
Future 2011 'do-nothing' traffic volumes were calculated as the sum of the 2010 existing traffic and growth in the background traffic (ranged from 1.0–3.0% a year depending on locations). This scenario forecasts the conditions that would exist if the W2CP is not granted approval.

Figures 5.8 and 5.9 show the forecast future traffic assigned to the key intersections in the peak hours during the months with daylight saving.



Note: different observed peak hours at the key intersections

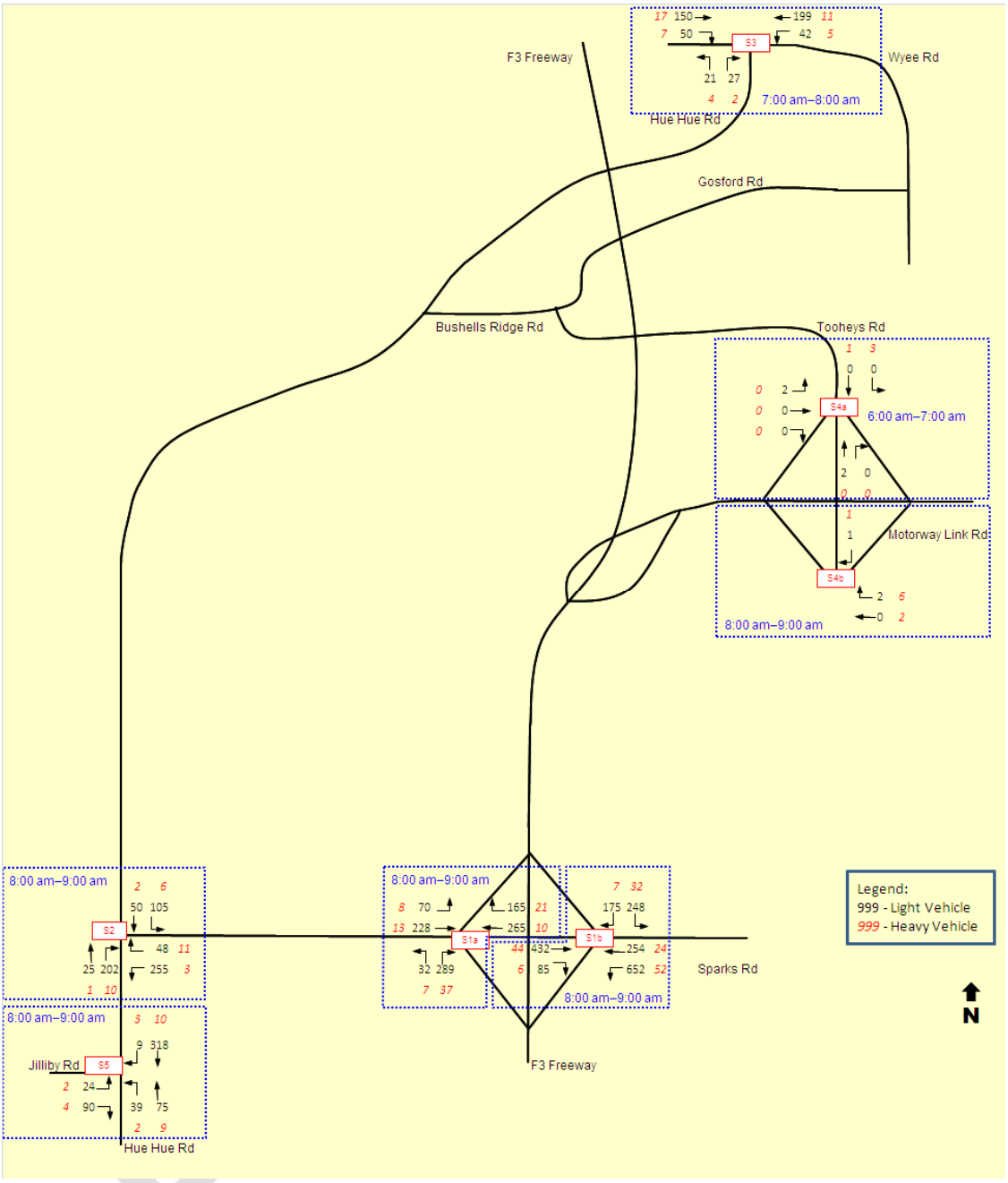
Figure 5.8 2011 do-nothing AM peak hour traffic volumes at the key intersections during the months with daylight saving



Note: different observed peak hours at the key intersections

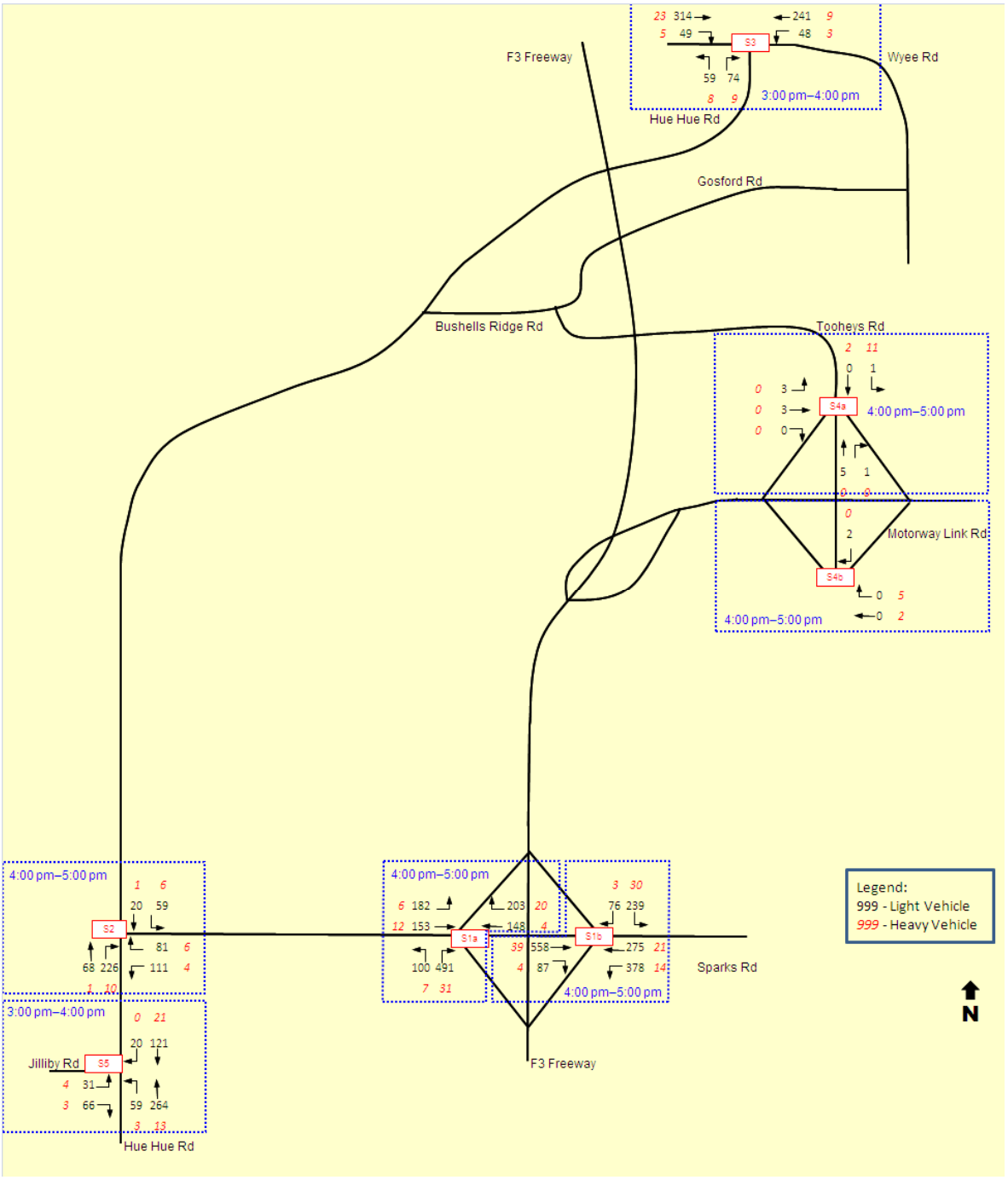
Figure 5.9 2011 do-nothing PM peak hour traffic volumes at the key intersections during the months with daylight saving

Figures 5.10 and 5.11 show the forecast future traffic assigned to the key intersections in the peak hours during the months without daylight saving.



Note: different observed peak hours at the key intersections

Figure 5.10 2011 do-nothing AM peak hour traffic volumes at the key intersections during the months without daylight saving



Note: different observed peak hours at the key intersections

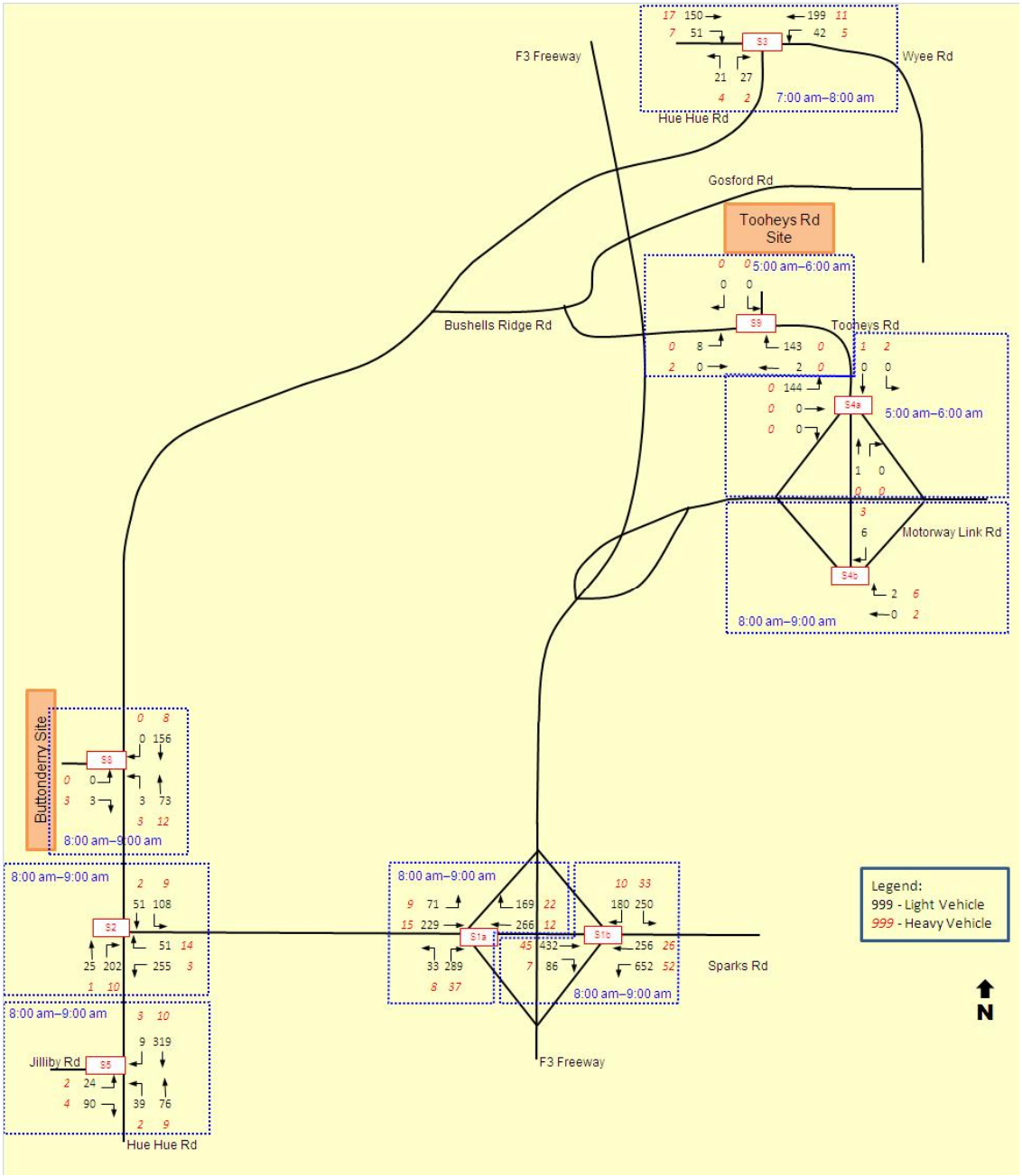
Figure 5.11 2011 do-nothing PM peak hour traffic volumes at the key intersections during the months without daylight saving

5.7.2 Scenario 2: Construction phase case for the Tooheys Road site and Buttonderry site (2011)

Future traffic volumes were calculated as the sum of the 2010 existing traffic, growth in the background traffic (ranged from 1.0–3.0% a year depending on locations) and the traffic

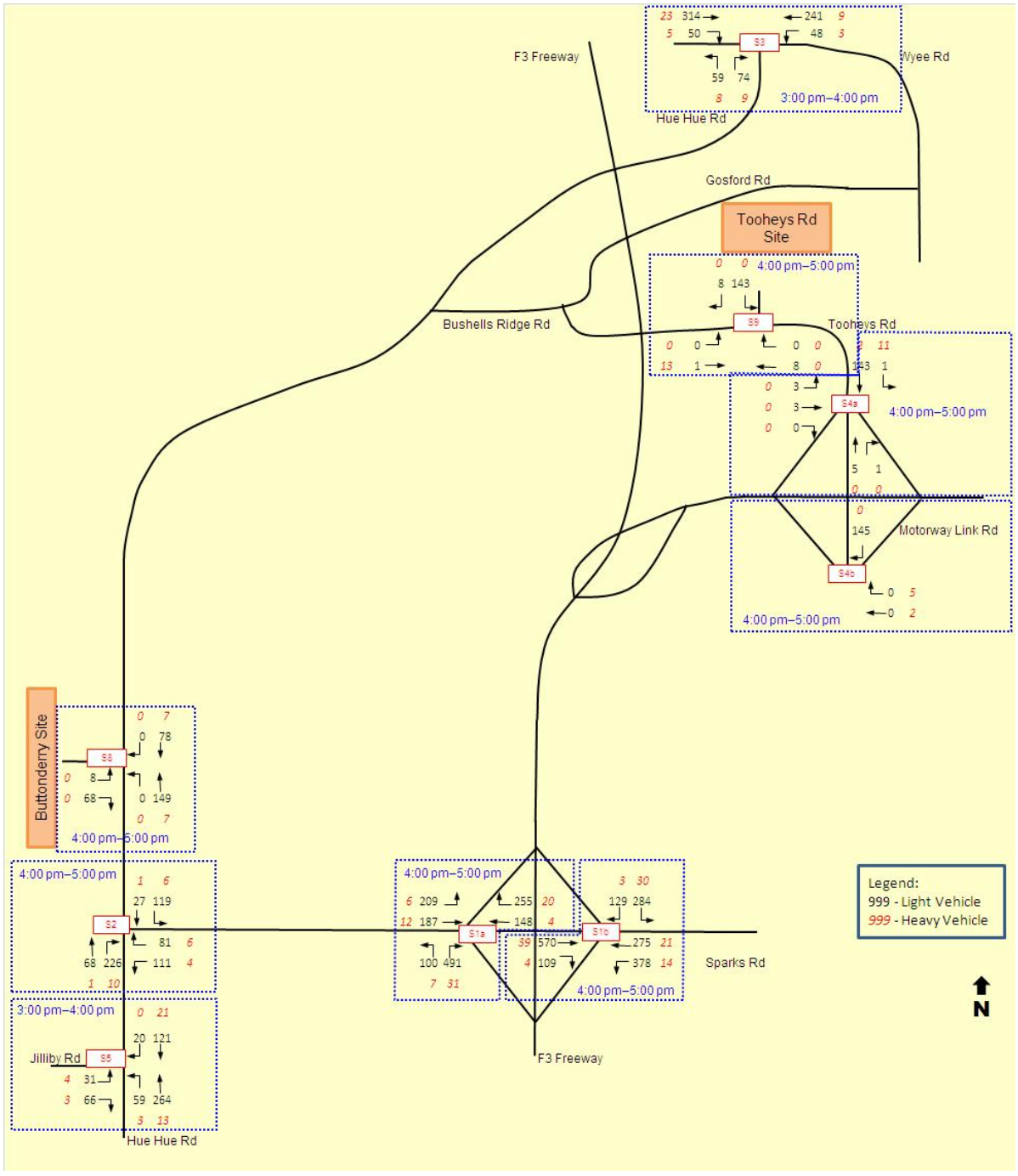
generation associated with the construction of the Tooheys Road site and Buttonderry site (refer to Tables 5.3 and 5.4).

Figures 5.12 and 5.13 show the forecast future traffic assigned to the key intersections in the peak hours during the months with daylight saving.



Note: different observed peak hours at the key intersections

Figure 5.12 2011 with mine construction AM peak hour traffic volumes at the key intersections during the months with daylight saving

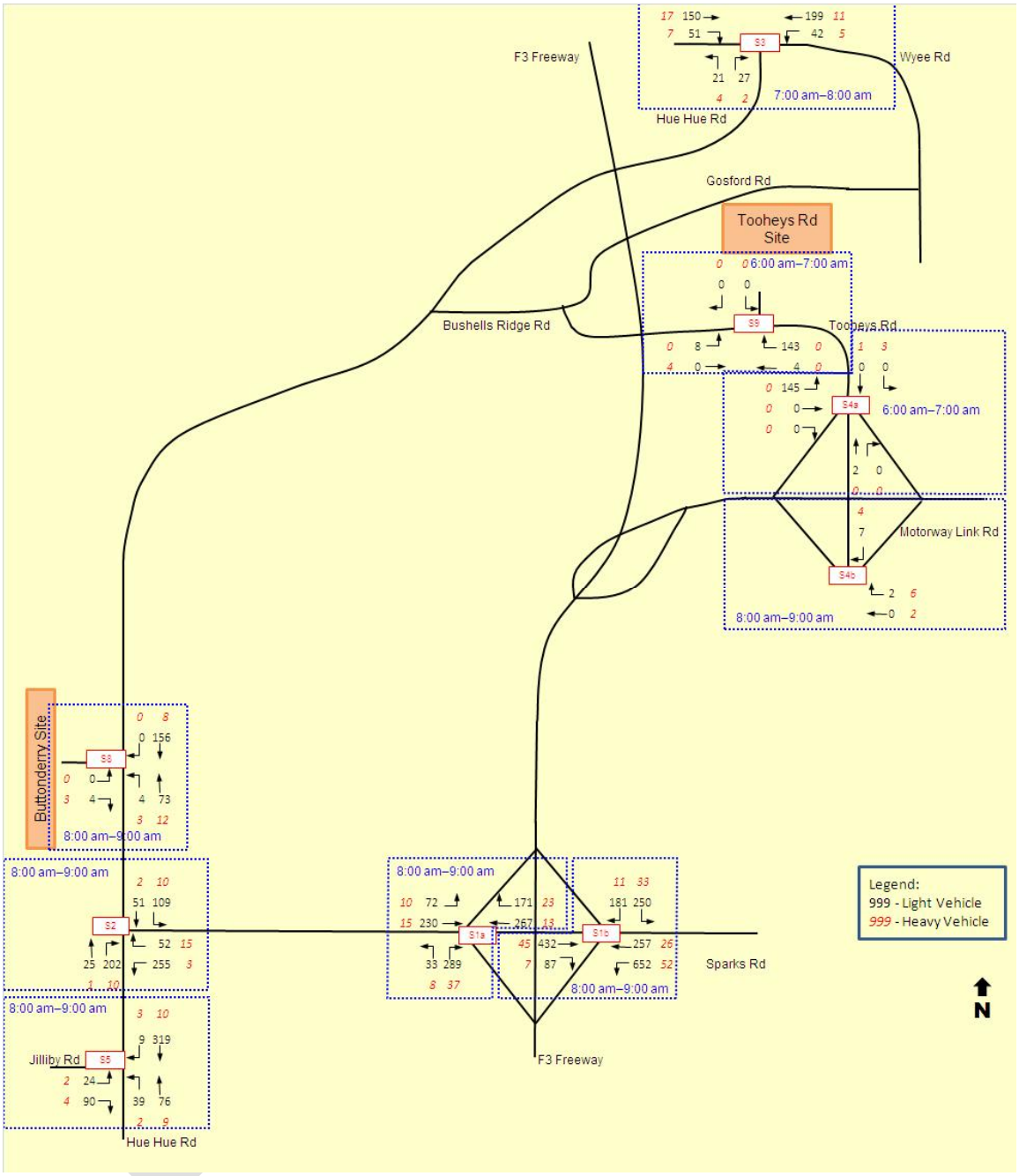


Note: different observed peak hours at the key intersections

Figure 5.13 2011 with mine construction PM peak hour traffic volumes at the key intersections during the months with daylight saving

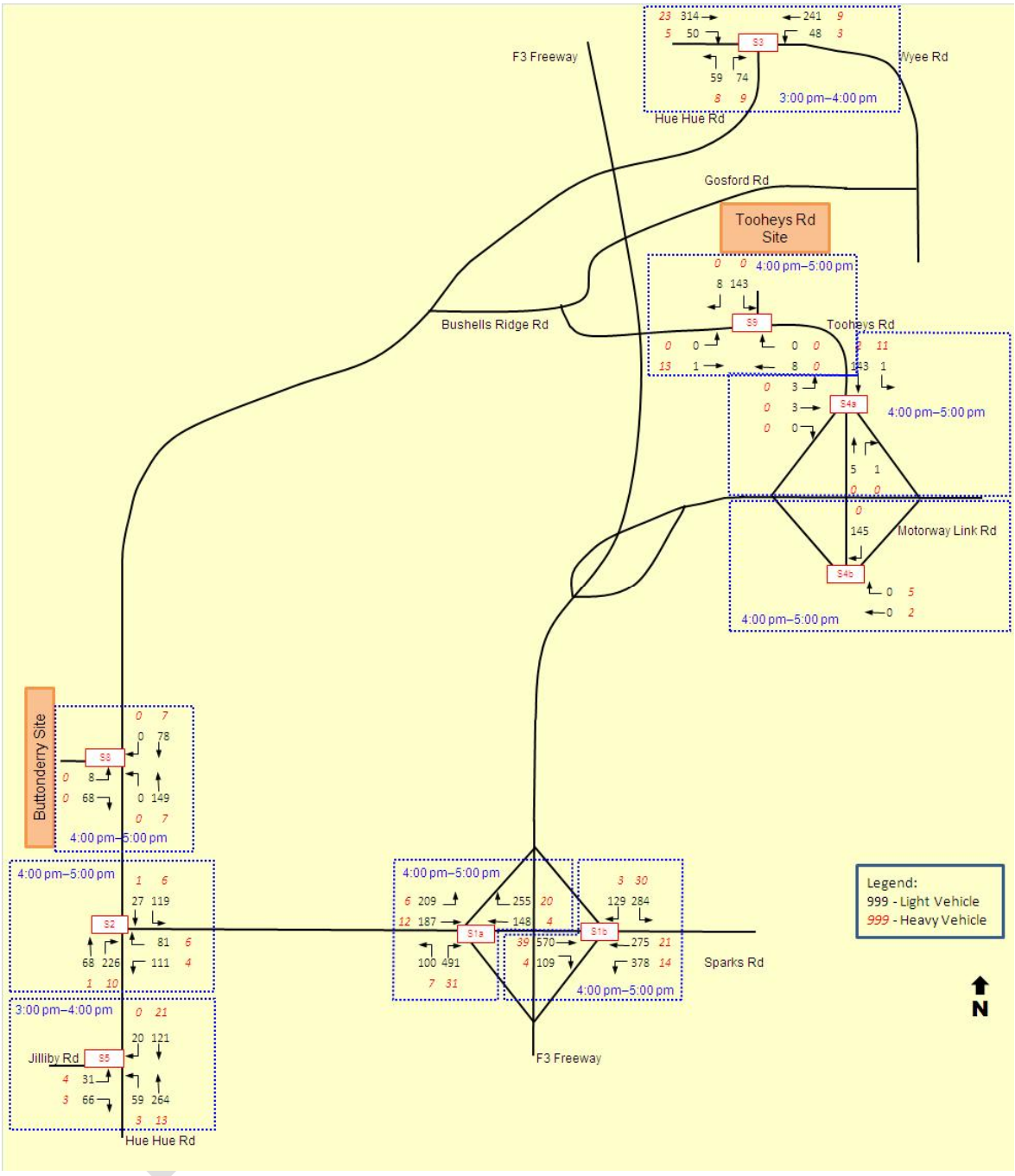
at the key intersections during the months with daylight saving

Figures 5.14 and 5.15 show the forecast future traffic assigned to the key intersections in the peak hours during the months without daylight saving.



Note: different observed peak hours at the key intersections

Figure 5.14 2011 with mine construction AM peak hour traffic volumes at the key intersections during the months without daylight saving



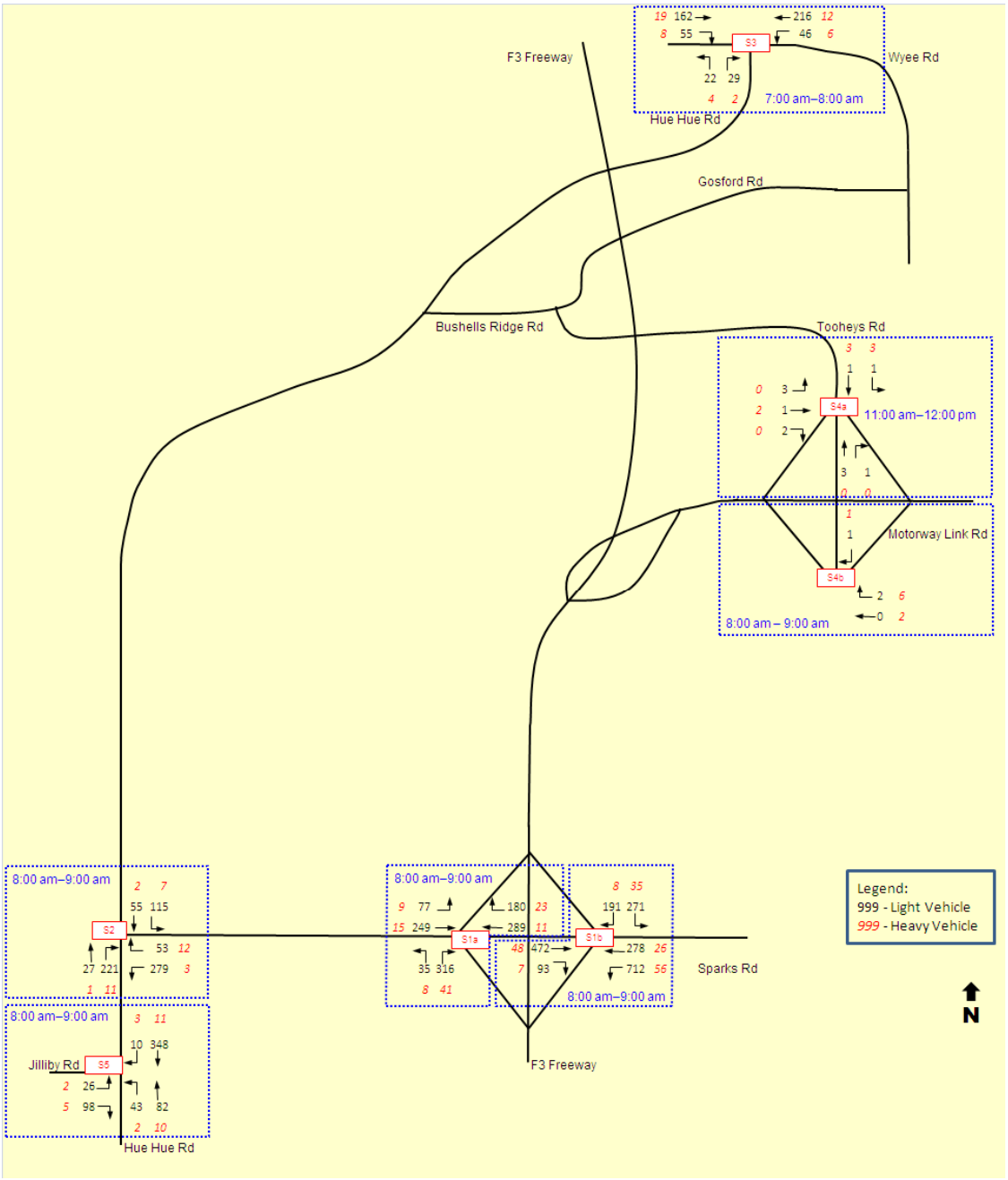
Note: different observed peak hours at the key intersections

Figure 5.15 2011 with mine construction PM peak hour traffic volumes at the key intersections during the months without daylight saving

5.7.3 Scenario 3: Do-nothing case (2014)

Future 2014 'do-nothing' traffic volumes were calculated as the sum of the 2010 existing traffic and growth in the background traffic (ranged from 1.0–3.0% a year depending on locations). This scenario forecasts the conditions that would exist in 2014 if the W2CP is not granted approval.

Figures 5.16 and 5.17 show the forecast future traffic assigned to the key intersections in the peak hours.



Note: different observed peak hours at the key intersections

Figure 5.16 2014 do-nothing AM peak hour traffic volumes at the key intersections

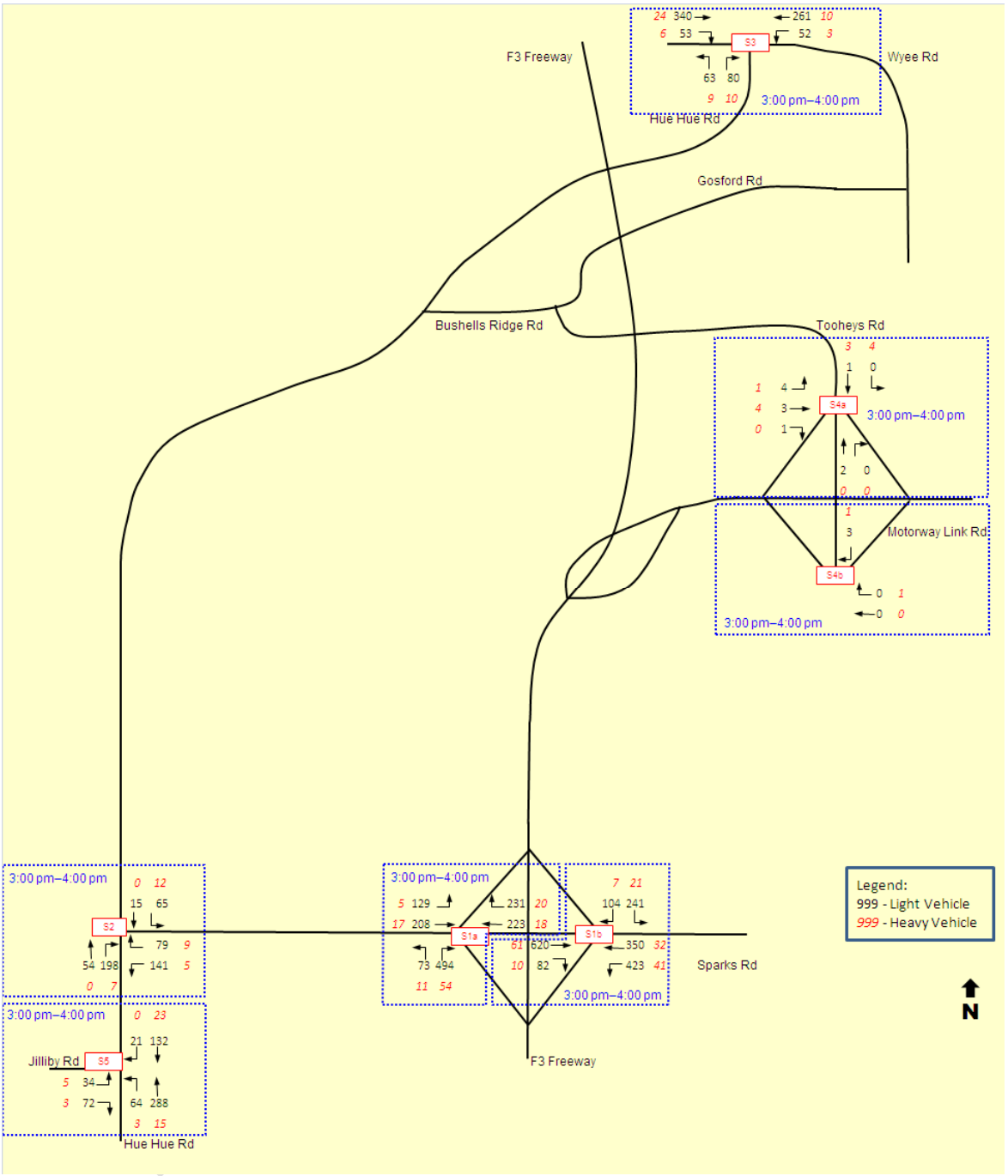
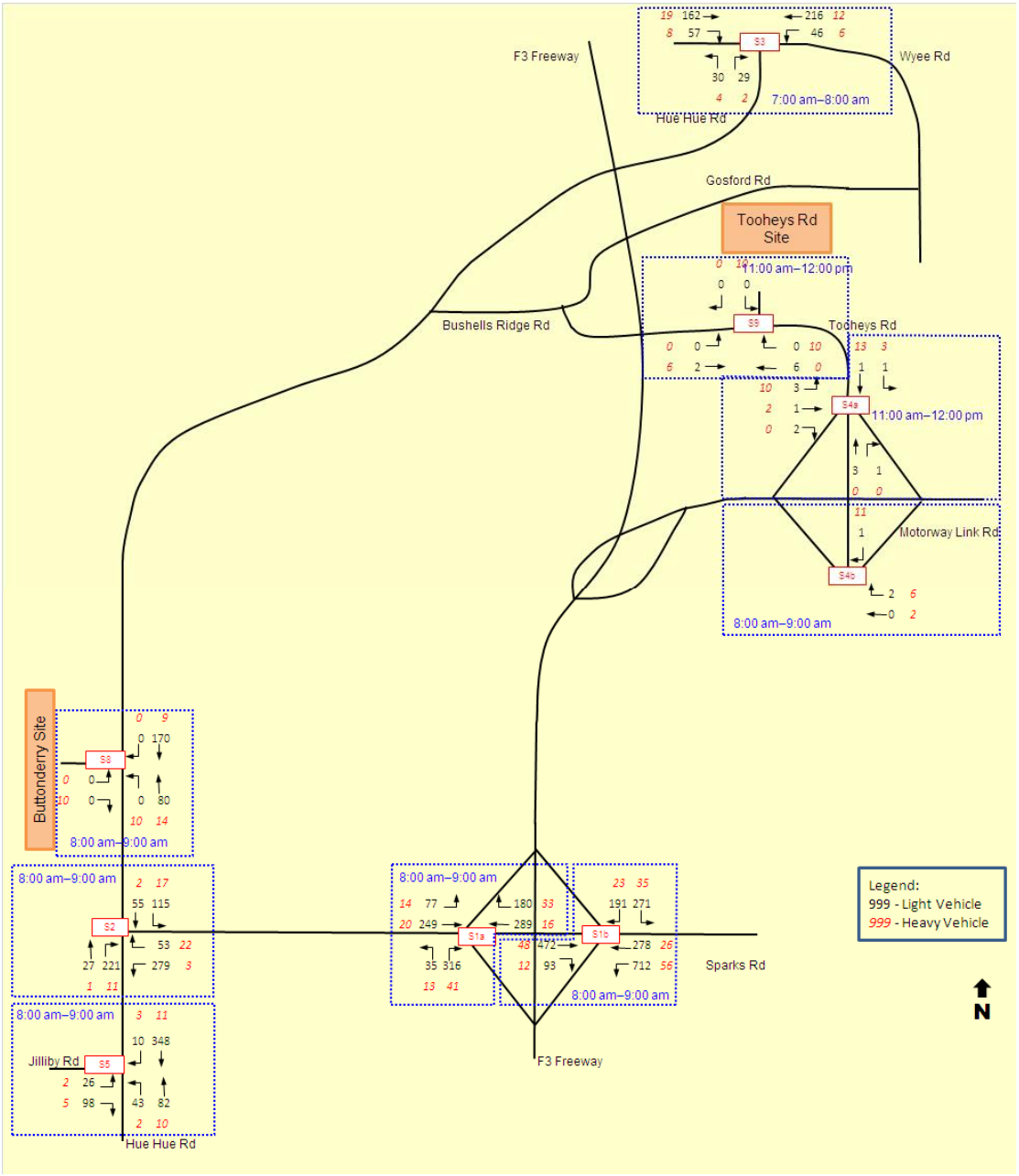


Figure 5.17 2014 do-nothing PM hour peak traffic volumes at the key intersections

5.7.4 Scenario 4: Mine operational phase case of the Tooheys Road site and Buttonderry site (2014)

Future traffic volumes were calculated as the sum of the 2010 existing traffic, growth in the background traffic (ranged from 1.0–3.0% a year depending on locations) and the traffic generation associated with the operation of the Tooheys Road site and Buttonderry site (refer to Tables 5.7 and 5.8).

Figures 5.18 and 5.19 show the forecast future traffic assigned to the key intersections in the peak hours during the months without daylight saving.



Note: different observed peak hours at the key intersections

Figure 5.18 2014 with mine operation AM peak hour traffic volumes at the key intersections

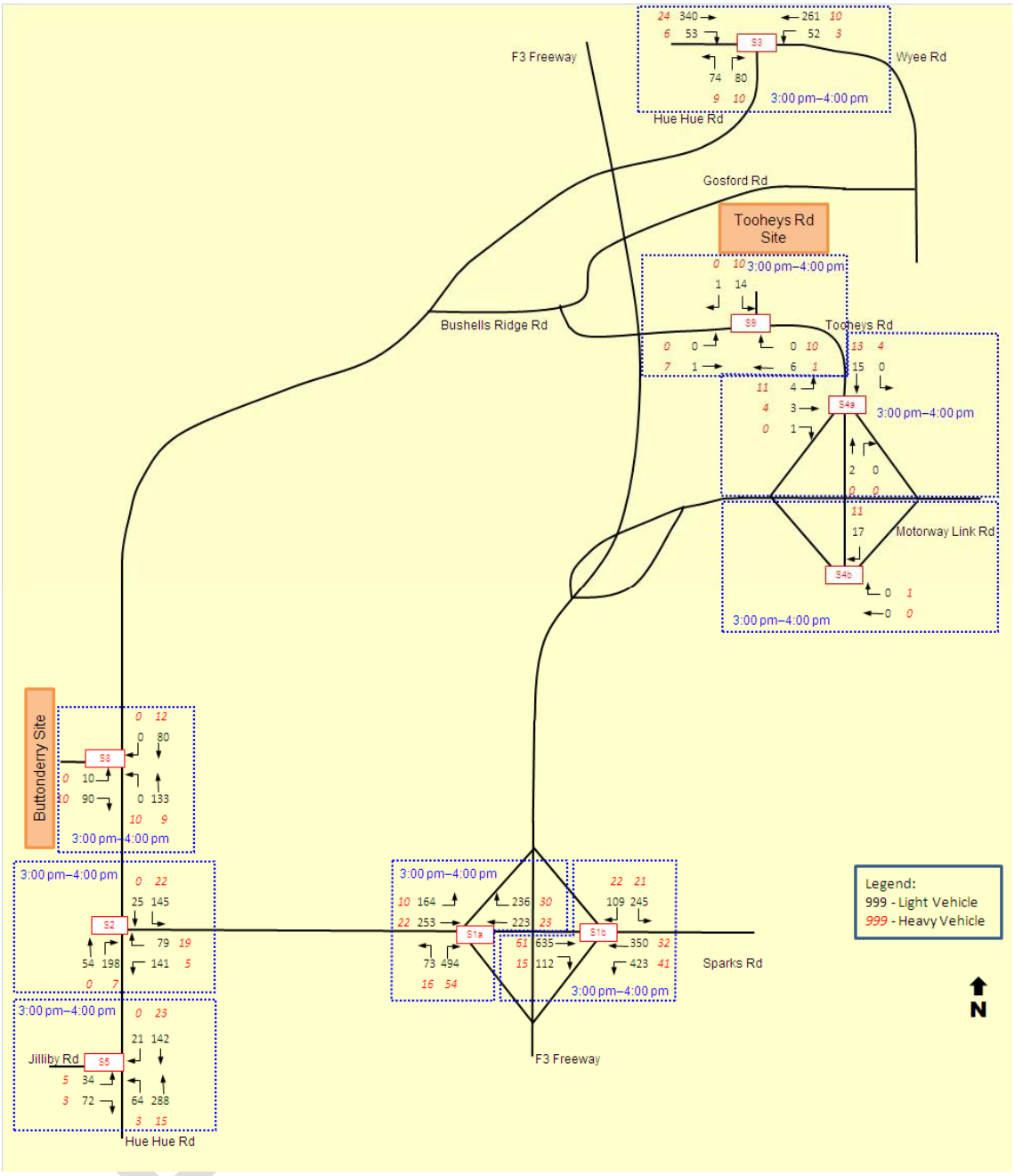
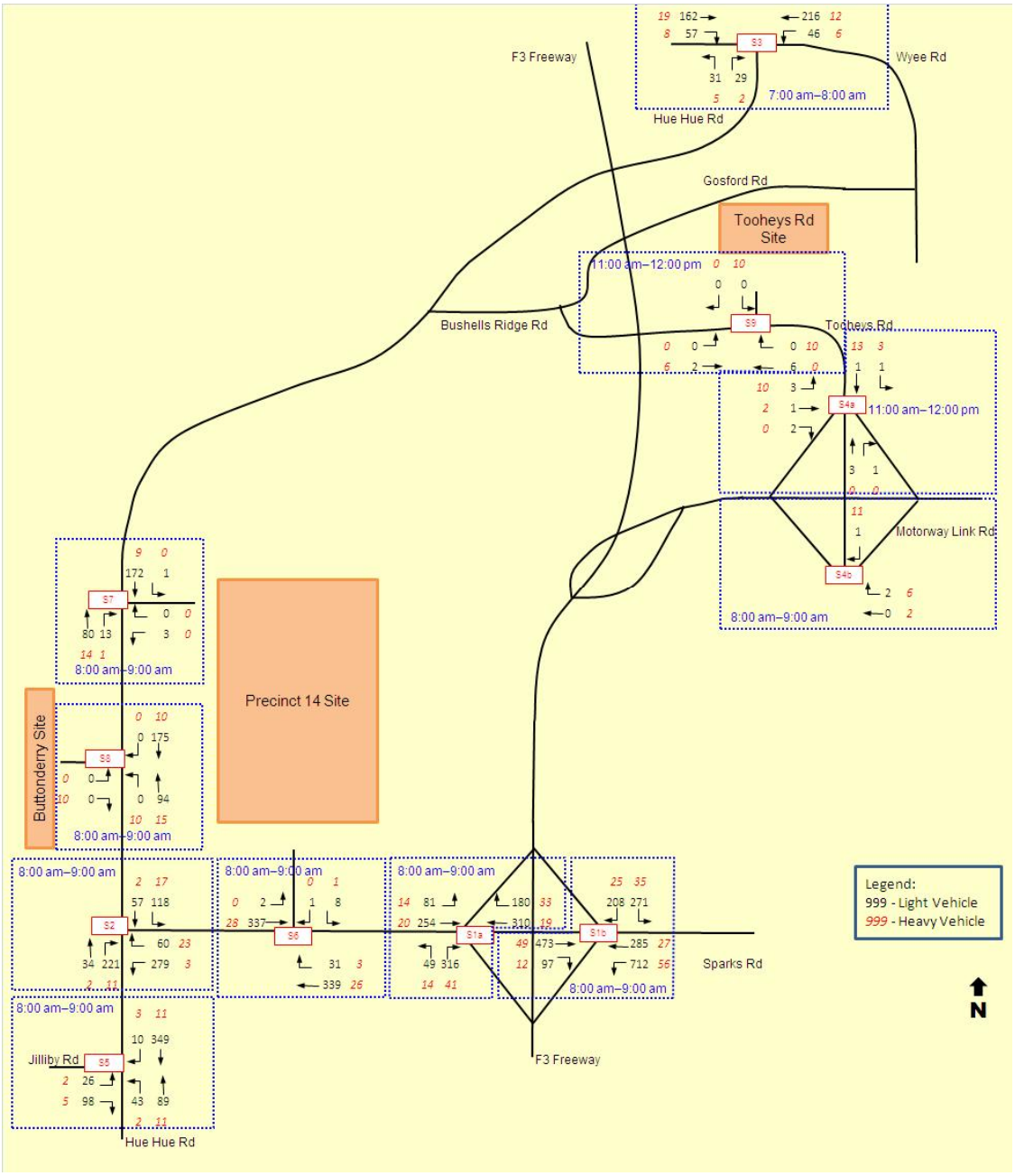


Figure 5.19 2014 with mine operation PM peak hour traffic volumes at the key intersections

5.7.5 Scenario 5: Mine operational phase case of the Tooheys Road site and Buttonderry site, and operation of Precinct 14 (2014)

Future traffic volumes were calculated as the sum of the 2010 existing traffic, growth in the background traffic (ranged from 1.0–3.0% a year depending on locations) and the traffic generation associated with the operation of the Tooheys Road site and Buttonderry site (refer to Tables 5.7 and 5.8) as well as the operation of the Precinct 14 development (refer to Section 5.5).

Figures 5.20 and 5.21 show the forecast future traffic assigned to the key intersections in the peak hours.



Note: different observed peak hours at the key intersections

Figure 5.20 2014 with mine operation and Precinct 14 AM peak hour traffic volumes at the key intersections

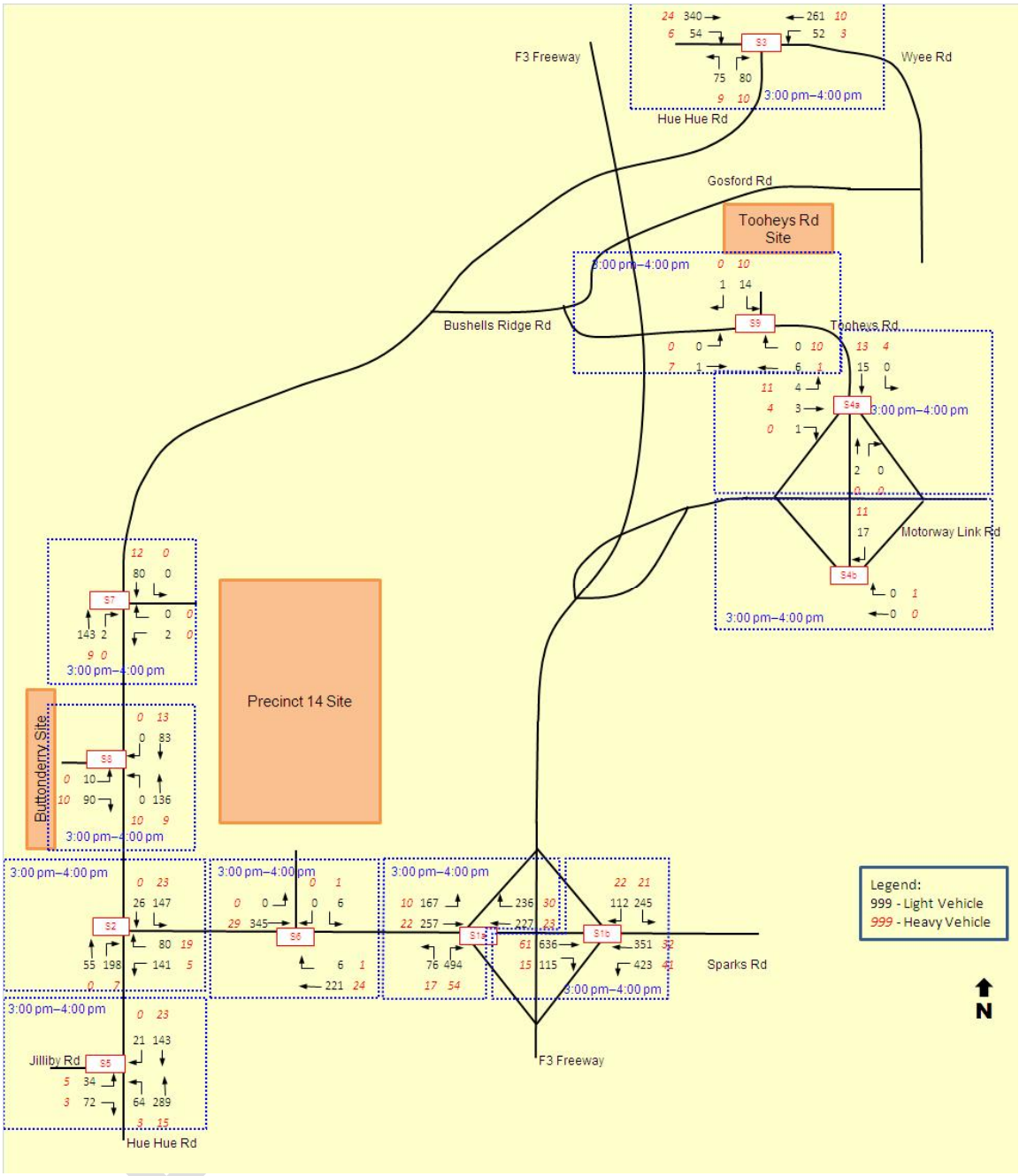
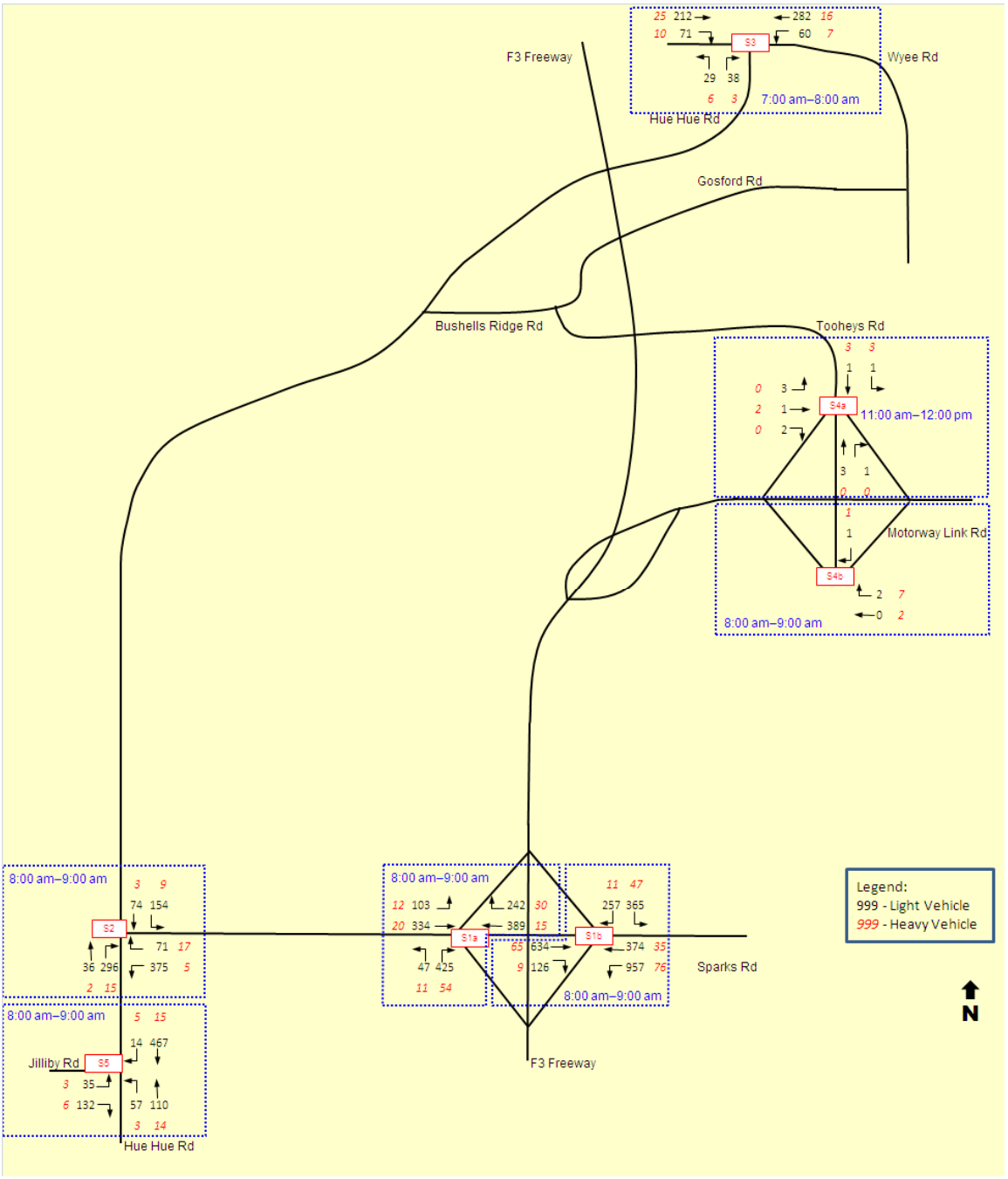


Figure 5.21 2014 with mine operation and Precinct 14 PM peak hour traffic volumes at the key intersections

5.7.6 Scenario 6: Do-nothing case (2024)

Future 2024 'do-nothing' traffic volumes were calculated as the sum of the 2010 existing traffic and growth in the background traffic (ranged from 1.0–3.0% a year depending on locations). This scenario forecasts the conditions that would exist in 2024 if the W2CP is not granted approval.

Figures 5.22 and 5.23 show the forecast future traffic assigned to the key intersections in the peak hours during the months with daylight saving.



Note: different observed peak hours at the key intersections

Figure 5.22 2024 do-nothing AM peak hour traffic volumes at the key intersections during the months with daylight saving

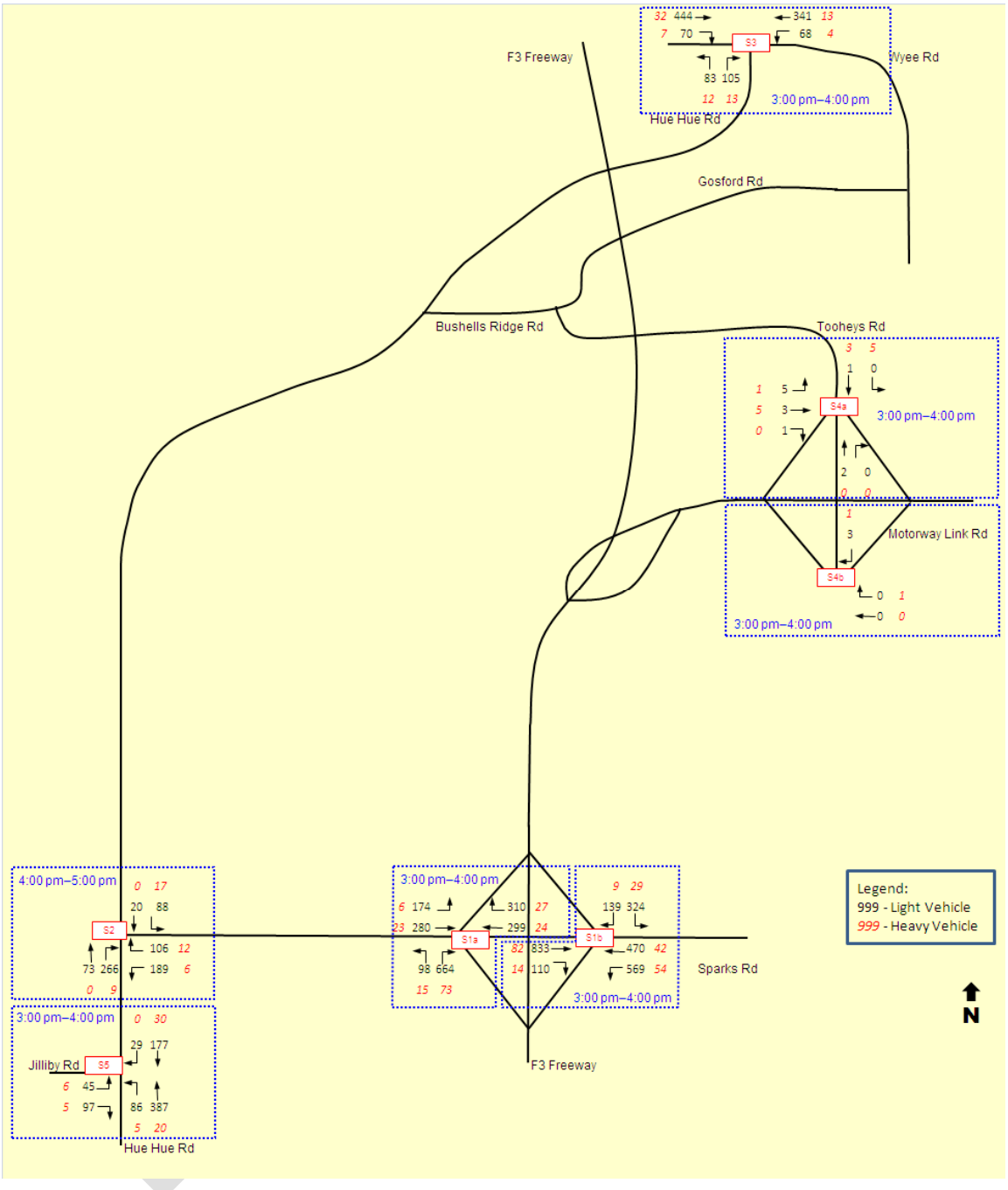
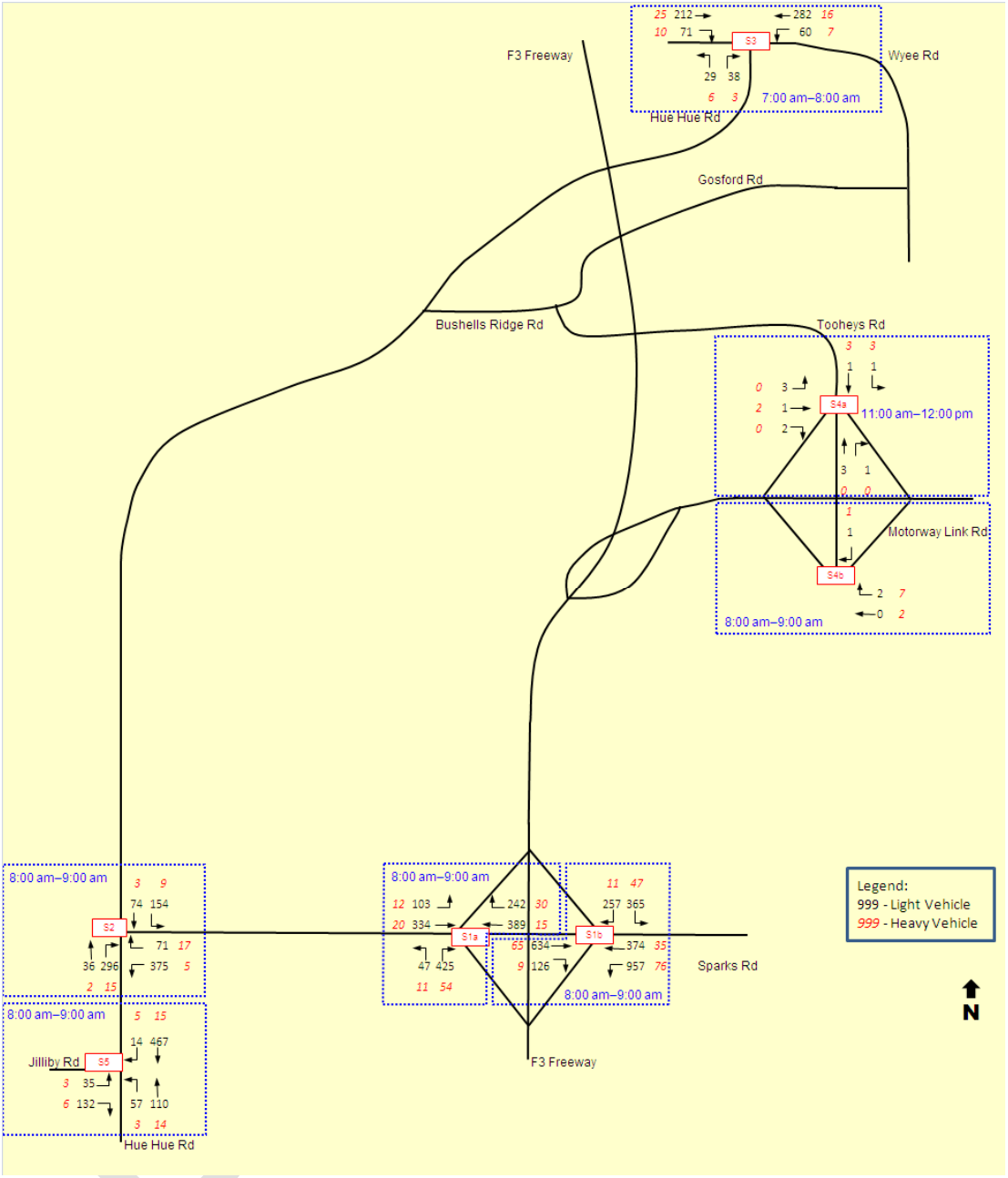


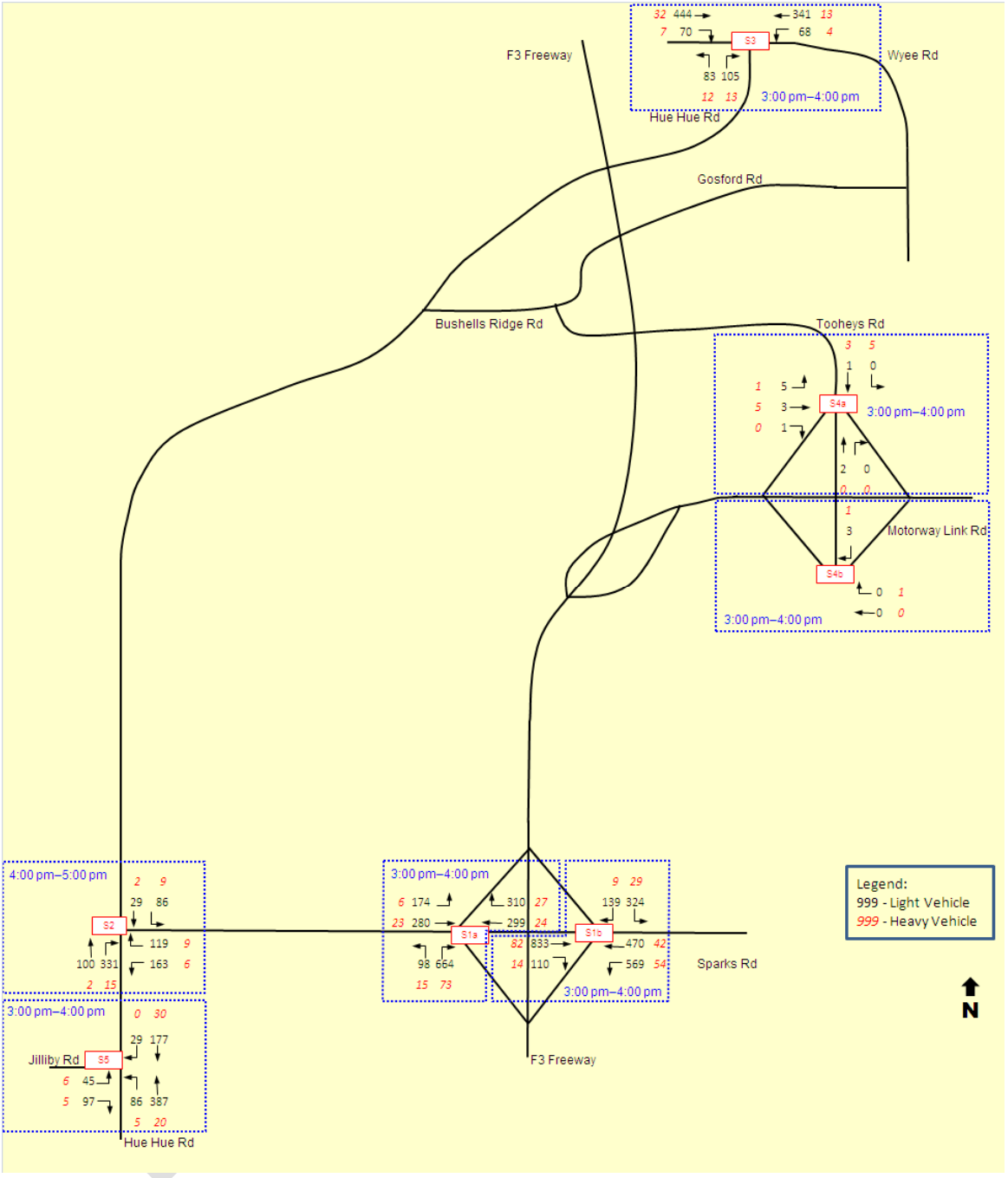
Figure 5.23 2024 do-nothing PM peak hour traffic volumes at the key intersections during the months with daylight saving

Figures 5.24 and 5.25 show the forecast future traffic assigned to the key intersections in the peak hours during the months without daylight saving.



Note: different observed peak hours at the key intersections

Figure 5.24 2024 do-nothing AM peak hour traffic volumes at the key intersections during the months without daylight saving



Note: different observed peak hours at the key intersections

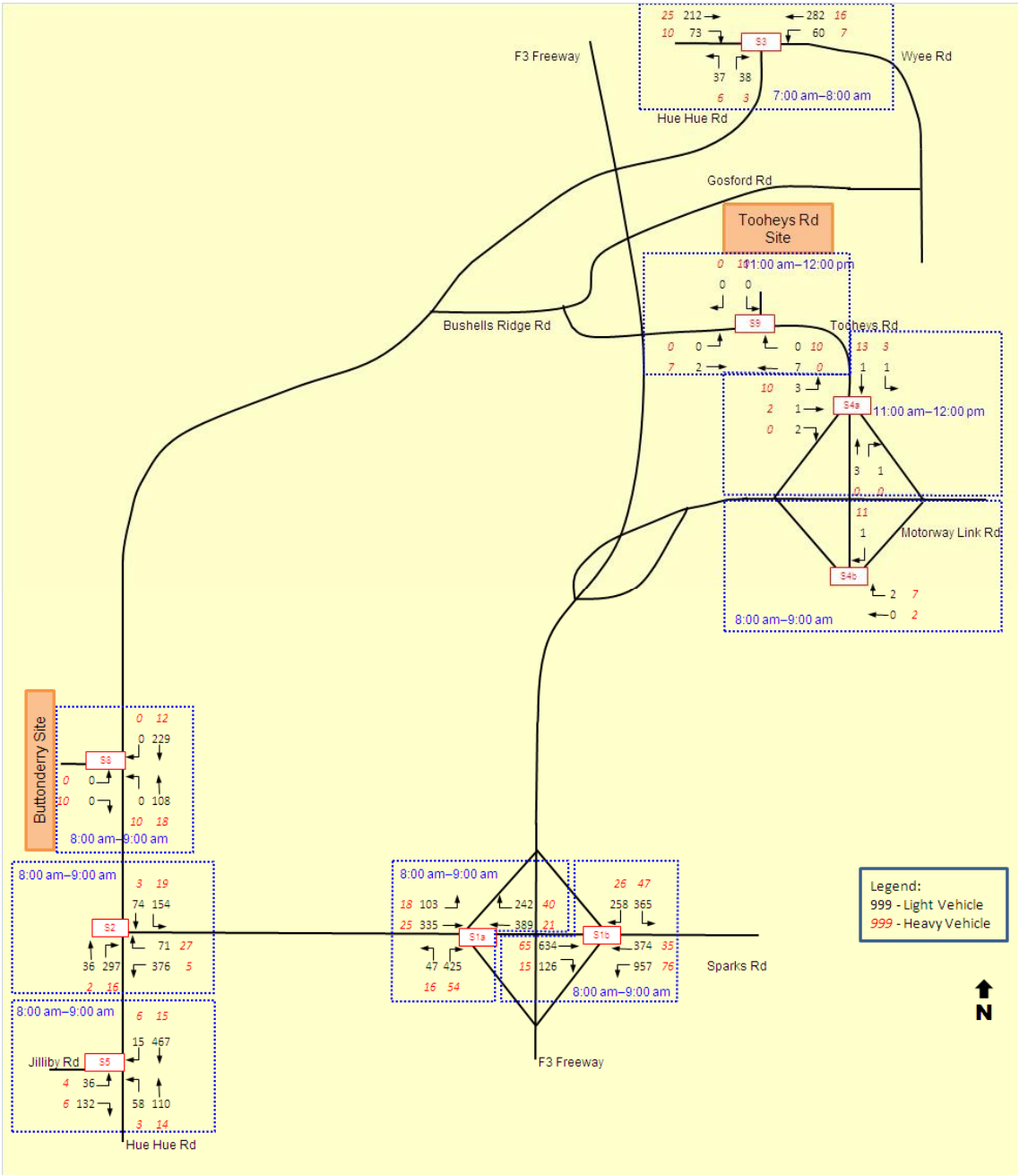
Figure 5.25 2024 do-nothing PM peak hour traffic volumes at the key intersections during the months without daylight saving

5.7.7 Scenario 7: Construction of the Western Shaft site, and mine operational phase of the Tooheys Road site and Buttonderry site (2024)

Future traffic volumes were calculated as the sum of the 2010 existing traffic, growth in the background traffic (ranged from 1.0–3.0% a year depending on locations) and the traffic generation associated with the operation of the Tooheys Road site and Buttonderry site

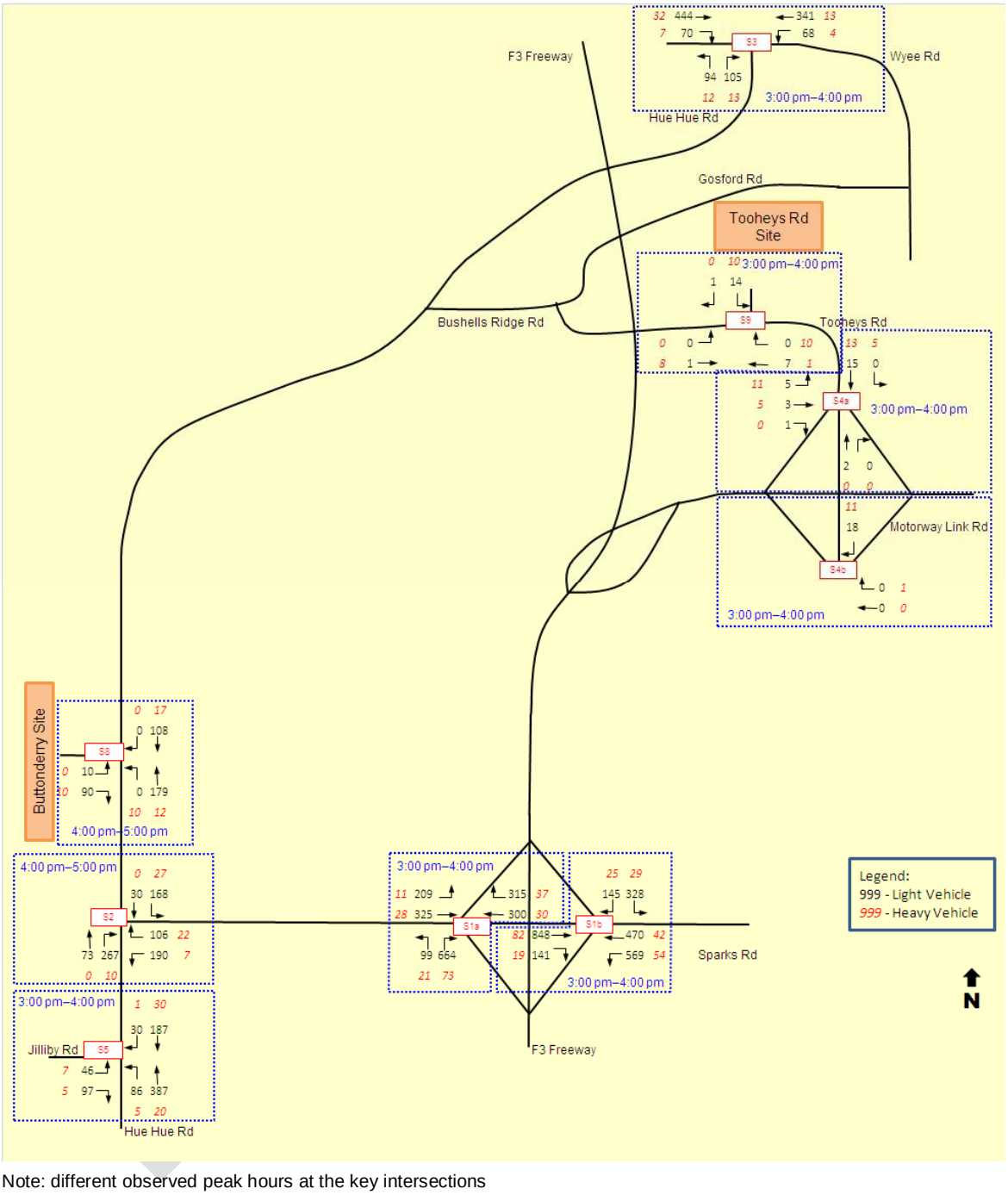
(refer to Tables 5.7 and 5.8), as well as the construction of Western Shaft site (refer to Table 5.5).

Figures 5.26 and 5.27 show the forecast future traffic assigned to the key intersections in the peak hours during the months with daylight saving.



Note: different observed peak hours at the key intersections

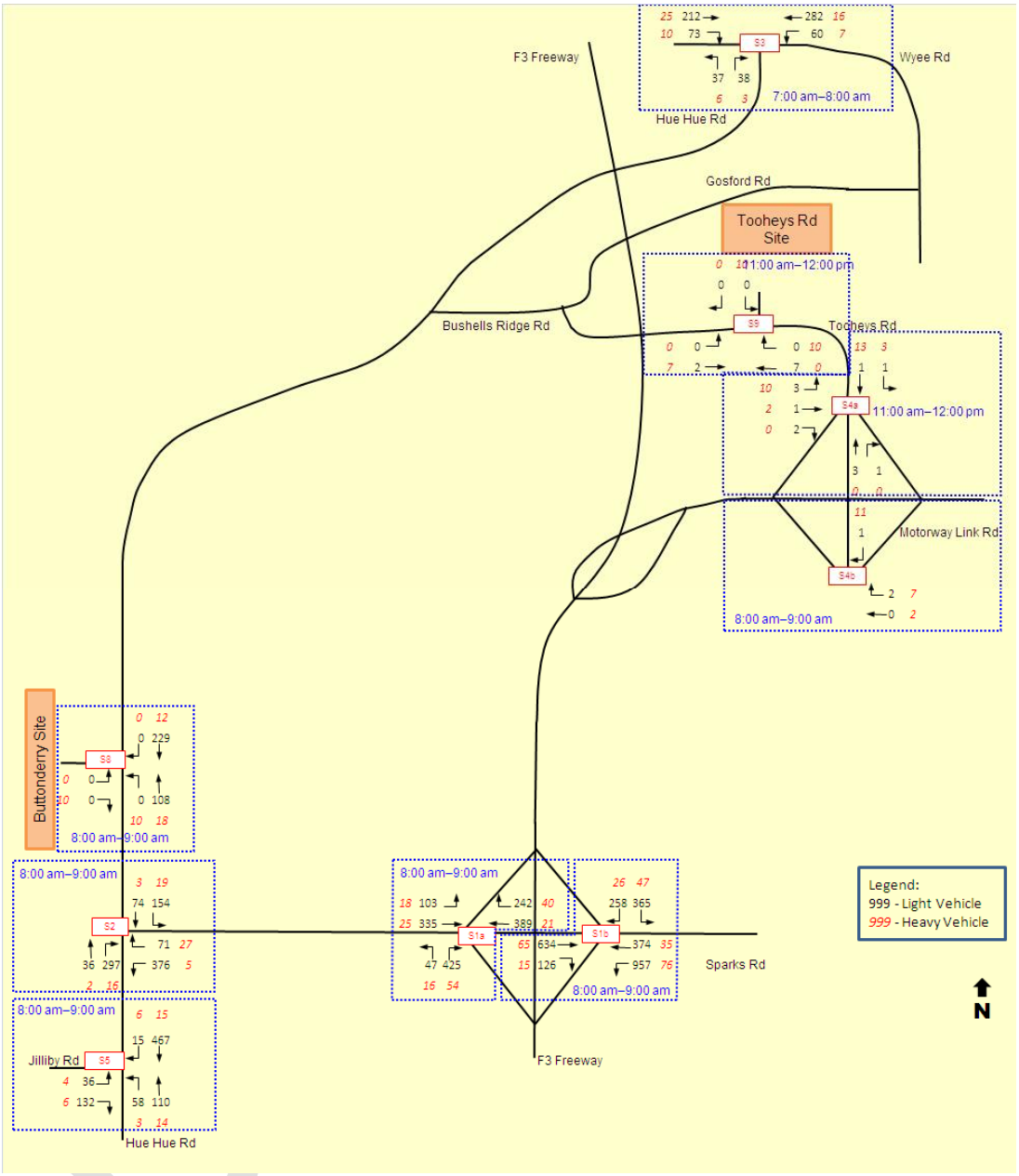
Figure 5.26 2024 with Western Shaft construction and mine operation AM peak hour traffic volumes at the key intersections during the months with daylight saving



Note: different observed peak hours at the key intersections

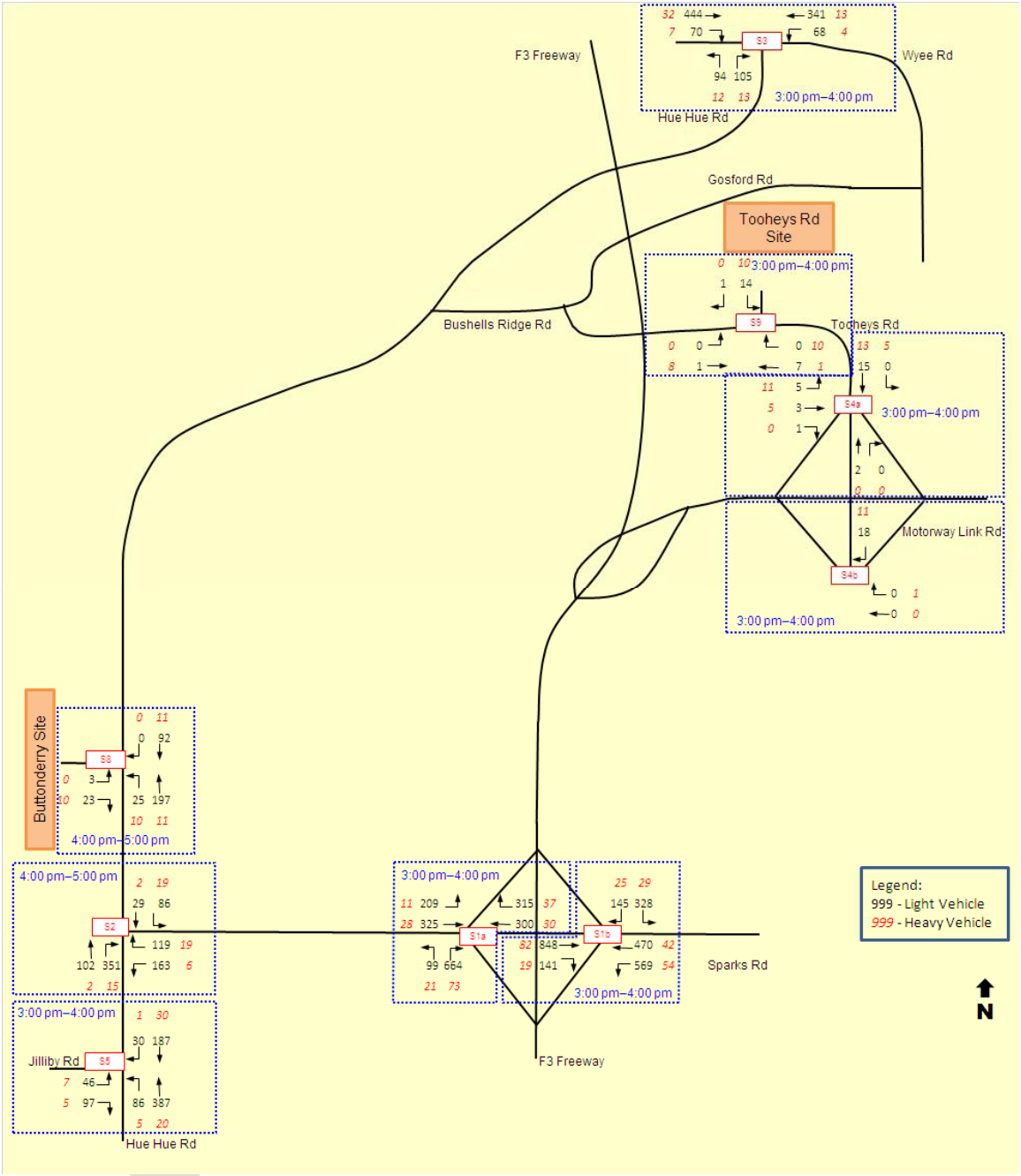
Figure 5.27 2024 with Western Shaft and mine operation construction PM peak hour traffic volumes at the key intersections during the months with daylight saving

Figures 5.28 and 5.29 show the forecast future traffic assigned to the key intersections in the peak hours during the months without daylight saving.



Note: different observed peak hours at the key intersections

Figure 5.28 2024 with Western Shaft construction and mine operation AM peak hour traffic volumes at the key intersections during the months without daylight saving



Note: different observed peak hours at the key intersections

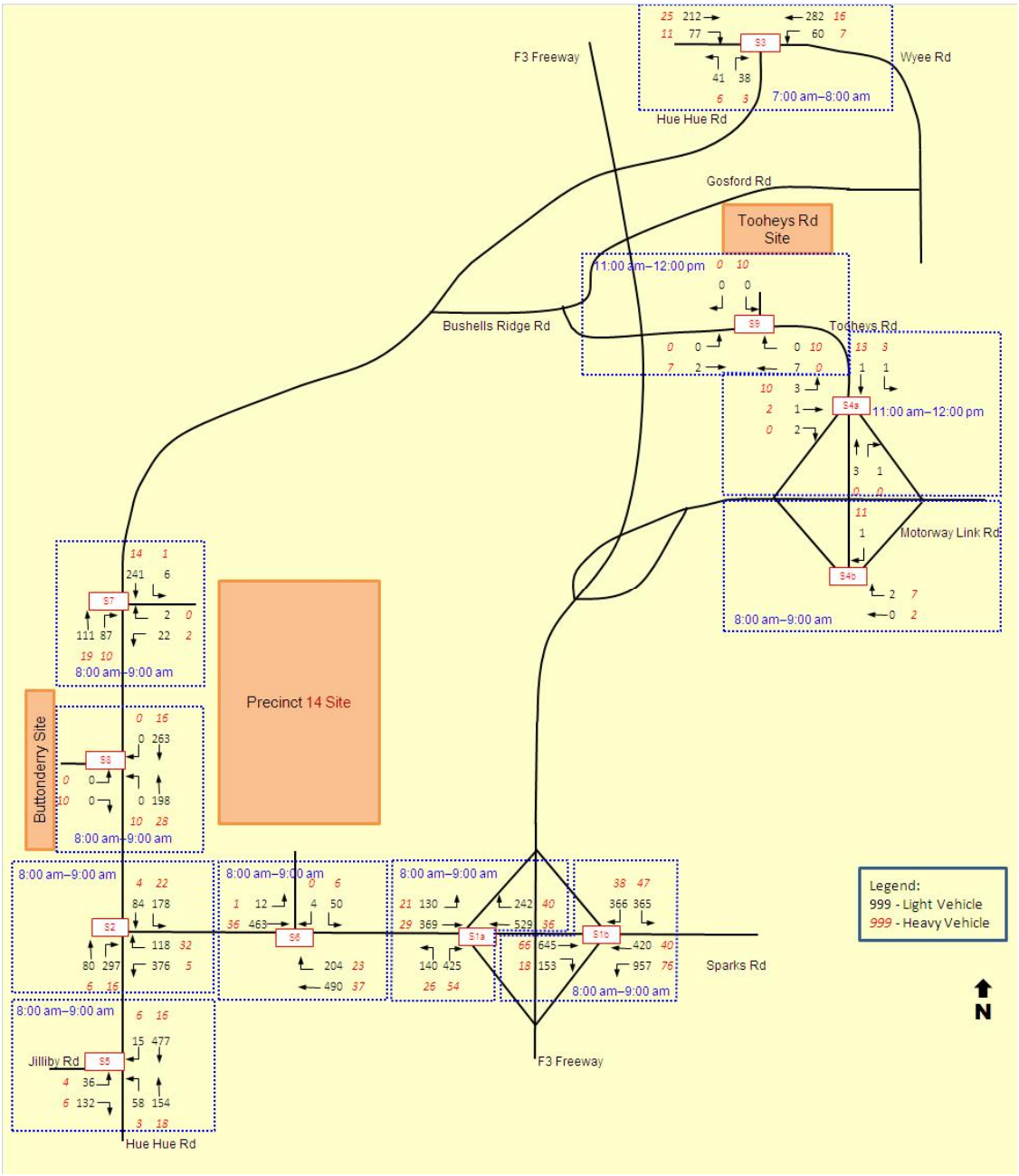
Figure 5.29 2024 with Western Shaft construction and mine operation PM peak hour traffic volumes at the key intersections during the months without daylight saving

5.7.8 Scenario 8: Construction of the Western Shaft site, mine operational phase of the Tooheys Road site and Buttonderry site, and operation of Precinct 14 (2024)

Future traffic volumes were calculated as the sum of the 2010 existing traffic, growth in the background traffic (ranged from 1.0–3.0% a year depending on locations) and the traffic generation associated with the operation of the Tooheys Road site and Buttonderry site

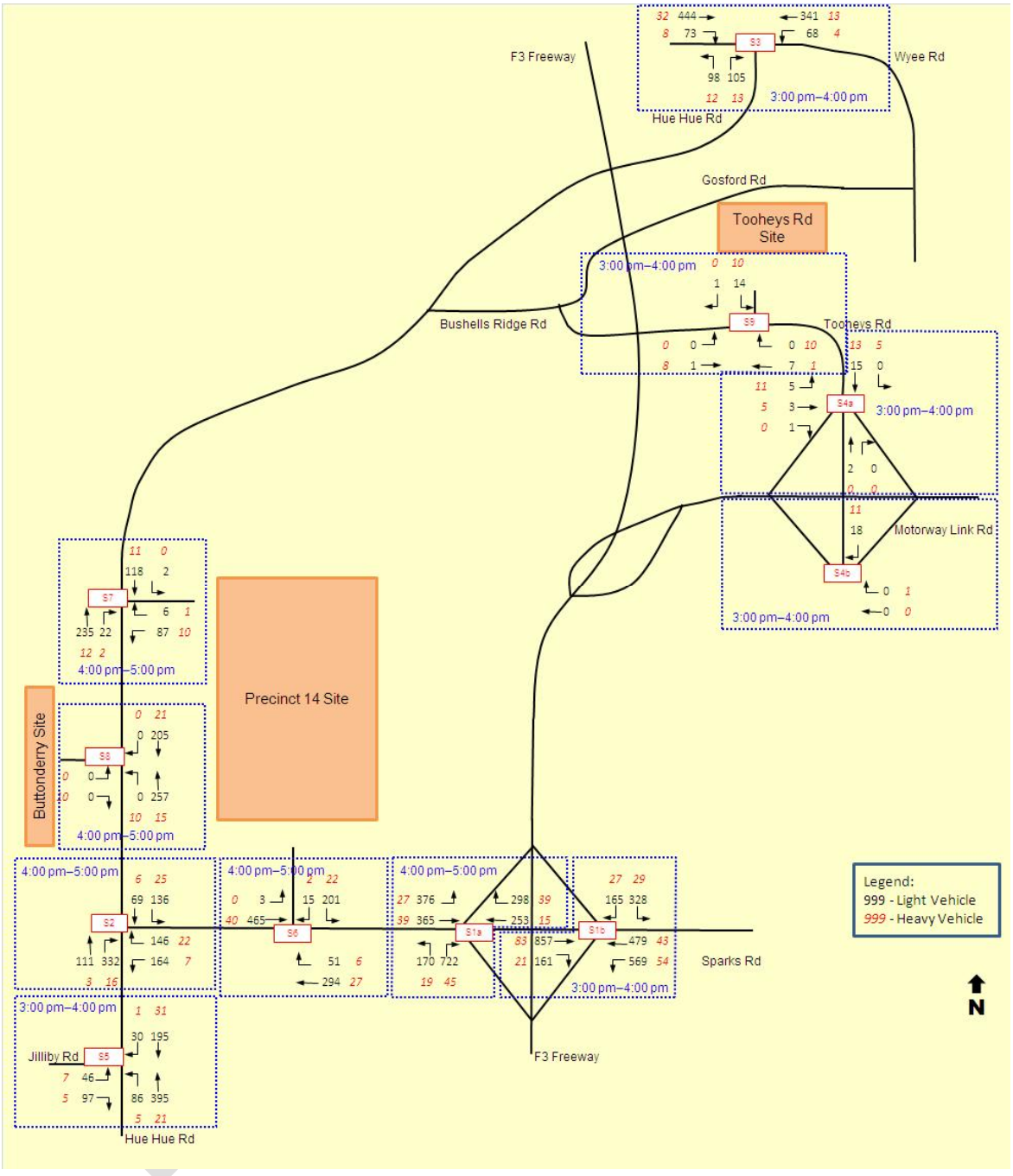
(refer to Tables 5.7 and 5.8), the construction of Western Shaft site (refer to Table 5.5), as well as the operation of the Precinct 14 development (refer to Section 5.5).

Figures 5.30 and 5.31 show the forecast future traffic assigned to the key intersections in the peak hours during the months with daylight saving.



Note: different observed peak hours at the key intersections

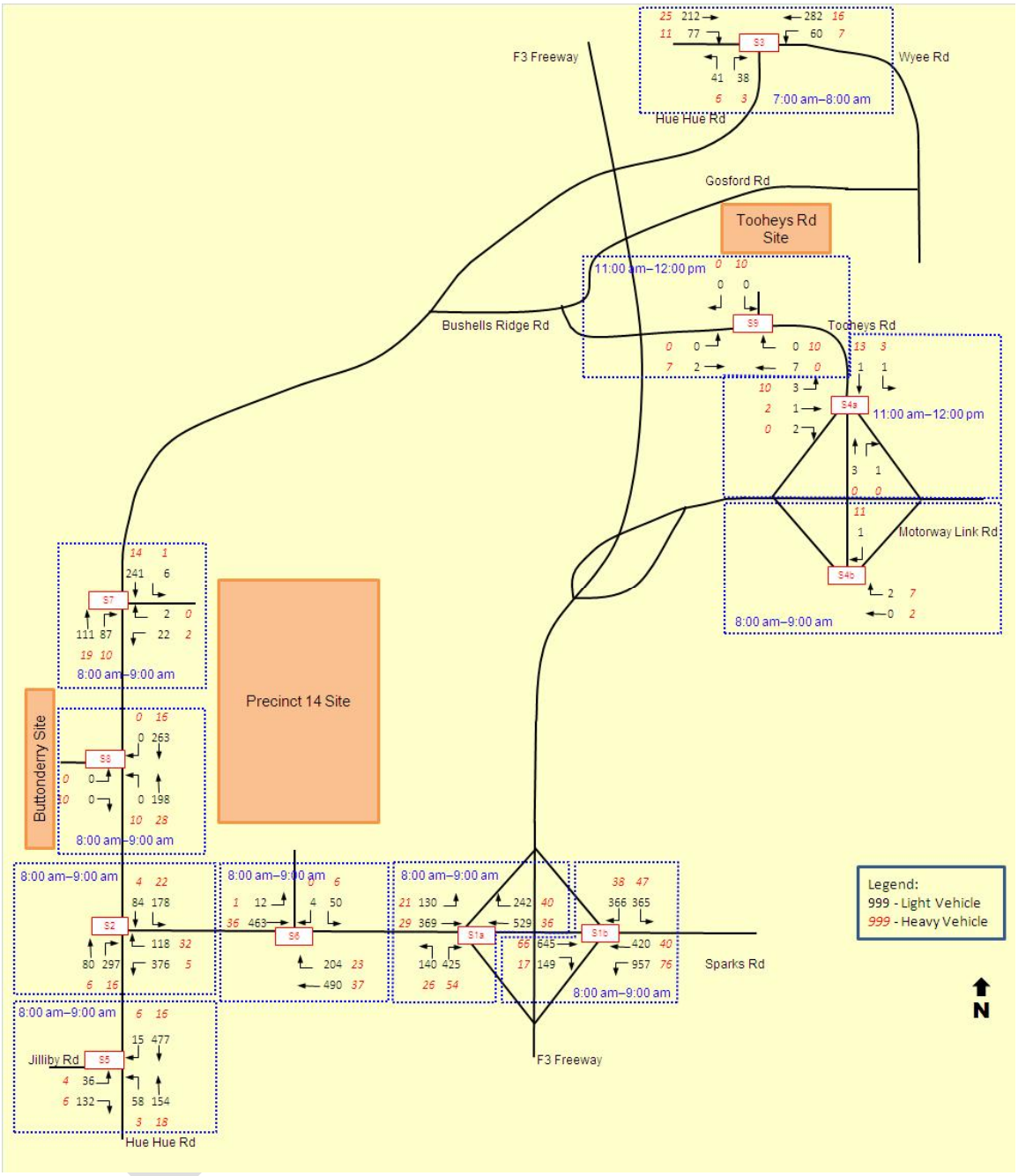
Figure 5.30 2024 with Western Shaft construction, mine operation and Precinct 14 AM peak hour traffic volumes at the key intersections during the months with daylight saving



Note: different observed peak hours at the key intersections

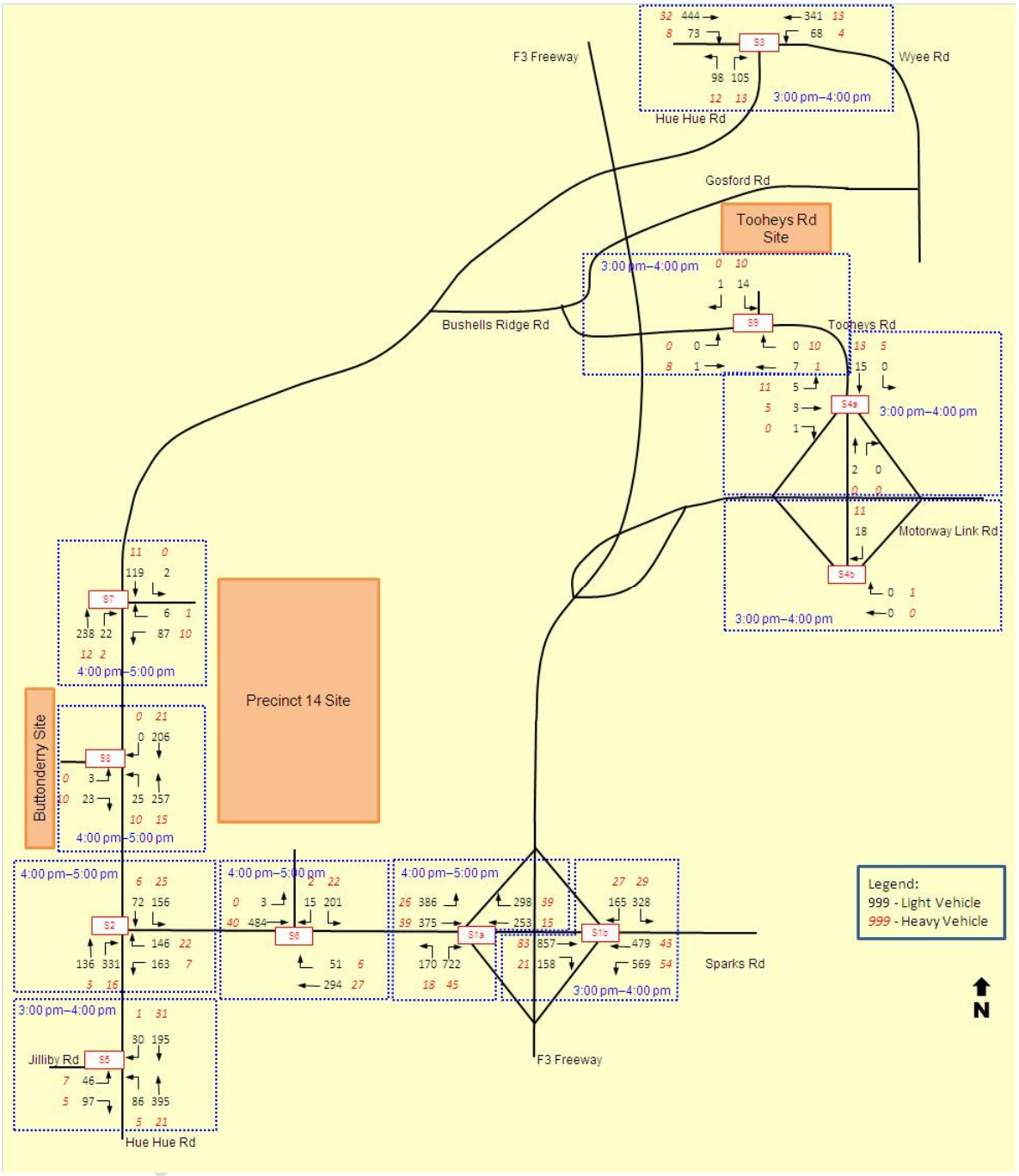
Figure 5.31 2024 with Western Shaft construction, mine operation and Precinct 14 PM peak hour traffic volumes at the key intersections during the months with daylight saving

Figures 5.32 and 5.33 show the forecast future traffic assigned to the key intersections in the peak hours during the months without daylight saving.



Note: different observed peak hours at the key intersections

Figure 5.32 2024 with Western Shaft construction, mine operation and Precinct 14 AM peak hour traffic volumes at the key intersections during the months without daylight saving



Note: different observed peak hours at the key intersections

Figure 5.33 2024 with Western Shaft construction, mine operation and Precinct 14 PM peak hour traffic volumes at the key intersections during the months without daylight saving

6. Traffic impacts

6.1 Scenario 1: Do-nothing case (2011)

Table 6.1 shows the SIDRA modelling results of the performance of the key intersections for the 2011 do-nothing scenario. In this scenario the mine construction has not occurred.

Table 6.1 Year 2011 do-nothing case traffic conditions

Intersection	Intersection control type	Peak hours		DoS	Delay	LoS	Queue (m)
Sydney–Newcastle Freeway/Sparks Road interchange (western side)	Signals	AM	8:00 am–9:00 am	0.90	30	C	85
		PM	4:00 pm–5:00 pm	1.08	49	D	117
Sydney–Newcastle Freeway/Sparks Road interchange (eastern side)	Priority (seagull)	AM	8:00 am–9:00 am	0.42	18	B	16
		PM	3:00 pm–4:00 pm	0.36	21	B	9
		PM	4:00 pm–5:00 pm	0.36	21	B	9
Sparks Road/Hue Hue Road	Priority	AM	8:00 am–9:00 am	0.42	12	A	10
		PM	4:00 pm–5:00 pm	0.27	16	B	9
Hue Hue Road/Wyee Road	Priority	AM	7:00 am–8:00 am	0.12	14	A	3
		PM	3:00 pm–4:00 pm	0.35	23	B	14
Motorway Link Road/Tooheys Road interchange (north side of the interchange)	Priority	AM	5:00 am–6:00 am	0.01	13	A	1
		AM	6:00 am–7:00 am	0.01	13	A	1
		PM	4:00 pm–5:00 pm	0.01	15	B	1
		PM	6:00 pm–7:00 pm	0.01	13	A	1
Motorway Link Road/Tooheys Road interchange (south side of the interchange)	Priority	AM	8:00 am–9:00 am	0.02	11	A	1
		PM	4:00 pm–5:00 pm	0.01	15	B	1
		PM	6:00 pm–7:00 pm	0.01	14	A	1
Sparks Road/Hue Hue Road	Priority	AM	8:00 am–9:00 am	0.32	24	B	16
		PM	3:00 pm–4:00 pm	0.28	28	B	11

Note: Interchanges were reported as two separate intersections

The analysis indicates the Sydney–Newcastle Freeway/Sparks Road interchange (western side) would operate at an unacceptable LoS D during the PM peak hour. This intersection operates above its design capacity during the PM peak hour.

With the exception of the Sydney–Newcastle Freeway/Sparks Road interchange (western side), in 2011 all other intersections would operate within their design capacity, indicating the road network would still have plenty of spare capacity in the peak hours to accommodate the W2CP related construction trips.

6.2 Scenario 2: Construction phase case for the Tooheys Road and Buttonderry sites (2011)

Table 6.2 shows the SIDRA modelling results of the performance of the key intersections during the construction phase, for the construction working hours between 6:00 am and 6:00 pm, during months with daylight saving in 2011. Table 6.3 shows the results for the months without daylight saving, when the construction working hours are between 7:00 am and 4:00 pm.

The working hours for the mine operators and mine office would remain the same throughout the year.

The number of key intersections is increased to seven, including the new access points to the mine sites on Hue Hue Road and Tooheys Road. These two newly created intersections would operate as priority controlled T-junctions (refer to Appendix C for the layout of the new intersections).

Table 6.2 Traffic conditions for the construction phase in 2011 during the months with daylight saving

Intersection	Intersection control type	Peak hours		DoS	Delay	LoS	Queue (m)
Sydney–Newcastle Freeway/Sparks Road interchange (western side)	Signals	AM	8:00 am–9:00 am	0.92	31	C	89
		PM	4:00 pm–5:00 pm	1.09	50	D	123
Sydney–Newcastle Freeway/Sparks Road interchange (eastern side)	Priority (seagull)	AM	8:00 am–9:00 am	0.42	18	B	18
		PM	3:00 pm–4:00 pm	0.36	21	B	10
Sparks Road/Hue Hue Road	Priority	AM	8:00 am–9:00 am	0.42	12	A	10
		PM	4:00 pm–5:00 pm	0.27	16	B	9
Hue Hue Road/Wyee Road	Priority	AM	7:00 am–8:00 am	0.12	14	A	3
		PM	3:00 pm–4:00 pm	0.35	23	B	14
Motorway Link Road/Tooheys Road interchange (north side of the interchange)	Priority	AM	5:00 am–6:00 am	0.19	16	B	5
		PM	6:00 pm–7:00 pm	0.08	25	B	1

Intersection	Intersection control type	Peak hours		DoS	Delay	LoS	Queue (m)
Motorway Link Road/Tooheys Road interchange (south side of the interchange)	Priority	AM	8:00 am–9:00 am	0.02	11	A	1
		PM	6:00 pm–7:00 pm	0.08	10	A	1
Hue Hue Road/Jilliby Road	Priority	AM	8:00 am–9:00 am	0.32	24	B	16
		PM	3:00 pm–4:00 pm	0.28	28	B	11
Hue Hue Road/Buttonderry site access	Priority	AM	8:00 am–9:00 am	0.10	25	B	5
		PM	4:00 pm–5:00 pm	0.09	25	B	3
Tooheys Road/Tooheys Road site access	Priority	AM	5:00 am–6:00 am	0.11	9	A	4
		PM	6:00 pm–7:00 pm	0.12	11	A	5

Note: Interchanges were reported as two separate intersections

Table 6.3 Traffic conditions for the construction phase in 2011 during the months without daylight saving

Intersection	Intersection control type	Peak hours		DoS	Delay	LoS	Queue (m)
Sydney–Newcastle Freeway/Sparks Road interchange (western side)	Signals	AM	8:00 am–9:00 am	0.92	31	C	90
		PM	4:00 pm–5:00 pm	1.09	66	E	143
Sydney–Newcastle Freeway/Sparks Road interchange (eastern side)	Priority (seagull)	AM	8:00 am–9:00 am	0.42	18	B	18
		PM	4:00 pm–5:00 pm	0.34	19	B	11
Sparks Road/Hue Hue Road	Priority	AM	8:00 am–9:00 am	0.42	12	A	10
		PM	4:00 pm–5:00 pm	0.28	17	B	9
Hue Hue Road/Wyee Road	Priority	AM	7:00 am–8:00 am	0.12	14	A	3
		PM	3:00 pm–4:00 pm	0.35	23	B	14
Motorway Link Road/Tooheys Road interchange (north side of the interchange)	Priority	AM	6:00 am–7:00 am	0.19	15	B	5
		PM	4:00 pm–5:00 pm	0.09	21	B	1
Motorway Link Road/Tooheys Road interchange (south side of the interchange)	Priority	AM	8:00 am–9:00 am	0.02	11	A	1
		PM	4:00 pm–5:00 pm	0.08	19	B	1
Hue Hue Road/Jilliby Road	Priority	AM	8:00 am–9:00 am	0.32	25	B	16
		PM	3:00 pm–4:00 pm	0.28	28	B	11
Hue Hue Road/Buttonderry site access	Priority	AM	8:00 am–9:00 am	0.10	25	B	5
		PM	4:00 pm–5:00 pm	0.09	25	B	3
Tooheys Road/Tooheys Road site access	Priority	AM	6:00 am–7:00 am	0.08	16	B	4
		PM	4:00 pm–5:00 pm	0.09	15	B	1

Note: Interchanges were reported as two separate intersections

When compared to the do-nothing results in Table 6.1, it is apparent there is only a marginal decrease in intersection performance as a result of the increased traffic on the network due to the construction of the mine sites, during the months with or without daylight saving. The Sydney–Newcastle Freeway/Sparks Road interchange (western side) would continue to operate at an unacceptable LoS D during the PM peak hour, during the months with daylight saving, with further reduction of the LoS to E when the construction working hours change during the months without daylight saving.

The analysis leads to the conclusion the construction of the mine sites has practically no impact on the performance of any of the intersections on the road network. The only intersection facing capacity constraints is the Sydney–Newcastle Freeway/Sparks Road interchange (western side), however this congestion is not caused by the W2CP project.

6.3 Scenario 3: Do-nothing case (2014)

Table 6.4 shows the SIDRA modelling results of the performance of the key intersections for the 2014 do-nothing case. In this scenario the operation of the mine sites has not occurred.

Table 6.4 Year 2014 do-nothing case traffic conditions

Intersection	Intersection control type	Peak hours	DoS	Delay	LoS	Queue (m)
Sydney–Newcastle Freeway/Sparks Road interchange (western side)	Signals	AM	0.99	37	C	115
		PM	1.09	57	E	123
Sydney–Newcastle Freeway/Sparks Road interchange (eastern side)	Priority (seagull)	AM	0.46	20	B	20
		PM	0.39	23	B	12
Sparks Road/Hue Hue Road	Priority	AM	0.46	15	B	20
		PM	0.39	22	B	12
Hue Hue Road/Wyee Road	Priority	AM	0.13	15	B	3
		PM	0.42	27	B	18
Motorway Link Road/Tooheys Road interchange (north side of the interchange)	Priority	AM	0.01	14	A	1
		PM	0.01	15	B	1
Motorway Link Road/Tooheys Road interchange (south side of the interchange)	Priority	AM	0.02	11	A	1
		PM	0.01	15	B	1
Hue Hue Road/Jilliby Road	Priority	AM	0.39	27	B	18
		PM	0.34	29	C	14

Note: Interchanges were reported as two separate intersections

The analysis indicates the Sydney–Newcastle Freeway/Sparks Road interchange (western side) would operate at an unacceptable LoS E during the PM peak hour. This intersection operates above its design capacity during the PM peak hour.

With the exception of the Sydney–Newcastle Freeway/Sparks Road interchange (western side), in 2014 all other intersections would operate within their design capacity, indicating the road network would still have spare capacity in the peak hours to accommodate the traffic associated with the mining operation activities.

6.4 Scenario 4: Mine operational phase case of the Tooheys Road and Buttonderry sites (2014)

Table 6.5 shows the SIDRA modelling results of the performance of the key intersections during the mine operational phase in 2014, under the forecast traffic demands summarised in Section 5.7.4.

Table 6.5 Traffic conditions in 2014 during mine operational phase

Intersection	Intersection control type	Peak hours		DoS	Delay	LoS	Queue (m)
Sydney–Newcastle Freeway/Sparks Road interchange (western side)	Signals	AM	8:00 am–9:00 am	1.02	41	C	132
		PM	3:00 pm–4:00 pm	1.25	93	F	264
Sydney–Newcastle Freeway/Sparks Road interchange (eastern side)	Priority (seagull)	AM	8:00 am–9:00 am	0.47	22	B	28
		PM	3:00 pm–4:00 pm	0.44	30	C	21
Sparks Road/Hue Hue Road	Priority	AM	8:00 am–9:00 am	0.46	12	A	12
		PM	3:00 pm–4:00 pm	0.30	18	B	13
Hue Hue Road/Wyee Road	Priority	AM	7:00 am–8:00 am	0.13	15	B	3
		PM	3:00 pm–4:00 pm	0.42	27	B	18
Motorway Link Road/Tooheys Road interchange (north side of the interchange)	Priority	AM	11:00 am–12:00 pm	0.04	14	A	1
		PM	3:00 pm–4:00 pm	0.04	23	B	1
Motorway Link Road/Tooheys Road interchange (south side of the interchange)	Priority	AM	8:00 am–9:00 am	0.02	13	A	1
		PM	3:00 pm–4:00 pm	0.02	16	B	1
Hue Hue Road/Jilliby Road	Priority	AM	8:00 am–9:00 am	0.39	27	B	18
		PM	3:00 pm–4:00 pm	0.35	29	C	15
Hue Hue Road/Buttonderry site access	Priority	AM	8:00 am–9:00 am	0.11	38	C	6
		PM	3:00 pm–4:00 pm	0.13	39	C	5
Tooheys Road/Tooheys Road site access	Priority	AM	11:00 am–12:00 pm	0.02	18	B	1
		PM	3:00 pm–4:00 pm	0.03	19	B	1

Note: Interchanges were reported as two separate intersections

When compared to the do-nothing results in Table 6.4, it is apparent there is only a marginal decrease in intersection performance as a result of the increased traffic on the network due to the operation of the Tooheys Road and Buttonderry sites. However, the Sydney–

Newcastle Freeway/Sparks Road interchange (western side) would operate unsatisfactorily and deteriorated LoS of F during the PM peak hour. The capacity constrains at this intersection is not caused by the W2CP project.

Apart from this intersection, the analysis leads to the conclusion the additional traffic resulting from the mine operation has no significant impact on the performance of other intersections on the road network.

6.5 Scenario 5: Mine operational phase case of the Tooheys Road and Buttonderry sites and Precinct 14 (2014)

Table 6.6 shows the SIDRA modelling results of the performance of the key intersections when the take up of Precinct 14 is approximately 15% in 2014, as a cumulative traffic impact in conjunction with the W2CP development (refer to Table 6.5).

Table 6.6 Traffic conditions in 2014 during mine operational phase and the operation of Precinct 14

Intersection	Intersection control type	Peak hours		DoS	Delay	LoS	Queue (m)
Sydney–Newcastle Freeway/Sparks Road interchange (western side)	Signals	AM	8:00 am–9:00 am	1.04	43	D	143
		PM	3:00 pm–4:00 pm	1.27	97	F	277
Sydney–Newcastle Freeway/Sparks Road interchange (eastern side)	Priority (seagull)	AM	8:00 am–9:00 am	0.52	23	B	33
		PM	3:00 pm–4:00 pm	0.45	30	C	21
Sparks Road/Hue Hue Road	Priority	AM	8:00 am–9:00 am	0.46	12	A	12
		PM	3:00 pm–4:00 pm	0.31	19	B	14
Hue Hue Road/Wyee Road	Priority	AM	7:00 am–8:00 am	0.13	15	B	3
		PM	3:00 pm–4:00 pm	0.42	28	B	2
Motorway Link Road/Tooheys Road interchange (north side of the interchange)	Priority	AM	11:00 am–12:00 pm	0.04	14	A	1
		PM	3:00 pm–4:00 pm	0.04	23	B	1
Motorway Link Road/Tooheys Road interchange (south side of the interchange)	Priority	AM	8:00 am–9:00 am	0.02	13	A	1
		PM	3:00 pm–4:00 pm	0.02	16	B	1
Hue Hue Road/Jilliby Road	Priority	AM	8:00 am–9:00 am	0.39	28	B	18
		PM	3:00 pm–4:00 pm	0.35	29	C	15
Hue Hue Road/Buttonderry site	Priority	AM	8:00 am–9:00 am	0.11	38	C	6

Intersection	Intersection control type	Peak hours		DoS	Delay	LoS	Queue (m)
access		PM	3:00 pm–4:00 pm	0.13	39	C	5
Tooheys Rd/Tooheys Rd site access	Priority	AM	11:00 am–12:00 pm	0.02	18	B	1
		PM	3:00 pm–4:00 pm	0.03	19	B	1
Sparks Rd/ Precinct 14 access	Roundabout	AM	8:00 am–9:00 am	0.30	15	B	15
		PM	3:00 pm–4:00 pm	0.26	15	B	14
Hue Hue Road/ Precinct 14 access	Priority (seagull)	AM	8:00 am–9:00 am	0.10	11	A	1
		PM	3:00 pm–4:00 pm	0.09	11	A	1

Note: Interchanges were reported as two separate intersections

When compared to the 2014 do-nothing results (refer to Table 6.4), it is apparent there is only a marginal decrease in intersection performance as a result of the increased traffic due to the operation of the mine sites and Precinct 14.

The Sydney–Newcastle Freeway/Sparks Road interchange (western side) would operate unsatisfactorily and further deteriorated to LoS D during the AM peak hour, and LoS F during the PM peak hour. The capacity constrains at this intersection is not caused by the W2CP project nor Precinct 14.

Apart from this intersection, the analysis leads to the conclusion the additional traffic resulting from the operation of the mine sites and Precinct 14 has no significant impact on the performance of other intersections on the road network.

6.6 Scenario 6: Do-nothing case (2024)

Table 6.7 shows the SIDRA modelling results of the performance of the key intersections for the 2024 do-nothing case. In this scenario the operation of the mine sites and the construction of the Western Shaft site have not occurred.

Table 6.7 Year 2024 do-nothing case traffic conditions

Intersection	Intersection control type	Peak hours		DoS	Delay	LoS	Queue (m)
Sydney–Newcastle Freeway/Sparks Road interchange (western side)	Signals	AM	8:00 am–9:00 am	1.33	137	F	378
		PM	3:00 pm–4:00 pm	1.50	228	F	486
		PM	4:00 pm–5:00 pm	1.51	229	F	487

Intersection	Intersection control type	Peak hours		DoS	Delay	LoS	Queue (m)
Sydney–Newcastle Freeway/Sparks Road interchange (eastern side)	Priority (seagull)	AM	8:00 am–9:00 am	0.70	32	C	48
		PM	3:00 pm–4:00 pm	0.70	42	C	30
Sparks Road/Hue Hue Road	Priority	AM	8:00 am–9:00 am	0.62	14	A	28
		PM	4:00 pm–5:00 pm	0.44	24	B	20
Hue Hue Road/Wyee Road	Priority	AM	7:00 am–8:00 am	0.17	19	B	5
		PM	3:00 pm–4:00 pm	0.91	91	F	61
Motorway Link Road/Tooheys Road interchange (north side of the interchange)	Priority	AM	11:00 am–12:00 pm	0.01	14	A	1
		PM	3:00 pm–4:00 pm	0.02	16	B	1
Motorway Link Road/Tooheys Road interchange (south side of the interchange)	Priority	AM	8:00 am–9:00 am	0.02	11	A	1
		PM	3:00 pm–4:00 pm	0.01	15	B	1
Hue Hue Road/Jilliby Road	Priority	AM	8:00 am–9:00 am	0.76	51	D	51
		PM	3:00 pm–4:00 pm	0.69	30	C	39

Note: Interchanges were reported as two separate intersections

The analysis indicates the Sydney–Newcastle Freeway/Sparks Road interchange (western side) would operate at an unacceptable LoS F during both AM and PM peak hours. This intersection operates above its design capacity during both peaks.

Hue Hue Road/Wyee Road intersection would operate at an unacceptable LoS F during the PM peak hour. This intersection operates within its design capacity during both peaks.

Hue Hue Road/Jilliby Road intersection would operate at an unacceptable LoS D during the AM peak hour. This intersection operates within its design capacity during both peaks.

With the exception of these three intersections, all other intersections in 2024 are forecast to operate within their design capacity, indicating the road network would still have spare capacity in the peak hours to accommodate the traffic associated with the mining operation and the construction activities of W2CP.

6.7 Scenario 7: Construction of the Western Shaft site, and mine operational phase of the Tooheys Road and Buttonderry sites (2024)

Table 6.8 shows the SIDRA modelling results of the performance of the key intersections during the construction phase of the Western Shaft, and the operational phase of the Tooheys Road and Buttonderry sites, for the construction working hours between 6:00 am and 6:00 pm, during months with daylight saving in 2024.

Table 6.9 shows the results for the months without daylight saving, when the construction working hours are between 7:00 am and 4:00 pm.

The working hours for the mine operators and mine office would remain the same throughout the year.

Wyong Council advised that the Hue Hue Road/Sparks Road intersection is expected to be upgraded after 2015. The intersection would be in a seagull layout with an acceleration lane on Hue Hue Road for the right turning traffic from Sparks Road.

Table 6.8 Traffic conditions in 2024 for the construction of Western Shaft site, and operation phase of Tooheys Road and Buttonderry sites (during the months with daylight saving)

Intersection	Intersection control type	Peak hours		DoS	Delay	LoS	Queue (m)
Sydney–Newcastle Freeway/Sparks Road interchange (western side)	Signals	AM	8:00 am–9:00 am	1.36	146	F	409
		PM	3:00 pm–4:00 pm	1.76	260	F	643
Sydney–Newcastle Freeway/Sparks Road interchange (eastern side)	Priority (seagull)	AM	8:00 am–9:00 am	0.81	42	C	68
		PM	3:00 pm–4:00 pm	1.08	162	F	142
Sparks Road/Hue Hue Road	Priority (seagull)	AM	8:00 am–9:00 am	0.63	13	A	29
		PM	4:00 pm–5:00 pm	0.36	13	A	14
Hue Hue Road/Wyee Road	Priority	AM	7:00 am–8:00 am	0.17	19	B	5
		PM	3:00 pm–4:00 pm	0.91	91	F	61
Motorway Link Road/Tooheys Road interchange (north side of the interchange)	Priority	AM	11:00 am–12:00 pm	0.04	14	A	1
		PM	3:00 pm–4:00 pm	0.05	23	B	1
Motorway Link Road/Tooheys Road interchange (south side of the interchange)	Priority	AM	8:00 am–9:00 am	0.02	13	A	1
		PM	3:00 pm–4:00 pm	0.02	16	B	1
Hue Hue Road/Jilliby Road	Priority	AM	8:00 am–9:00 am	0.77	52	D	53
		PM	3:00 pm–4:00 pm	0.72	50	D	42
Hue Hue Road/Buttonderry site access	Priority	AM	8:00 am–9:00 am	0.14	39	C	8
		PM	3:00 pm–4:00 pm	0.15	39	C	5
Tooheys Road/Tooheys Road site access	Priority	AM	11:00 am–12:00 pm	0.02	19	B	1
		PM	3:00 pm–4:00 pm	0.03	19	B	1

Note: Interchanges were reported as two separate intersections

Table 6.9 Traffic conditions in 2024 for the construction of Western Shaft site, and operation phase of Tooheys Road and Buttonderry sites (during the months without daylight saving)

Intersection	Intersection control type	Peak hours		DoS	Delay	LoS	Queue (m)
Sydney–Newcastle Freeway/Sparks Road interchange (western side)	Signals	AM	8:00 am–9:00 am	1.36	146	F	409
		PM	3:00 pm–4:00 pm	1.75	260	F	644
Sydney–Newcastle Freeway/Sparks Road interchange (eastern side)	Priority (seagull)	AM	8:00 am–9:00 am	0.81	42	C	68
		PM	3:00 pm–4:00 pm	1.08	162	F	142
Sparks Road/Hue Hue Road	Priority (seagull)	AM	8:00 am–9:00 am	0.63	14	A	29
		PM	4:00 pm–5:00 pm	0.44	14	A	19
Hue Hue Road/Wyee Road	Priority	AM	7:00 am–8:00 am	0.17	19	B	5
		PM	3:00 pm–4:00 pm	0.91	91	F	61
Motorway Link Road/Tooheys Road interchange (north side of the interchange)	Priority	AM	11:00 am–12:00 pm	0.04	14	A	1
		PM	3:00 pm–4:00 pm	0.05	23	B	1
Motorway Link Road/Tooheys Road interchange (south side of the interchange)	Priority	AM	8:00 am–9:00 am	0.02	13	A	1
		PM	3:00 pm–4:00 pm	0.02	16	B	1
Hue Hue Road/Jilliby Road	Priority	AM	8:00 am–9:00 am	0.77	52	D	53
		PM	3:00 pm–4:00 pm	0.72	50	D	42
Hue Hue Road/Buttonderry site access	Priority	AM	8:00 am–9:00 am	0.14	39	C	8
		PM	3:00 pm–4:00 pm	0.14	25	B	4
Tooheys Road/Tooheys Road site access	Priority	AM	11:00 am–12:00 pm	0.02	19	B	1
		PM	3:00 pm–4:00 pm	0.03	19	B	1

Note: Interchanges were reported as two separate intersections

The intersections' performance results are similar during the months with or without daylight saving. When compared to the do-nothing results in Table 6.7, the performance of the Sydney–Newcastle Freeway/Sparks Road interchange (eastern side) is estimated to deteriorate, as a result of the additional W2CP related trips. The LoS is expected to deteriorate from C to F, and the intersection would operate above its design capacity during the PM peak hour.

The performance of the three other intersections would continue to deteriorate in 2024 and operate at an unacceptable LoS D or worse during both peak hours:

- Sydney–Newcastle Freeway/Sparks Road interchange (western side)
- Hue Hue Road/Wyee Road intersection
- Hue Hue Road/Jilliby Road intersection.

With the exception of these four intersections, all other intersections in 2024 are forecast to operate within their design capacity, indicating that the road network would still have plenty of spare capacity in the peak hours for W2CP related trips.

The performance of Sparks Road/Hue Hue Road intersection would improve after its upgrade to a channalised configuration (seagull).

The newly created intersections would provide sufficient capacity during the AM and PM peak hours.

6.8 Scenario 8: Construction of the Western Shaft site, mine operational phase of the Tooheys Road and Buttonderry sites, and operation of Precinct 14 (2024)

Tables 6.10 and 6.11 show the SIDRA modelling results of the performance of the key intersections when Precinct 14 is fully developed in 2024, as a cumulative traffic impact in conjunction with the W2CP development (refer to Tables 6.8 and 6.9).

Table 6.10 Traffic conditions in 2024 for the construction of Western Shaft site, operation phase of Tooheys Road and Buttonderry sites as well as with Precinct 14 fully developed (during the months with daylight saving)

Intersection	Intersection control type	Peak hours		DoS	Delay	LoS	Queue (m)
Sydney–Newcastle Freeway/Sparks Road interchange (western side)	Signals	AM	8:00 am–9:00 am	1.51	159	F	542
		PM	4:00 pm–5:00 pm	2.88	580	F	1489
Sydney–Newcastle Freeway/Sparks Road interchange (eastern side)	Priority (seagull)	AM	8:00 am–9:00 am	1.27	275	F	519
		PM	3:00 pm–4:00 pm	1.24	285	F	257
Sparks Road/Hue Hue Road	Priority	AM	8:00 am–9:00 am	0.64	15	B	30
		PM	4:00 pm–5:00 pm	0.47	15	B	23
Hue Hue Road/Wyee Road	Priority	AM	7:00 am–8:00 am	0.17	19	B	5
		PM	3:00 pm–4:00 pm	0.91	94	F	63

Intersection	Intersection control type	Peak hours		DoS	Delay	LoS	Queue (m)
Motorway Link Road/Tooheys Road interchange (north side of the interchange)	Priority	AM	11:00 am–12:00 pm	0.04	14	A	1
		PM	3:00 pm–4:00 pm	0.05	23	B	1
Motorway Link Road/Tooheys Road interchange (south side of the interchange)	Priority	AM	8:00 am–9:00 am	0.02	13	A	1
		PM	3:00 pm–4:00 pm	0.02	16	B	1
Hue Hue Road/Jilliby Road	Priority	AM	8:00 am–9:00 am	0.90	78	F	78
		PM	3:00 pm–4:00 pm	0.75	55	D	45
Hue Hue Road/Buttonderry site access	Priority	AM	8:00 am–9:00 am	0.16	40	C	11
		PM	3:00 pm–4:00 pm	0.16	40	C	9
Tooheys Road/Tooheys Road site access	Priority	AM	11:00 am–12:00 pm	0.02	19	B	1
		PM	3:00 pm–4:00 pm	0.03	19	B	1
Sparks Road/Precinct 14 access	Roundabout	AM	8:00 am–9:00 am	0.53	17	B	42
		PM	4:00 pm–5:00 pm	0.41	15	B	26
Hue Hue Road/Precinct 14 access	Priority (seagull)	AM	8:00 am–9:00 am	0.14	14	A	4
		PM	4:00 pm–5:00 pm	0.14	14	A	4

Note: Interchanges were reported as two separate intersections

Table 6.11 Traffic conditions in 2024 for the construction of Western Shaft site, operation phase of Tooheys Road and Buttonderry sites as well as with Precinct 14 fully developed (during the months without daylight saving)

Intersection	Intersection control type	Peak hours		DoS	Delay	LoS	Queue (m)
Sydney–Newcastle Freeway/Sparks Road interchange (western side)	Signals	AM	8:00 am–9:00 am	1.51	159	F	542
		PM	4:00 pm–5:00 pm	2.97	609	F	1550
Sydney–Newcastle Freeway/Sparks Road interchange (eastern side)	Priority (seagull)	AM	8:00 am–9:00 am	1.27	275	F	519
		PM	3:00 pm–4:00 pm	1.24	285	F	257
Sparks Road/Hue Hue Road	Priority	AM	8:00 am–9:00 am	0.64	15	B	30
		PM	4:00 pm–5:00 pm	0.48	15	B	24
Hue Hue Road/Wyee Road	Priority	AM	7:00 am–8:00 am	0.17	19	B	5
		PM	3:00 pm–4:00 pm	0.91	94	F	63
Motorway Link Road/Tooheys Road interchange (north side of the interchange)	Priority	AM	11:00 am–12:00 pm	0.04	14	A	1
		PM	3:00 pm–4:00 pm	0.05	23	B	1
Motorway Link Road/Tooheys Road interchange (south side of the interchange)	Priority	AM	8:00 am–9:00 am	0.02	13	A	1
		PM	3:00 pm–4:00 pm	0.02	16	B	1
Hue Hue Road/Jilliby Road	Priority	AM	8:00 am–9:00 am	0.90	78	F	78
		PM	3:00 pm–4:00 pm	0.75	55	D	45
Hue Hue Road/Buttonderry site access	Priority	AM	8:00 am–9:00 am	0.16	40	C	11
		PM	3:00 pm–4:00 pm	0.18	26	B	9
Tooheys Road/Tooheys Road site access	Priority	AM	11:00 am–12:00 pm	0.02	19	B	1
		PM	3:00 pm–4:00 pm	0.03	19	B	1
Sparks Road/Precinct 14 access	Roundabout	AM	8:00 am–9:00 am	0.53	17	B	42
		PM	4:00 pm–5:00 pm	0.42	15	B	27
Hue Hue Road/Precinct 14 access	Priority (seagull)	AM	8:00 am–9:00 am	0.14	14	A	4
		PM	4:00 pm–5:00 pm	0.14	14	A	4

Note: Interchanges were reported as two separate intersections

When compared to the do-nothing results in Table 6.7, it is apparent there is a decrease in intersection performance as a result of the increased traffic on the network, associated with the construction of the Western Shaft site, and the operation of Tooheys Road site, Buttonderry sites as well as Precinct 14. Similar results are shown during the months with or without daylight saving.

The performance of three other intersections would continue to deteriorate in 2024 and operate at an unacceptable LoS D or worse during both AM and PM peak hours:

- Sydney–Newcastle Freeway/Sparks Road interchange (western side)
- Hue Hue Road/Wyee Road intersection
- Hue Hue Road/Jilliby Road intersection.

The only exception is the Sydney–Newcastle Freeway/Sparks Road interchange (eastern side) where the traffic performance is estimated to deteriorate as a result of the additional W2CP and Precinct 14 related trips. The LoS is expected to reduce from C to F, and the intersection would operate above its design capacity during both AM and PM peak hours.

With the exception of these four intersections, all other intersections in 2024 are forecast to operate within their design capacity, indicating that the road network would still have plenty of spare capacity in the peak hours.

The proposed layout at the newly created intersections would provide sufficient capacity during the AM and PM peak hours.

6.9 Future public transport activities and services

During the construction and operation periods of the W2CP, the demand of mining employees using public transport is not anticipated to be high. This is because bus stops are not located in the vicinity of the proposed mining sites, and evening and night shifts' working hours are generally outside the public transport service hours.

A review of the Environmental Assessment that was prepared for the Warner Industrial Park Concept Plan and Project Application (Precinct 14 Wyong Employment Zone) indicated a number of public transport improvements along the Sparks Road corridor. The Sparks Road Corridor would become a major bus route feeding the new Warnervale Town Centre and associated transport interchange with extended services throughout the remaining part of the Wyong Employment Zone as it develops. This would benefit the mining employees of the Buttonderry site if they consider bus as a mode of transport.

6.10 Future pedestrian and cyclist activities and facilities

The proposed mining development is unlikely to generate pedestrian and cyclist activities, therefore, no additional facilities are considered.

The Concept Plan prepared for the Warner Industrial Park (Precinct 14 Wyong Employment Zone) indicated a cycleway proposed for the Precinct 14 Wyong Employment Zone would link with the existing on-road cycle lane on Sparks Road.

The RTA has developed a strategic plan for an off-road cycleway on the southern side of Sparks Road. However, the timing and implementation of this plan has not been determined.

6.11 Road safety

6.11.1 Crash data

From July 2004 to June 2009, a total of 85 crashes occurred on the road network within the boundary of the study area. Crash reports from the Roads and Traffic Authority (RTA) are presented in Appendix D.

6.11.1.1 Sparks Road

A total of 52 crashes occurred on Sparks Road between Hue Hue Road and 100 m to the east of the Sydney–Newcastle Freeway/Sparks Road interchange. These crashes involved one fatal crash, 24 injury crashes and 27 non-injury crashes.

Analysis of the location of recorded crashes indicates that:

- 49 out of 52 crashes (94%) occurred at the Sydney–Newcastle Freeway/Sparks Road interchange
- 3 out of 52 crashes (6%) occurred at the Sparks Road/Hue Hue Road intersection.

Analysis of the type of crashes indicates:

- Right-through crash was the most common and almost exclusive crash type along Sparks Road. This included one fatal crash that occurred at the Sydney–Newcastle Freeway/Sparks Road interchange, involving a car turning right from Sparks Road onto the on-ramp, colliding with a truck travelling westbound on Sparks Road.
- Three rear end crashes occurred on Sparks Road when vehicles travelling westbound on approach to the Sparks Road/Hue Hue Road intersection.

6.11.1.2 Hue Hue Road

A total of 27 crashes occurred on Hue Hue Road between Wyee Road and Jilliby Road. These crashes involved one fatal crash and 13 injury crashes, resulting in one fatality and 21 injuries.

Analysis of the location of recorded crashes indicates that:

- 4 out of 27 crashes (15%) occurred at the Hue Hue Road/Sparks Road intersection
- the remaining 23 out of 27 crashes (85%) spread along Hue Hue Road.

Analysis of the type of crashes indicates:

- Run-off-road crash (RUM 70-89) was the most common and almost exclusive crash type along Hue Hue Road. The most common run-off-road crash type was off-road-to-the-right-on-a-straight road section.
- The second most common crash type involved vehicles hitting wildlife along Hue Hue Road, which mainly occurred between Sparks Road and Wyee Road during night time.
- A head-on crash involved a vehicle travelling on the wrong side of the road and collided with an opposing vehicle on a curved section of Hue Hue Road, to the north of the Kiar Ridge Road. This crash resulted in one fatality.

6.11.1.3 Tooheys Road

One injury crash occurred on Tooheys Road between Bushells Ridge Road and the Motorway Link Road/Tooheys Road interchange. A vehicle was travelling eastbound on Tooheys Road and ran off the carriageway at a left hand bend. Speeding was reported as a contributing factor in this crash.

6.11.1.4 Bushells Ridge Road

One injury crash occurred on Bushells Ridge between Hue Hue Road and Tooheys Road. A vehicle was turning right from Bushells Ridge Road onto Tooheys Road and ran off the carriageway. Speeding was reported as a contributing factor in this crash.

6.11.1.5 Jilliby Road

Four crashes occurred on Jilliby Road between Hue Hue Road and Little Jilliby Road. These crashes involved three injury crashes and one non-injury crash.

Analysis of the location of recorded crashes indicates that:

- two out of four crashes (50%) occurred at the Jilliby Road/Watagan Forest Drive intersection
- one of out four crashes (25%) occurred at the Jilliby Road/Little Jilliby Road intersection

Analysis of the type of crashes indicates:

- Run-off-road crash (RUM 70-89) was the most common and almost exclusive crash type along Jilliby Road. Two crashes involved vehicles running off the carriageway on a bend that collided with roadside objects.

6.11.1.6 Little Jilliby Road

No crashes have been reported on Little Jilliby Road between Jilliby Road and Brothers Road.

6.11.2 Identified road safety deficiencies

Daylight site inspections were carried out on 2 June 2010 in good weather conditions and 8 July 2010 in wet weather conditions. The road sections were driven in each direction to identify possible safety concerns. A walk over was undertaken to investigate concerns in details.

The following sections show the identified issues related to road safety. Site photos are shown in Appendix E.

6.11.2.1 Motorway Link Road/Tooheys Road interchange

- The No Right Turn sign is damaged and faded, with low retro-reflectivity, and not clearly visible during the night (refer to Photo 1).
- The directional signs are faded, with low retro-reflectivity, and not clearly visible during the night (refer to Photo 1).
- No standard stop line provided at the eastbound off ramp on approach to the interchange (refer to Photo 2).
- The damaged pavement on the eastbound off ramp on approach to Tooheys Road may significantly affect vehicles controllability and safety (refer to Photo 2).
- The guardrails alongside Tooheys Road at the interchange are obstructed by overgrown vegetation. The lack of reflectors would not provide sufficient delineation along the guardrail (refer to Photo 3).

6.11.2.2 Tooheys Road

- No posted speed limit signs are on display on Tooheys Road.
- Overhanging tree branches are a potential hazard for vehicles with a high clearance (refer to Photo 4).
- Large trees and utility poles are located within the clear zone, particularly along the inner curve of a horizontal bend (refer to Photos 5 and 6). The presence of these roadside hazards does not provide a safe recovery zone for an errant vehicle.
- The potholes are a hazard for road users and may significantly affect vehicles controllability and safety (refer to Photos 6 and 7).
- Insufficient delineation along a curve, especially during the night (refer to Photo 8).
- The limited forward visibility and insufficient delineation on the northern approach to the horizontal curve, located to the south of the Sydney–Newcastle Freeway overpass, may give motorists a false impression that the road continues in a straight section leading vehicles towards a side road (refer to Photo 9).

6.11.2.3 Hue Hue Road/Wyee Road intersection

- There is no Sight Board at the intersection, thus drivers on Hue Hue Road may not be aware of the termination of Hue Hue Road (refer to Photo 10). Failure to give way to traffic on Wyee Road may result in crossing/turning crashes.
- Hold line and Give Way sign are missing at the intersection (refer to Photo 11).

6.11.2.4 Hue Hue Road/Bushells Ridge Road intersection

- Insufficient delineation along a combined horizontal/vertical curve on Bushells Ridge Road on approach to the intersection (refer to Photo 12).
- There is no defined priority control provided at the intersection (refer to Photo 13).
- Incorrect type of Sight board is used to indicate termination of Bushells Ridge Road (refer to Photo 13).
- The drop in the pavement edge at the south-eastern corner of the intersection (refer to Photo 14) would make it difficult for drivers to drive back on to the road if a vehicle leaves the carriageway.
- The sight distance from Hue Hue Road on northern approach to the intersection is obstructed by a large tree located at the south-eastern corner of the intersection (refer to Photo 15).

6.11.2.5 Sparks Road/Hue Hue Road intersection

- The hold line on Sparks Road is faded at the intersection (refer to Photo 16).
- The potholes are a hazard for road users and may significantly affect vehicles controllability and safety (refer to Photos 16, 17 and 18).
- A number of retro-reflective pavement markers (RRPMs) are missing or damaged along the centreline of Hue Hue Road.
- There is some soil and gravel tracked onto the intersection (refer to Photos 16 and 18). Loose material on the road surface would adversely affect the controllability of a vehicle and could increase the chance of driver's error and the likelihood of a crash.
- The drop in the pavement edge at the north-east corner of the intersection (refer to Photo 19) would make it difficult for drivers to drive back on to the road if a vehicle leaves the carriageway. In addition, poor drainage is a serious issue as apart from a build-up water on surface and other traffic safety related concerns. It always eventually results in deterioration of the road surface.

6.11.2.6 Hue Hue Road (between Wyee Road and Jilliby Road)

- The following road safety problems have been identified in various sections of Hue Hue Road:
  - Edgeline is faded and is covered by overgrown grass and soil (refer to Photo 20), reducing its visibility to approaching motorists.
  - The edge of seal is irregular in shape, and the lip in the sealed shoulder may de-stabilise a vehicle tracking over the edge of pavement (refer to Photos 21 and 22).
  - There is some pavement failure on Hue Hue Road (refer to Photos 23 to 26), which may significantly affect vehicles controllability and safety. These include roughness, rutting, potholes and friction loss.
  - A number of retro-reflective pavement markers (RRPMs) are missing or damaged along the centre line and edge lines on the road (refer to Photos 26 and 27).
- Roadside hazards have been identified:
  - The culverts located to the south of Bushells Ridge Road are within the clear zone, not traversable and not protected, and pose a significant risk for an errant vehicle. These culverts are clogged by overgrown grass and accumulated debris, with water ponding on both sides of the culverts, which ultimately may be washed onto the roadway causing flooding (refer to Photos 28 and 29).
  - The culvert located to the south of Dickson Road is within the clear zone (refer to Photo 30), not traversable and not protected, and poses a significant risk for an errant vehicle.
  - A large tree located to the south of Dickson Road is within the clear zone (refer to Photo 31).
- The guardrail terminal post located next to the northbound lane in the road section between Holloway Drive and Dickson Road has deteriorated significantly and requires replacement (refer to Photos 32 and 33).
- The drop in the pavement edge at various sections of Hue Hue Road (refer to Photo 34) would make it difficult for drivers to drive back on to the road if a vehicle leaves the carriageway.

6.11.2.7 Hue Hue Road/Jilliby Road intersection

- A hazard marker is incorrectly installed that should be replaced with a Sight Board to make motorists aware of the termination of Jilliby Road (refer to Photo 35).
- There is some soil and gravel tracked onto the north-western corner of the intersection (refer to Photo 36). Loose material on the road surface would adversely affect the controllability of a vehicle and could increase the chance of driver's error and the likelihood of a crash.
- The edge of seal is irregular in shape and is damaged on Jilliby Road's northbound lane (refer to Photo 37).

6.11.2.8 Jilliby Road

- The drop in the pavement edge on the northbound lane to the north of Hue Hue Road (refer to Photo 38) would make it difficult for drivers to drive back on to the road if a vehicle leaves the carriageway, increasing the crash risk.
- The guardrail terminal post located on the road section over the creek has deteriorated significantly and requires replacement (refer to Photo 39).
- The guardrail, which connects directly to bridge parapet without an adequate transition near the bridge connection, is considered unsatisfactory (refer to Photo 40). If a vehicle strikes the guardrail travelling toward the bridge, the outcome of the crash could be serious.
- A number of culverts are within the clear zone, not traversable and not protected, and pose a significant risk for an errant vehicle (refer to Photos 41 and 42). Some of these culverts are clogged by overgrown grass, with water ponding next to the culverts, which ultimately may be washed onto the roadway causing flooding.

6.11.2.9 Jilliby Road/Little Jilliby Road intersection

- The centreline marking is faded on Jilliby Road, which results in insufficient road delineation (refer to Photo 43).
- There is no Sight Board or hold line at the intersection (refer to Photo 43), thus drivers on Little Jilliby Road may not be aware of the termination of the road and it is also insufficient to make motorists aware of the yield location. Failure to give way to traffic on Jilliby Road may result in crossing/turning crashes.

6.11.2.10 Little Jilliby Road/Brothers Road intersection

- Brothers Road is narrow to allow safe manoeuvring for all vehicles at the intersection (refer to Photo 44).

6.11.3 Road safety impacts

The predicted road safety impact on the surrounding road network and its key intersections, as a direct result of the additional W2CP related traffic would impose some impact on the future traffic pattern. The potential impact areas include:

- Hue Hue Road/Sparks Road intersections; the number of right-through crashes may increase due to additional W2CP related traffic involving in both the right turn and crossing movements.
- Sydney–Newcastle Freeway/Sparks Road interchange; the number of right-through crashes may increase due to additional W2CP related traffic involving in both the right turn and crossing movements.

7. Mitigation measures

Section 6 outlined the existing deficiencies along the potential access routes, and the potential traffic impacts as a result of the construction and operation activities of the W2CP. These have been assessed below, and mitigation measures have been recommended where appropriate.

7.1 Intersection capacity

7.1.1 Sydney–Newcastle Freeway/Sparks Road interchange (western side)

As indicated previously, the Sydney-Newcastle Freeway/Sparks Road interchange would need to be upgraded in order to accommodate the existing background traffic and its growth, as well as the future traffic that would be generated by the proposed mine sites.

The first option considered an adjustment of traffic phasing and cycle time at the intersection. Although this would improve the traffic performance in the current year, it would not resolve the capacity problem as a result of background traffic growth in 2011 and beyond.

The second option considered widening Sparks Road to provide additional eastbound and westbound lanes. This option fails to achieve Wyong Council's specified criteria, based on the 2024 traffic demand.

The third option considered converting the signalised intersection to a roundabout with two circulating lanes. Slip lanes are provided on the northbound on- and off- ramps (refer to Figure 7.1). Table 7.1 shows the SIDRA modelling results of the intersection performance for all forecast scenarios.

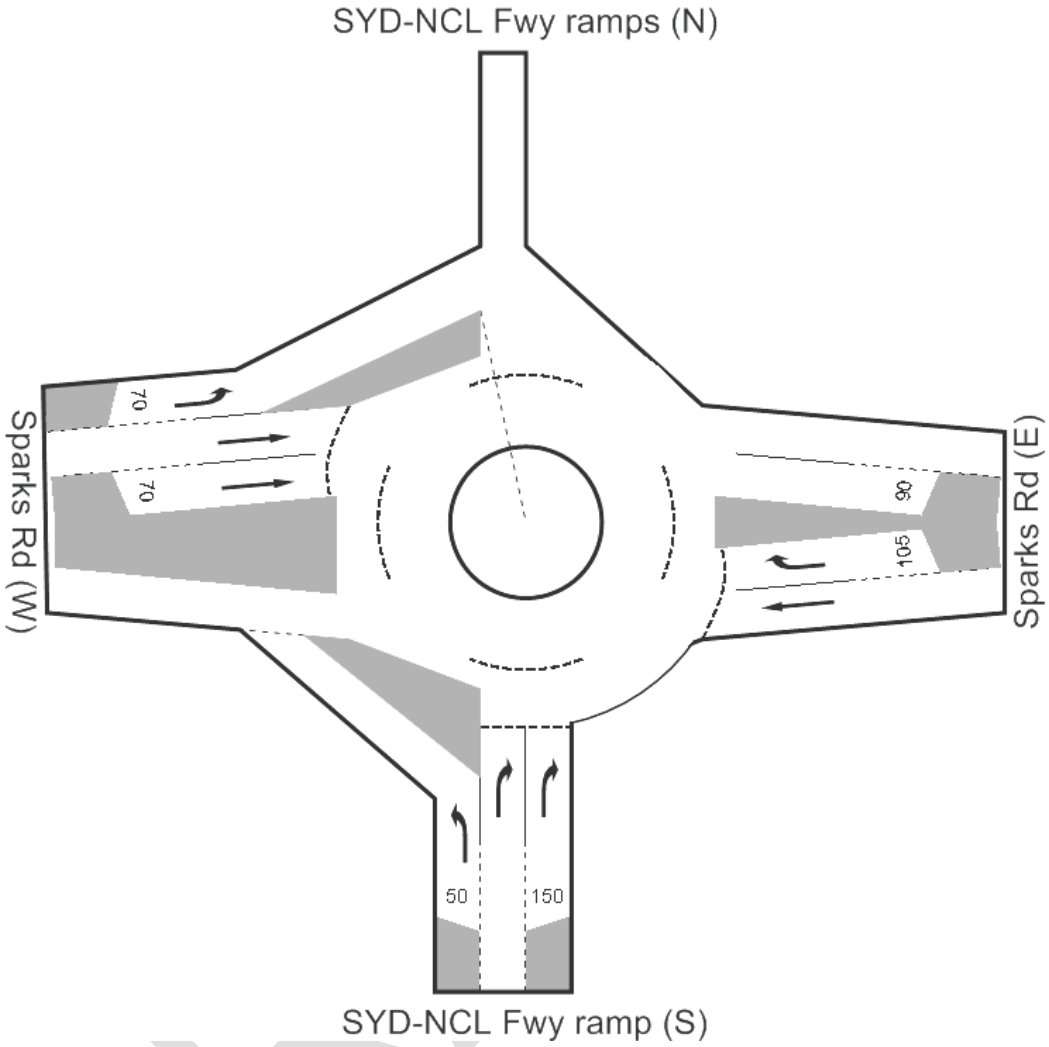


Figure 7.1 Proposed layout for Sydney–Newcastle Freeway/Sparks Road interchange (western side)

Table 7.1 Traffic conditions at the Sydney–Newcastle Freeway/Sparks Road interchange (western side) if upgraded to a two-lane roundabout

Scenario	Construction working hours	Peak hours	DoS	Delay	LoS	Queue (m)
Scenario 1: do-nothing (2011)	-	AM	0.16	17	B	6
		PM	0.21	14	A	9
Scenario 2: construction phase for the Tooheys Road and Buttonderry sites (2011)	6:00 am to 6:00 pm during the months with daylight saving	AM	0.16	17	B	6
		PM	0.21	14	A	9
	7:00 am to 4:00 pm during the months without daylight saving	AM	0.16	17	B	6
		PM	0.21	14	A	10
Scenario 3: do-nothing (2014)	-	AM	0.18	17	B	7
		PM	0.23	14	A	10
Scenario 4: mine operational phase of the Tooheys Road and Buttonderry sites (2014)	-	AM	0.18	19	B	7
		PM	0.25	17	B	11
Scenario 5: mine operational phase of the Tooheys Road and Buttonderry sites and Precinct 14 (2014)	-	AM	0.19	18	B	7
		PM	0.25	17	B	11
Scenario 6: do-nothing (2024)	-	AM	0.24	17	B	11
		PM	0.33	15	B	16
Scenario 7: construction of the Western Shaft site, and mine operational phase of the Tooheys Road and Buttonderry sites (2024)	6:00 am to 6:00 pm during the months with daylight saving	AM	0.24	19	B	11
		PM	0.35	17	B	17
	7:00 am to 4:00 pm during the months without daylight saving	AM	0.24	19	B	11
		PM	0.35	17	B	17
Scenario 8: construction of the Western Shaft site, mine operational phase of the Tooheys Road and Buttonderry sites, and operation of Precinct 14 (2024)	6:00 am to 6:00 pm during the months with daylight saving	AM	0.33	18	B	12
		PM	0.34	16	B	18
	7:00 am to 4:00 pm during the months without daylight saving	AM	0.33	18	B	12
		PM	0.34	15	B	19

As can be seen from Table 7.1, the performance of the Sydney-Newcastle Freeway/Sparks Road interchange, if upgraded to a two-lane roundabout, would be improved significantly in all scenarios, and would satisfy Wyong Council's specified criteria.

Under this proposed layout, this intersection would operate at a satisfactory LoS B or better during both AM and PM peak hours, and the 95th percentile queue of the turn movements would not overflow to adjacent through lanes.

7.1.2 Sydney–Newcastle Freeway/Sparks Road interchange (eastern side)

Sydney–Newcastle Freeway/Sparks Road interchange (eastern side) would need to be upgraded in order to accommodate the future traffic demand in 2024, associated with the proposed mine sites and Precinct 14.

Consistent with the proposed two-lane roundabout at the western side, a similar intersection control was tested at this intersection. Figure 7.2 shows the proposed roundabout layout, while Table 7.2 shows the SIDRA modelling results of the intersection performance for the forecast scenarios in 2024.

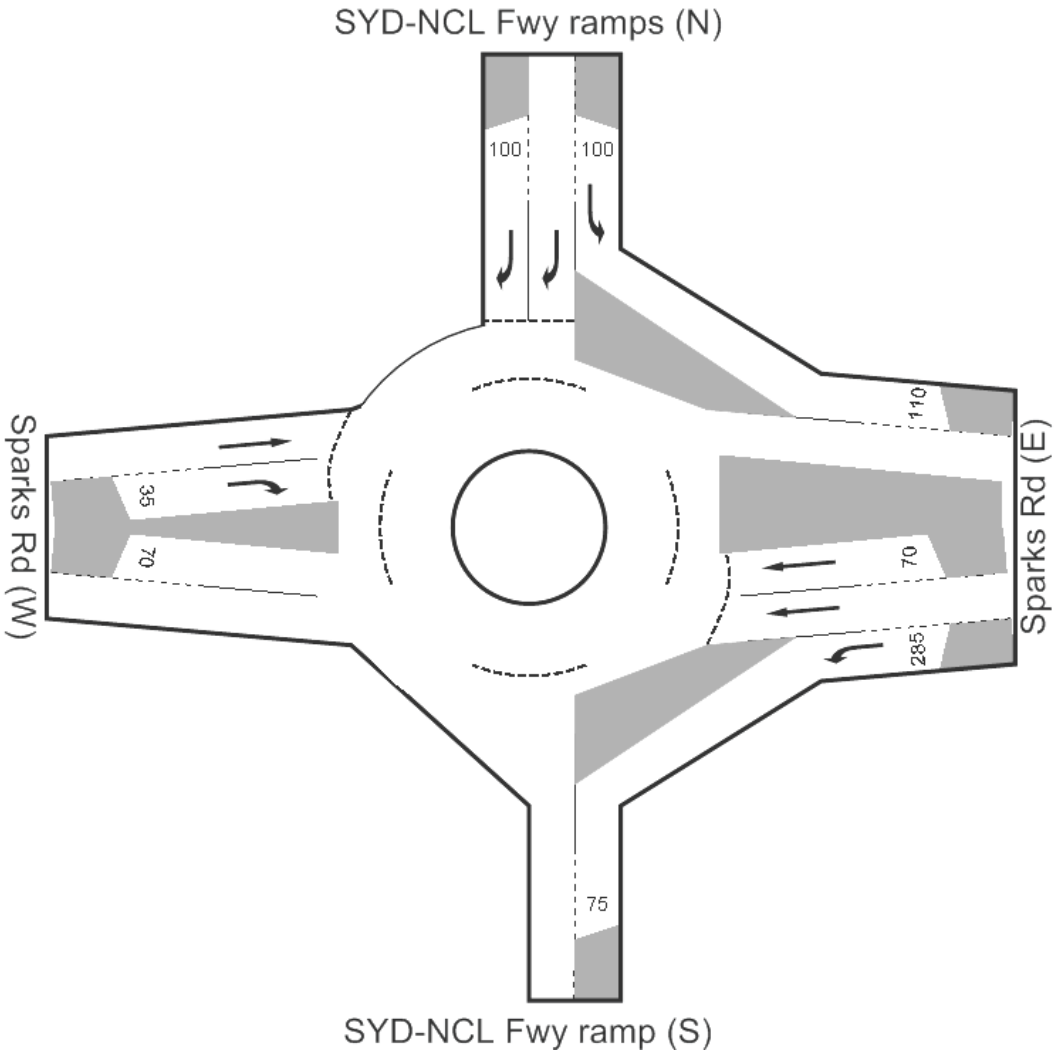


Figure 7.2 Proposed layout for the Sydney–Newcastle Freeway/Sparks Road interchange (eastern side)

Table 7.2 Traffic conditions at the Sydney–Newcastle Freeway/Sparks Road interchange (eastern side) if upgraded to a two-lane roundabout

Scenario	Construction working hours	Peak hours	DoS	Delay	LoS	Queue (m)
Scenario 7: construction of the Western Shaft site, and mine operational phase of the Tooheys Road and Buttonderry sites (2024)	6:00 am to 6:00 pm during the months with daylight saving	AM	0.62	16	B	11
		PM	0.56	18	B	13
	7:00 am to 4:00 pm during the months without daylight saving	AM	0.62	16	B	11
		PM	0.56	18	B	13
Scenario 8: construction of the Western Shaft site, mine operational phase of the Tooheys Road and Buttonderry sites, and operation of Precinct 14 (2024)	6:00 am to 6:00 pm during the months with daylight saving	AM	0.62	17	B	15
		PM	0.57	18	B	14
	7:00 am to 4:00 pm during the months without daylight saving	AM	0.62	17	B	15
		PM	0.57	18	B	14

The performance of the Sydney–Newcastle Freeway/Sparks Road interchange (eastern side), as a two-lane lane roundabout, would improve significantly in 2024, in accommodating the future traffic demand associated with the proposed developments.

Under this proposed layout, this intersection would operate at a satisfactory LoS A during both AM and PM peak hours, and the 95th percentile queue of the turn movements would not overflow to adjacent through lanes. These results would satisfy Wyong Council's specified criteria.

7.1.3 Hue Hue Road/Wyee Road intersection

Hue Hue Road/Wyee Road intersection would need to be upgraded in order to accommodate the background traffic growth in 2024, as well as the future traffic that would be generated by the proposed mine sites.

Figure 7.3 shows the proposed roundabout layout, while Table 7.3 shows the SIDRA modelling results of the intersection performance for the forecast scenarios in 2024.

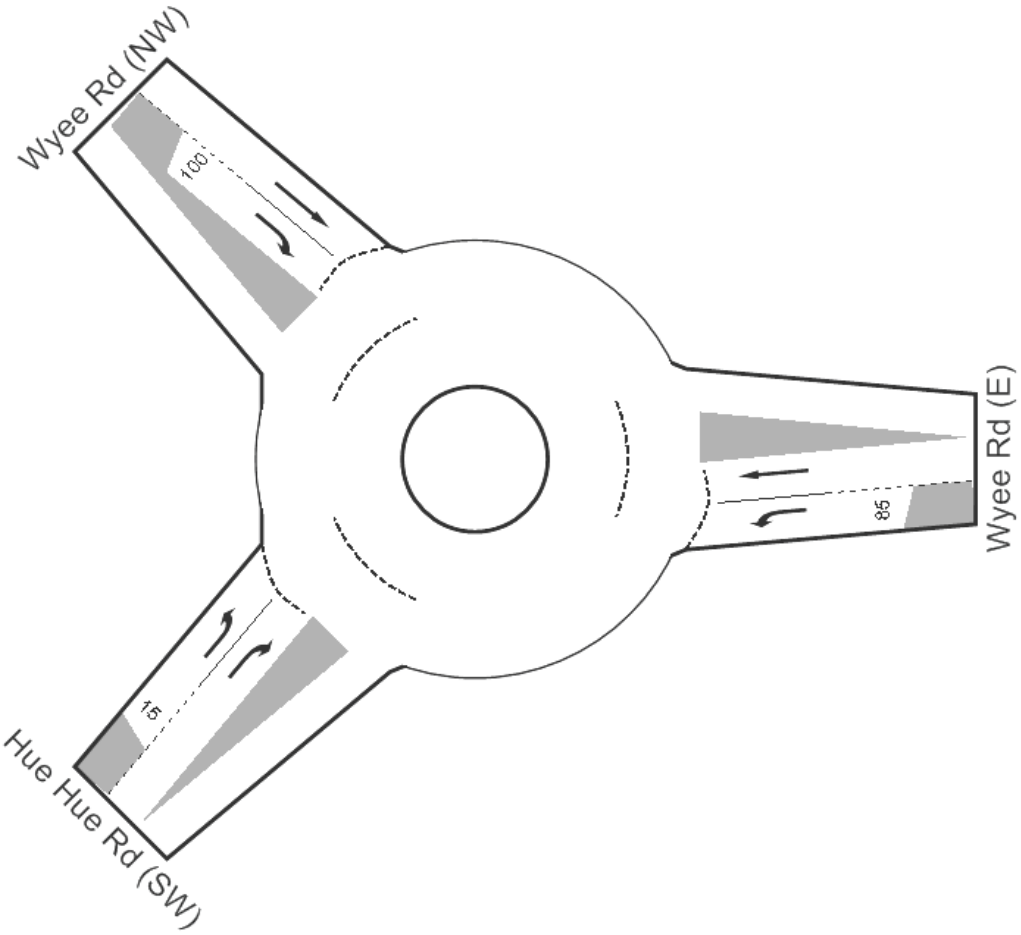


Figure 7.3 Proposed layout for the Hue Hue Road/Wyee Road intersection

Table 7.3 Modelled traffic conditions at the Hue Hue Road/Wyee Road intersection if upgraded to a single lane roundabout

Scenario	Construction working hours	Peak hours	DoS	Delay	LoS	Queue (m)
Scenario 6: do-nothing (2024)	-	AM	0.21	11	A	11
		PM	0.36	11	A	22
Scenario 7: construction of the Western Shaft site, and mine operational phase of the Tooheys Road and Buttonderry sites (2024)	6:00 am to 6:00 pm during the months with daylight saving	AM	0.21	11	A	11
		PM	0.36	11	A	22
	7:00 am to 4:00 pm during the months without daylight saving	AM	0.21	11	A	11
		PM	0.36	11	A	22
Scenario 8: construction of the Western Shaft site, mine operational phase of the Tooheys Road and Buttonderry sites, and operation of Precinct 14 (2024)	6:00 am to 6:00 pm during the months with daylight saving	AM	0.22	10	A	11
		PM	0.36	13	A	22
	7:00 am to 4:00 pm during the months without daylight saving	AM	0.22	10	A	11
		PM	0.36	13	A	22

As can be seen from Table 7.3, the performance of the Hue Hue Road/Wyee Road intersection, as a single lane roundabout, would be improved significantly in the forecast scenarios in 2024, and would satisfy Wyong Council's specified criteria.

Under this proposed layout, this intersection would operate at a satisfactory LoS A during both AM and PM peak hours, and the 95th percentile queue of the turn movements would not overflow to adjacent through lanes.

7.1.4 Hue Hue Road/Jilliby Road intersection

Hue Hue Road/Jilliby Road intersection would need to be upgraded in order to accommodate the background traffic growth in 2024, as well as the future traffic that would be generated by the proposed mine sites.

Figure 7.4 shows the proposed roundabout layout, while Table 7.4 shows the SIDRA modelling results of the intersection performance for the forecast scenarios in 2024.

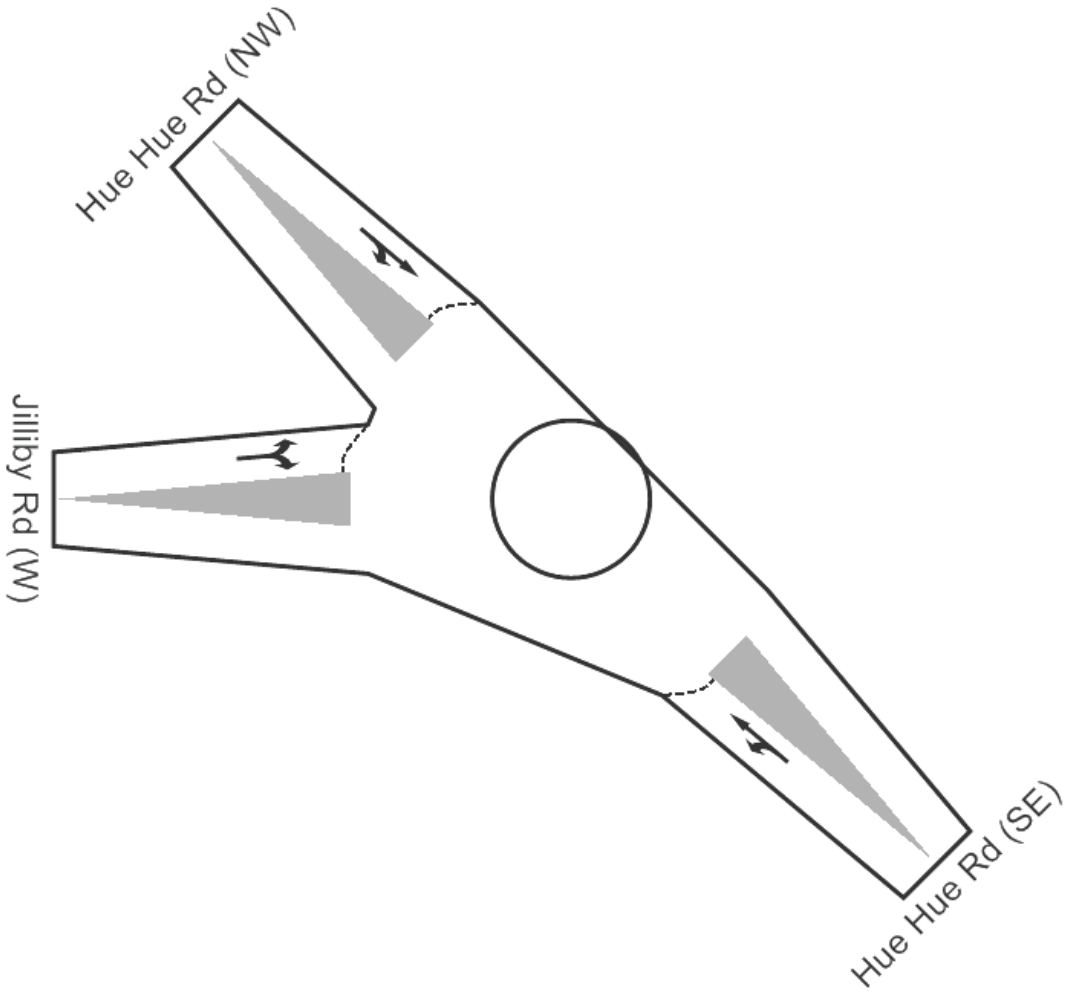


Figure 7.4 Proposed intersection layout for the Hue Hue Road/Jilliby Road intersection

Table 7.4 Traffic conditions at the Hue Hue Road/Jilliby Road intersection if upgraded to a single lane roundabout

Scenario	Construction working hours	Peak hours	DoS	Delay	LoS	Queue (m)
Scenario 6: do-nothing (2024)	-	AM	0.46	13	A	33
		PM	0.36	15	B	26
Scenario 7: construction of the Western Shaft site, and mine operational phase of the Tooheys Road and Buttonderry sites (2024)	6:00 am to 6:00 pm during the months with daylight saving	AM	0.46	13	A	33
		PM	0.36	15	B	26
	7:00 am to 4:00 pm during the months without daylight saving	AM	0.46	13	A	33
		PM	0.36	15	B	26
Scenario 8: construction of the Western Shaft site, mine operational phase of the Tooheys Road and Buttonderry sites, and operation of Precinct 14 (2024)	6:00 am to 6:00 pm during the months with daylight saving	AM	0.47	18	B	35
		PM	0.37	16	B	27
	7:00 am to 4:00 pm during the months without daylight saving	AM	0.47	18	B	35
		PM	0.37	16	B	27

As can be seen from Table 7.4, the performance of the Hue Hue Road/Jilliby Road intersection, as a single lane roundabout, would be improved significantly in the forecast scenarios in 2024, and would satisfy Wyong Council's specified criteria.

Under this proposed layout, this intersection would operate at a satisfactory LoS B or better during both AM and PM peak hours.

7.2 Road safety

7.2.1 Sydney–Newcastle Freeway/Sparks Road interchange

Other than the significant improvement in intersection performance (refer to Sections 8.1.1 and 8.1.2), roundabouts are a safe and efficient form of intersection control. The considered roundabouts at the interchange would improve safety by simplifying conflicts, reducing vehicle speed and by simplifying a driver's decision by providing by a clearer indication of the driver's right of way. Major casual factors of the right turning/crossing crashes at the interchange may include a lack of available gaps and their misjudgement combined with the high speed traffic environment. The safety issue at this interchange is not caused by the development but would be made slightly worse by it. The roundabouts would probably result in a significant reduction in all crashes (especially injury crashes). These reductions result from the elimination of most head-on, right turning across oncoming traffic and right angle crashes.

7.2.2 Motorway Link Road/Tooheys Road interchange

- repair the No Right Turn sign
- repair the directional sign
- install a Stop sign at the northbound off ramp
- consider proper and timely pavement maintenance
- trim back the vegetation around the guardrail and provide sufficient reflectors along the guardrail.

7.2.3 Tooheys Road

- consider the installation of posted speed limit signs on Tooheys Road to reinforce a suitable legal speed
- trim the tree branches to provide a sufficient vertical clearance
- consider position of the trees and utility poles within the clear zone and develop roadside management strategy to improve road safety near the road
- consider proper and timely pavement maintenance
- provide sufficient delineation along the horizontal curve
- provide priority control at the Tooheys Road intersection with the side road.

7.2.4 Hue Hue Road/Wyee Road intersection

- provide a hold line and Give Way sign on Hue Hue Road on approach to the intersection
- provide a Sight Board at the termination of Hue Hue Road.

7.2.5 Hue Hue Road/Bushells Ridge Road intersection

- provide sufficient delineation along the curve by means of chevron alignment markers in accordance with AS1742.2
- provide priority control on Bushells Ridge Road on approach to the intersection
- install a standard Sight board at the termination of Bushells Ridge Road
- rectify the drop in the pavement edge
- consider position of the tree and develop roadside management strategy to improve road safety regarding the sight distance obstruction.

7.2.6 Sparks Road/Hue Hue Road intersection

- re-paint the hold line on Sparks Road
- consider proper and timely pavement maintenance
- re-install retro-reflective pavement markers (RRPMs) along Hue Hue Road
- clean up the gravel at the intersection, and ensure regular and timely maintenance and cleaning
- Wyong Council has planned to adopt a roundabout after 2015. The pros and cons of a roundabout has been discussed in Section 7.2.1.

7.2.7 Hue Hue Road (between Wyee Road and Jilliby Road)

- re-paint the edgeline and trim back the grass on the roadside
- rectify the drop in the pavement edge
- consider proper and timely pavement maintenance
- re-install retro-reflective pavement markers (RRPMs) along Hue Hue Road
- clean up the debris trapped in the culverts, and ensure regular and timely maintenance and cleaning
- consider making the culverts traversable
- consider position of the tree within the clear zone and develop roadside management strategy to improve road safety regarding the tree near the road
- replace the guardrail terminal.

7.2.8 Hue Hue Road/Jilliby Road intersection

- install a Sight Board at the termination of Jilliby Road
- clean up the gravel at the intersection, and ensure regular and timely maintenance and cleaning
- rectify the drop in the pavement edge.

7.2.9 Jilliby Road

- rectify the drop in the pavement edge
- replace the guardrail terminal
- provide adequate transition between the guardrail and the bridge parapet
- consider making the culverts traversable

- trim the overgrown vegetation in the culverts, and ensure regular and timely maintenance and trimming/cleaning.

7.2.10 Jilliby Road/Little Jilliby Road intersection

- re-paint the centreline marking along Jilliby Road
- install a Sight Board at the termination of Little Jilliby Road.

7.2.11 Little Jilliby Road/Brothers Road intersection

- consider widening Brothers Road to accommodate safe manoeuvring for all vehicles at the intersection.

8. Construction traffic management

Prior to any construction commencing, a construction traffic management plan would need to be prepared as part of the overall construction occupational health and safety and environmental management planning. The plan would detail how the traffic associated with the construction would be managed.

Traffic Management Plans would be developed for the construction of rail bridges for the new rail spur line crossing over Tooheys Road as well as the temporary closure of Tooheys Road and Brothers Forest Road during the construction period.

The construction traffic management plan would also be used to develop a site-specific traffic management measures once the construction methods are finalised. These measures would be developed as part of the site-specific management plans to indicate how traffic would be controlled and managed during each stage of the construction.

The construction traffic management plan should contain the following information:

- the proposed works and construction traffic impacts
  - proposed construction techniques
  - estimated duration of the works
  - increased traffic volume by vehicle type
  - summary of the potential construction impacts on the road network
- recommendations
  - retention of local property and emergency access
  - provide a swept path analysis to ascertain that sufficient manoeuvring space is provided for all vehicles along the access route
  - warning signs to advise road users in advance of work zones and surrounding intersections
  - safety signage to be installed to warn construction vehicle drivers of the presence of cyclists and pedestrians
  - U-turn facilities for construction vehicles where necessary
- stakeholders
  - the main stakeholders in the plan
  - roles and responsibilities of all stakeholders
  - contact details for all stakeholders
  - the person responsible for developing, updating and implementing the plan
- community consultation
  - letterbox drops to local residents advising of potential property access restrictions
  - signposting and advertising to warn motorists of proposed road closures and traffic diversions and other temporary traffic arrangements
  - advertisements in local newspapers

In addition to the proposed Traffic Management Plans and Traffic Management Reports, it is also proposed that Traffic Control Plans be prepared for all works that would take place in the road or that would affect trafficable areas in accordance with the RTA's Traffic Control at Work Sites Guidelines 2010.

9. Conclusions

The traffic impact assessment has identified some minor traffic impacts associated with increase in traffic due to construction and operation of the proposed W2CP. Three intersections would face capacity constraints, however this congestion is not caused by the W2CP. These intersection include The Sydney–Newcastle Freeway/Sparks Road interchange (western side), and Hue Hue Road's intersections with Wyee Road and Jilliby Road.

Impacts of the W2CP is seen at the Sydney–Newcastle Freeway/Sparks Road interchange (eastern side), where the intersection performance would be decreased, resulting in a reduction of LoS from C to F in 2024.

In order to maintain satisfactory intersection performance in the forecast years, PB recommends the following intersection upgrades:

- two-lane roundabout at the Sydney–Newcastle Freeway/Sparks Road interchange (western side
- two-lane roundabout at the Sydney–Newcastle Freeway/Sparks Road interchange (eastern side)
- single lane roundabout at the Hue Hue Road/Wyee Road intersection
- single lane roundabout at the Hue Hue Road/Jilliby Road intersection.

Under the proposed layouts, these intersections would operate at a satisfactory LoS B or better, and operate within the design capacity, during both AM and PM peak hours. The 95th percentile queue of the turn movements would not overflow to adjacent through lanes. These results would satisfy Wyong Council's specified criteria.

The proposed layout at the newly created intersections, including the Tooheys Road and Buttonderry site accesses, and the two Precinct 14 accesses, is adequate to accommodate the estimated future traffic.

The crash record at the Sydney–Newcastle Freeway/Sparks Road interchange as well as the Hue Hue Road/Sparks Road intersection is quite poor and included a high number of right turning/crossing crashes. With the W2CP related traffic assigned across the road network in the future, traffic is likely to use these intersections. This would increase the risk exposure at this intersection and may increase the frequency of crashes.

The considered roundabouts as mentioned above would reduce the safety risks.

Roundabouts are a safe and efficient form of intersection control. The considered roundabouts at the Sydney–Newcastle Freeway/Sparks Road interchange and the Hue Hue Road/Wyee Road, would improve safety by simplifying conflicts, reducing vehicle speed and by simplifying a driver's decision by providing by a clearer indication of the driver's right of way. Major casual factors of the right turning/crossing crashes at the Sydney–Newcastle Freeway/Sparks Road interchange may include a lack of available gaps and their misjudgement combined with the high speed traffic environment. The safety issue at these intersections is not caused by the development but would be made slightly worse by it. The roundabouts would probably result in a significant reduction in all crashes (especially injury

crashes). These reductions result from the elimination of most head-on, right turning across oncoming traffic and right angle crashes.

Consultation with Wyong Council indicated that the Hue Hue Road/Sparks Road intersection to be upgraded to be a roundabout after 2015. This would significantly improve the road safety at this intersection.

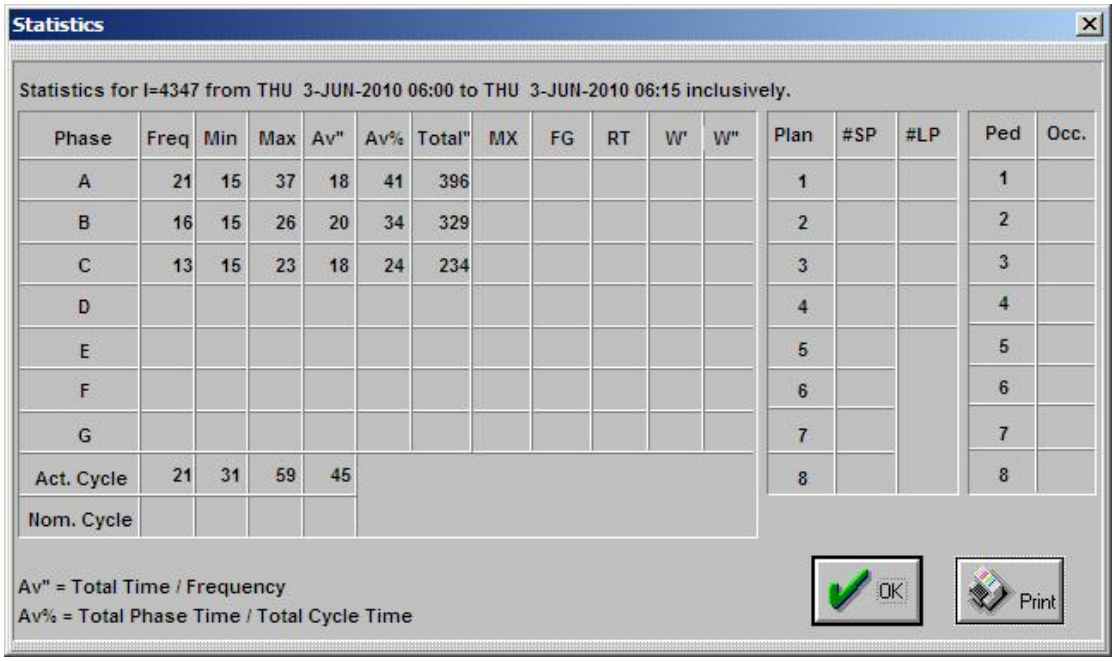
A number of road safety issues were identified in relation to deficiencies in signs and linemarking, delineation, pavement, guardrail and drainage. Other issues included unprotected roadside hazards identified within the clear zone. A number of mitigation measures have been recommended to improve road safety outcome for the construction and operation of the W2CP.

The W2CP construction and operation should be undertaken in compliance with accepted traffic engineering practices, as well as the mitigation measures recommended in this report.

Public transport, pedestrian and cyclist facilities would be improved along the Sparks Road corridor, as a result of the Wyong Employee Zone project. This would apparently benefit the mining employees of the Buttonderry site if they consider bus as a mode of transport. However, the demand of mining employees using public transport is not anticipated to be high, because evening and night shifts' working hours are generally outside the public transport service hours.

Appendix A

RTA Intersection Diagnostic Monitor (IDM) data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Phase Freq Min Max Av" Av% Total" MX FG RT W' W"
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B 16 15 26 20 34 329
C 13 15 23 18 24 234
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Act. Cycle 21 31 59 45
Nom. Cycle
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Av" = Total Time / Frequency
Av% = Total Phase Time / Total Cycle Time
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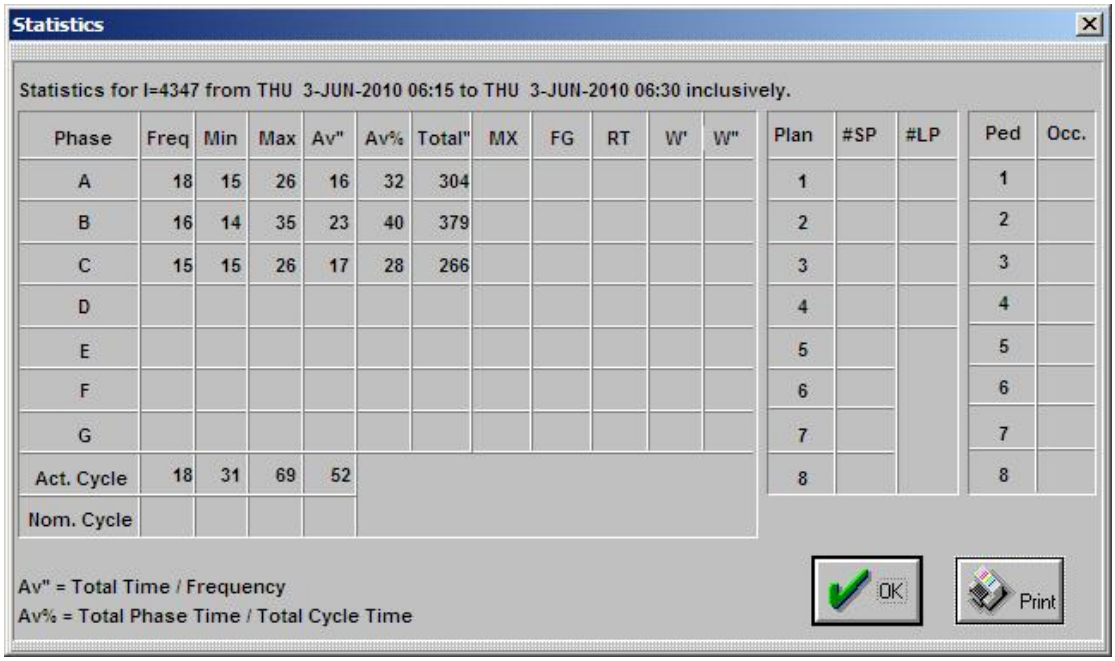
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B 16 14 35 23 40 379
C 15 15 26 17 28 266
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Act. Cycle 18 31 69 52
Nom. Cycle
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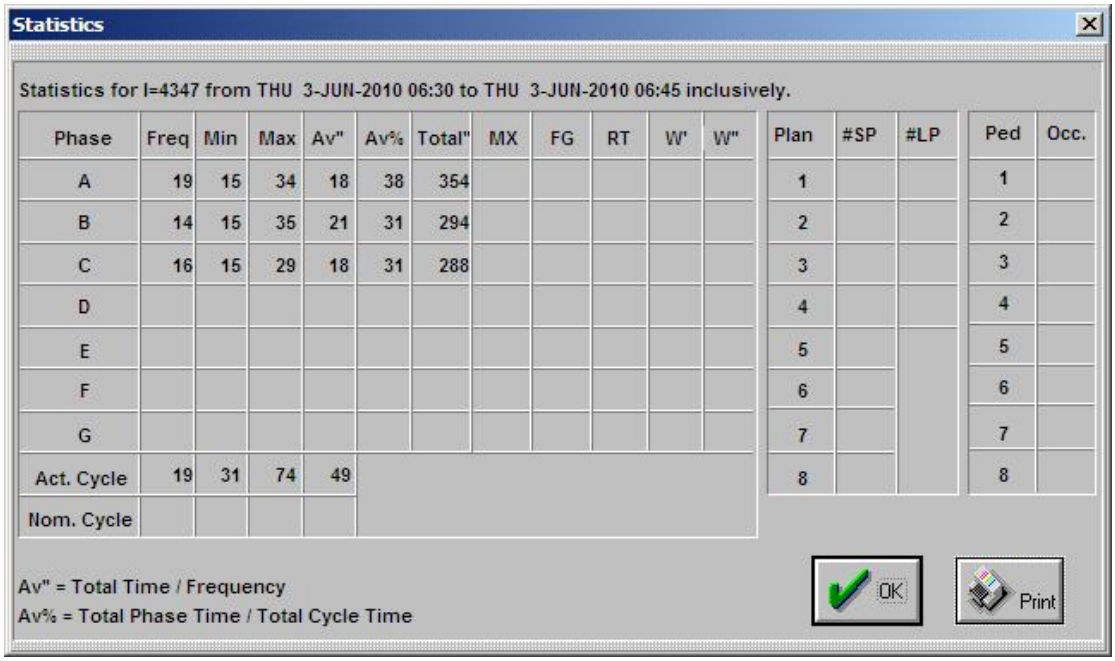
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B 14 15 35 21 31 294
C 16 15 29 18 31 288
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Act. Cycle 19 31 74 49
Nom. Cycle
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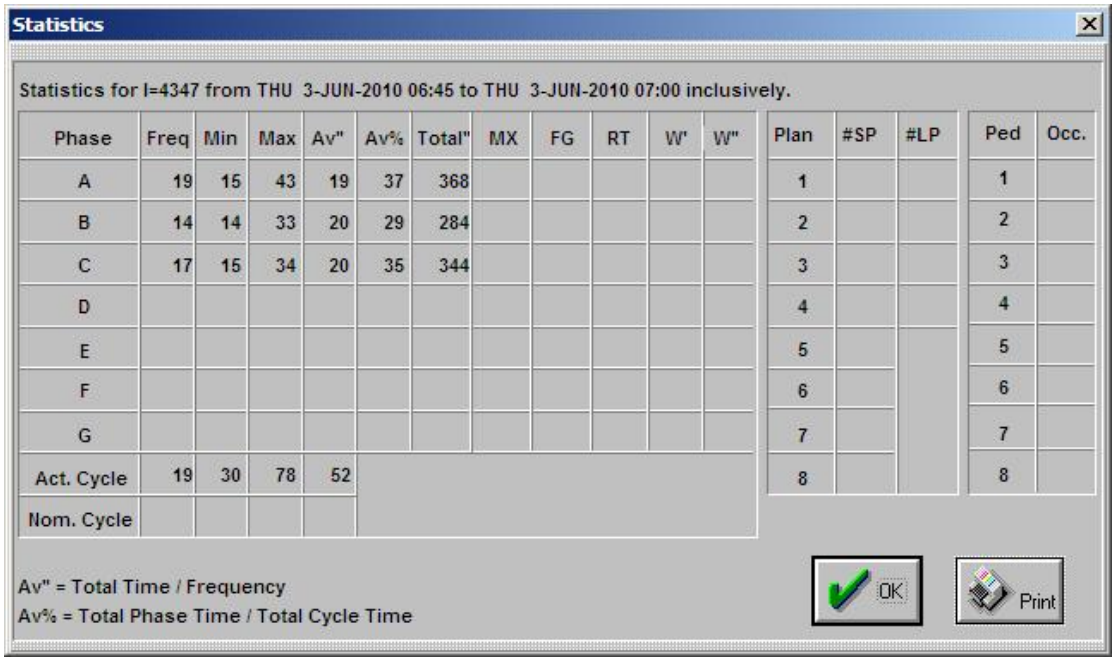
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Phase Freq Min Max Av" Av% Total" MX FG RT W' W"
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C 17 15 34 20 35 344
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Act. Cycle 19 30 78 52
Nom. Cycle
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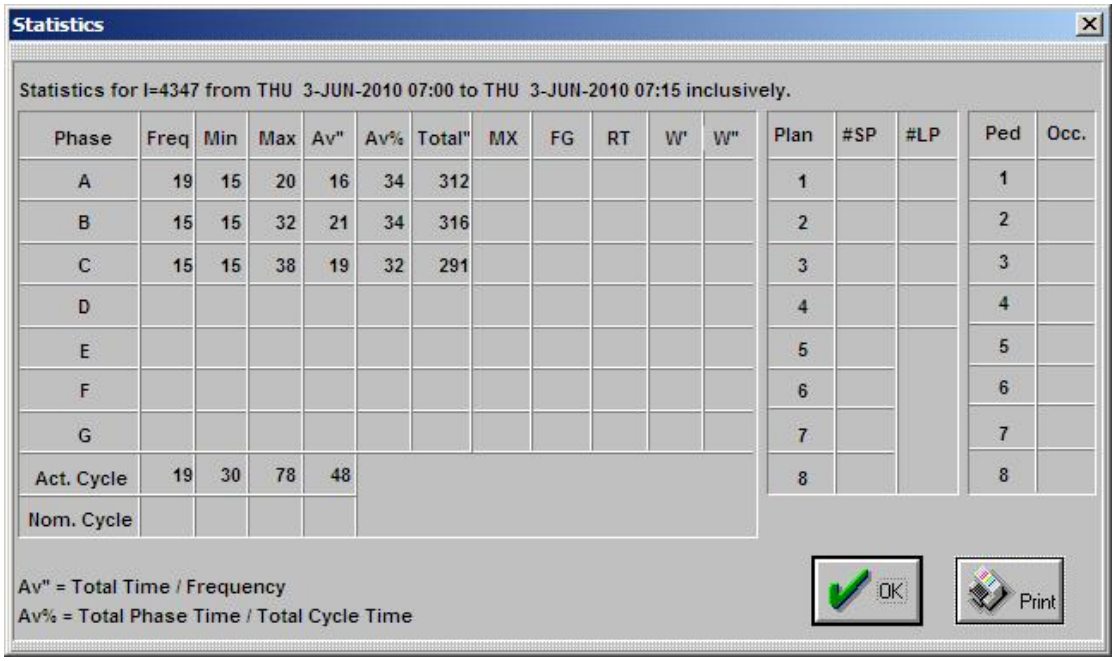
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B 15 15 32 21 34 316
C 15 15 38 19 32 291
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Act. Cycle 19 30 78 48
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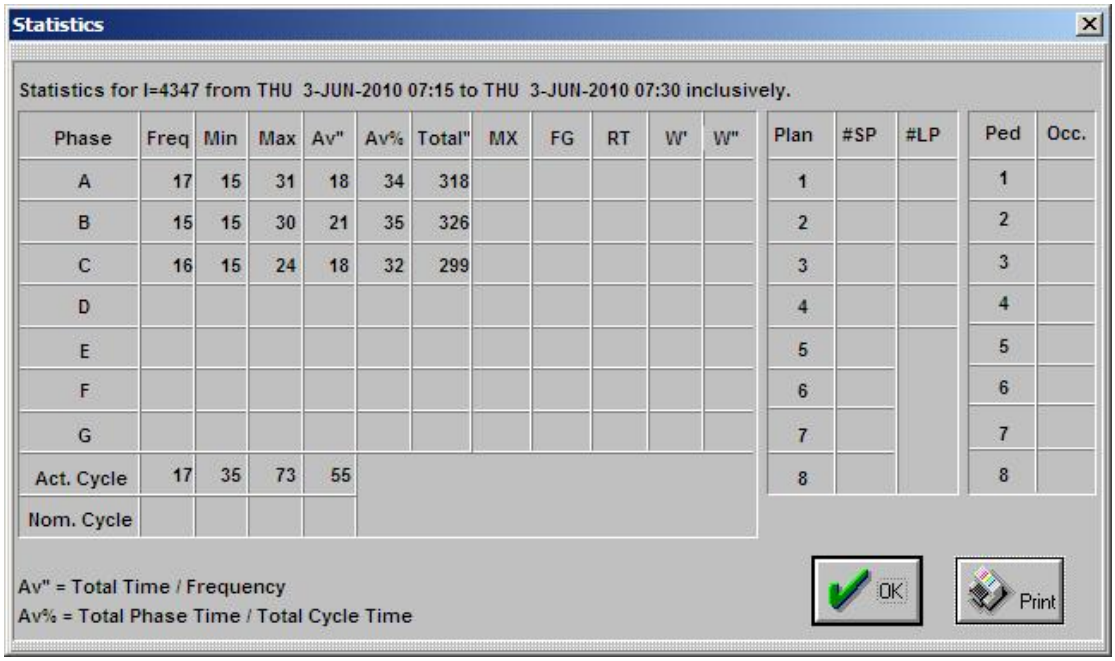
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B 15 15 30 21 35 326
C 16 15 24 18 32 299
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Act. Cycle 17 35 73 55
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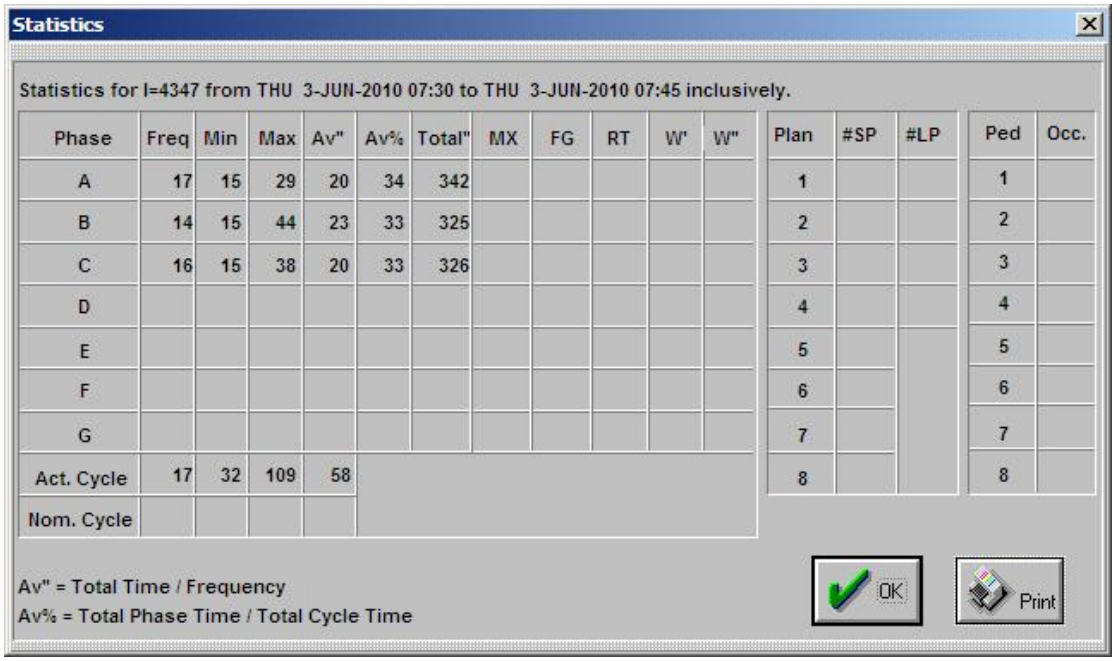
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C 16 15 38 20 33 326
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Act. Cycle 17 32 109 58
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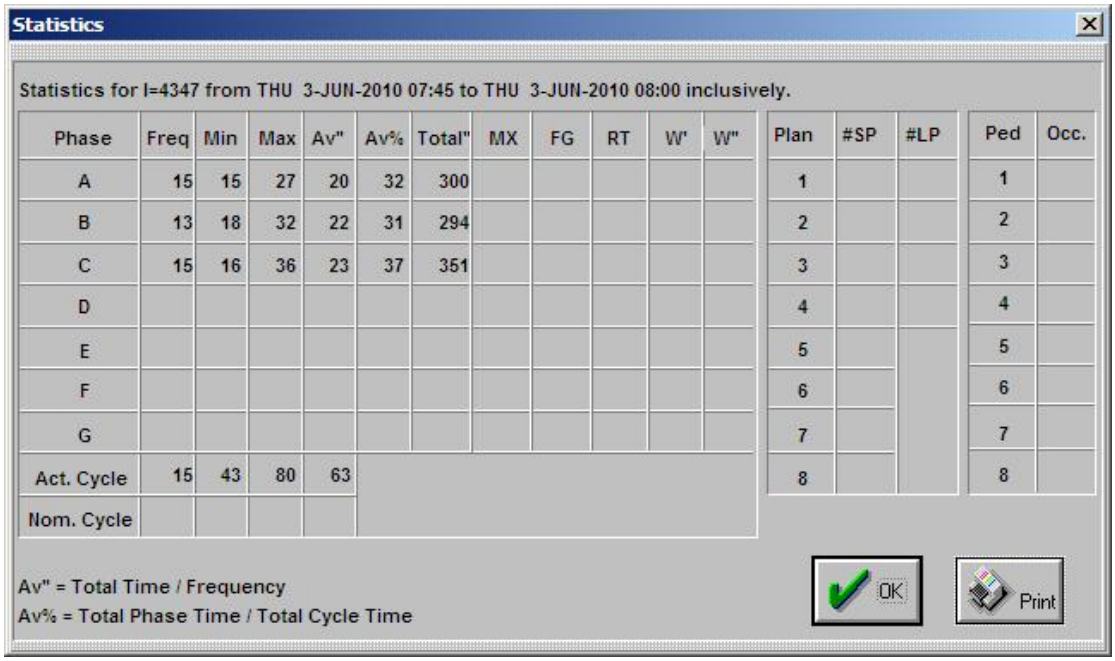
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B 13 18 32 22 31 294
C 15 16 36 23 37 351
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Act. Cycle 15 43 80 63
Nom. Cycle
Plan #SP #LP
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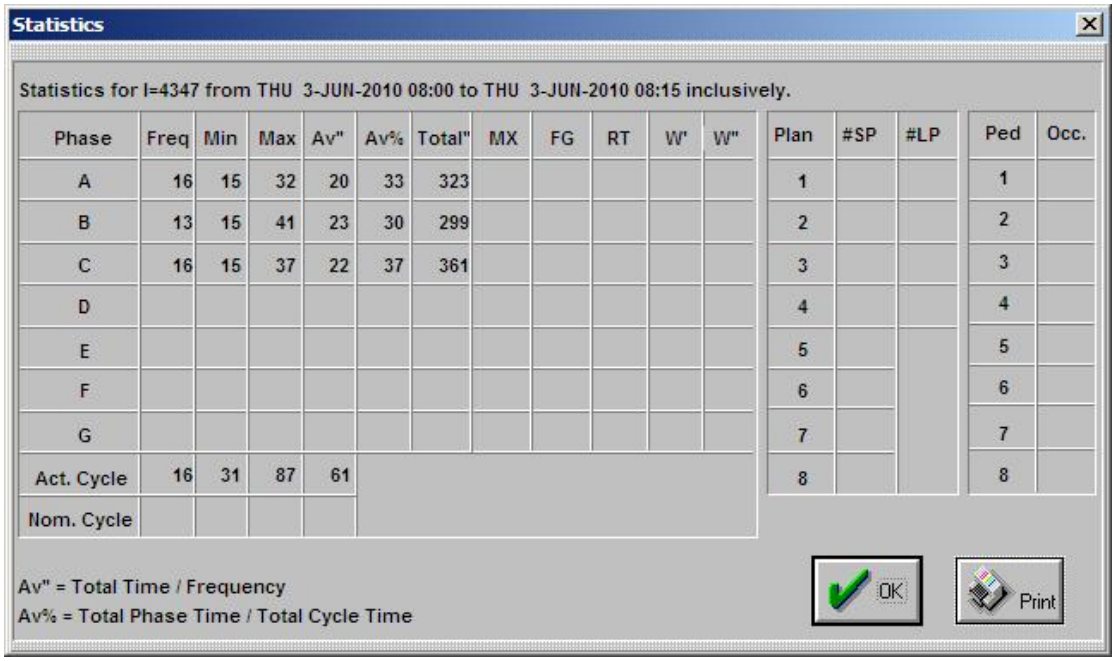
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B 13 15 41 23 30 299
C 16 15 37 22 37 361
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Act. Cycle 16 31 87 61
Nom. Cycle
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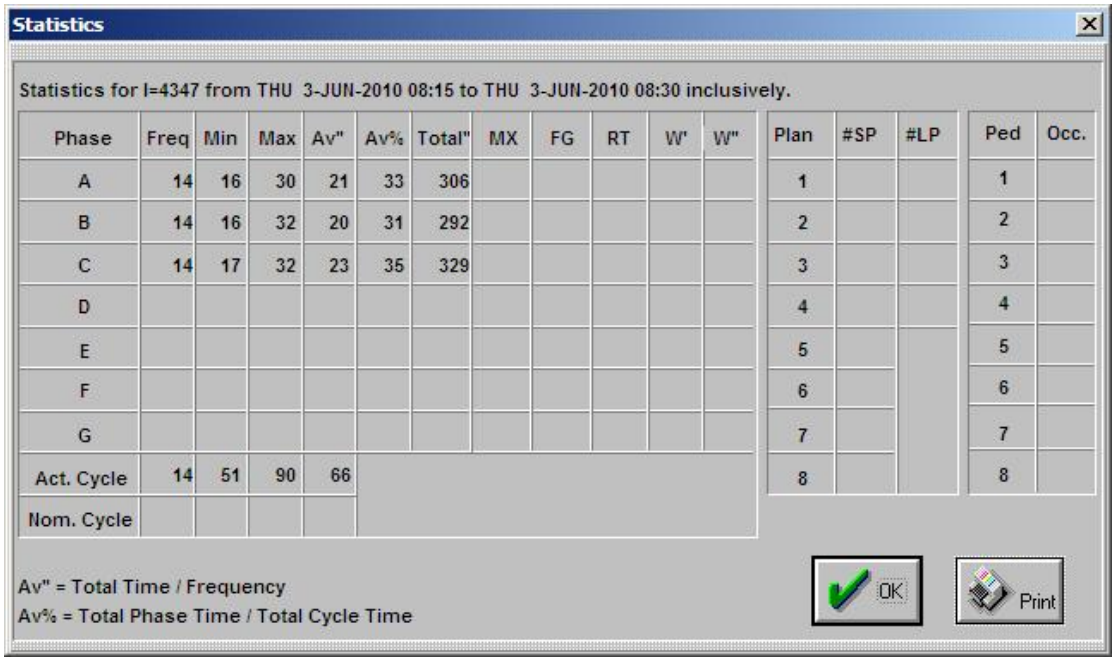
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B 14 16 32 20 31 292
C 14 17 32 23 35 329
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Act. Cycle 14 51 90 66
Nom. Cycle
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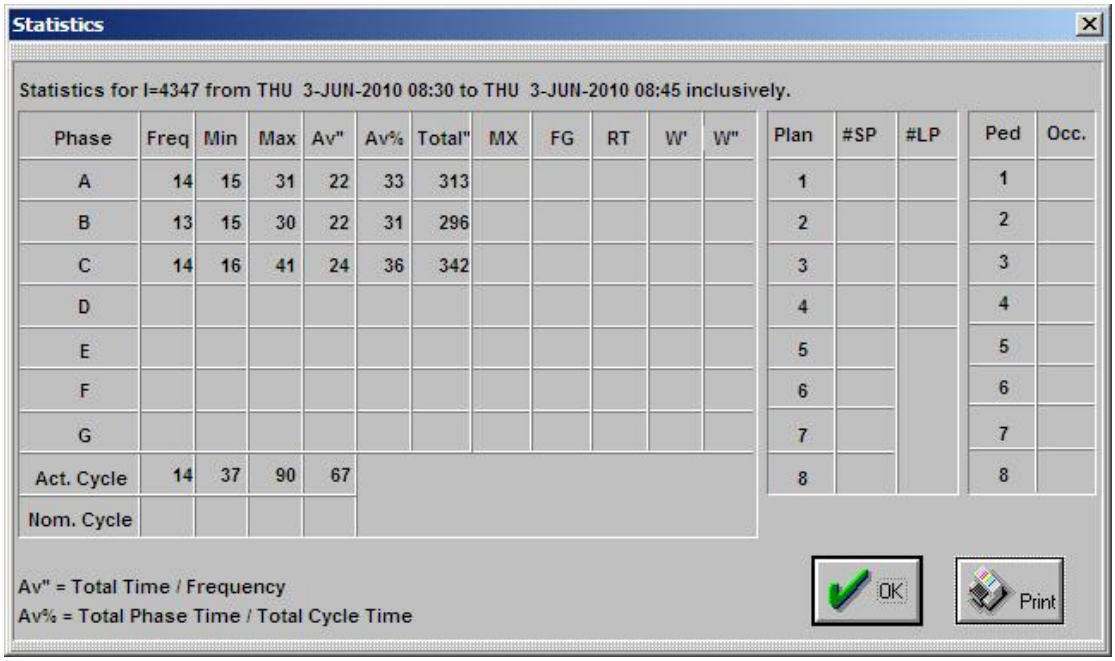
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C 14 16 41 24 36 342
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Act. Cycle 14 37 90 67
Nom. Cycle
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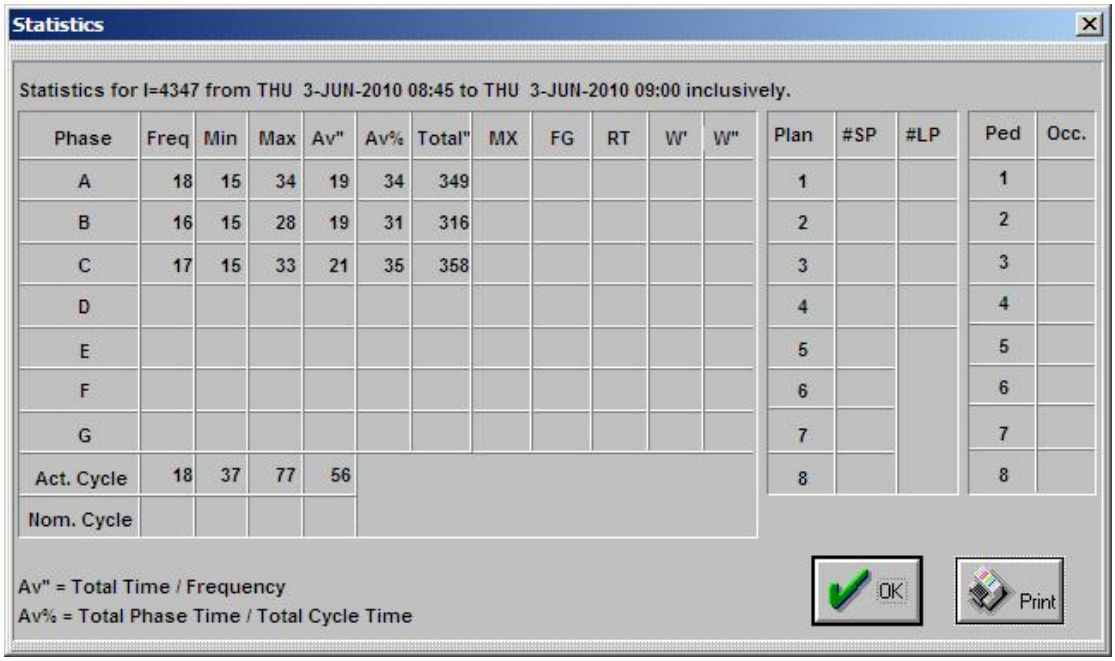
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B 16 15 28 19 31 316
C 17 15 33 21 35 358
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Act. Cycle 18 37 77 56
Nom. Cycle
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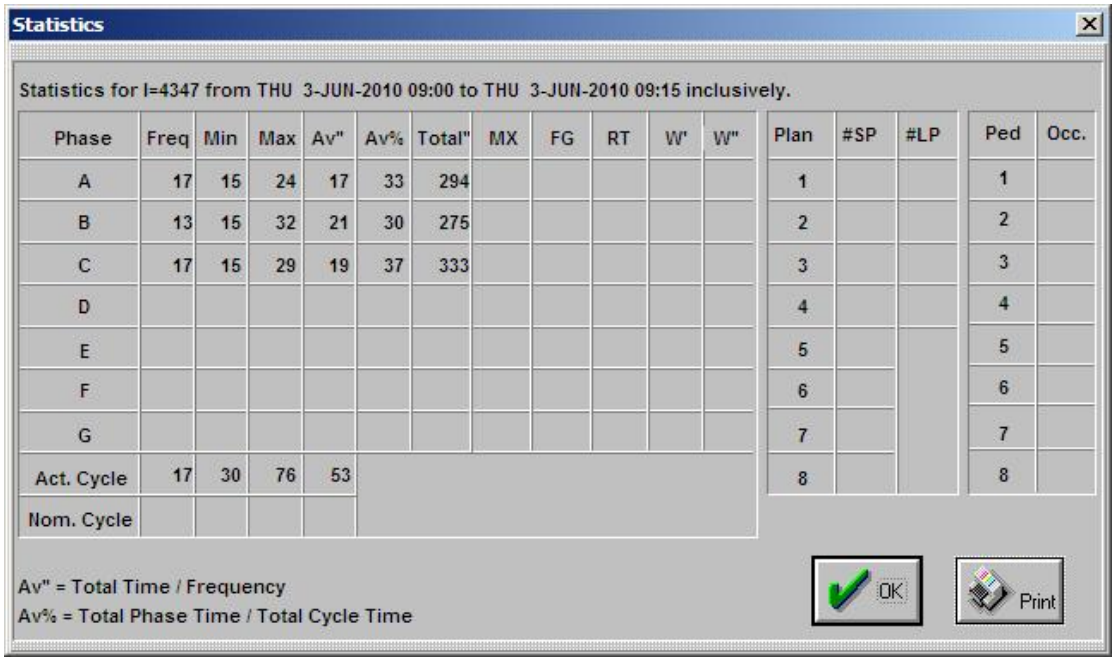
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B 13 15 32 21 30 275
C 17 15 29 19 37 333
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Act. Cycle 17 30 76 53
Nom. Cycle
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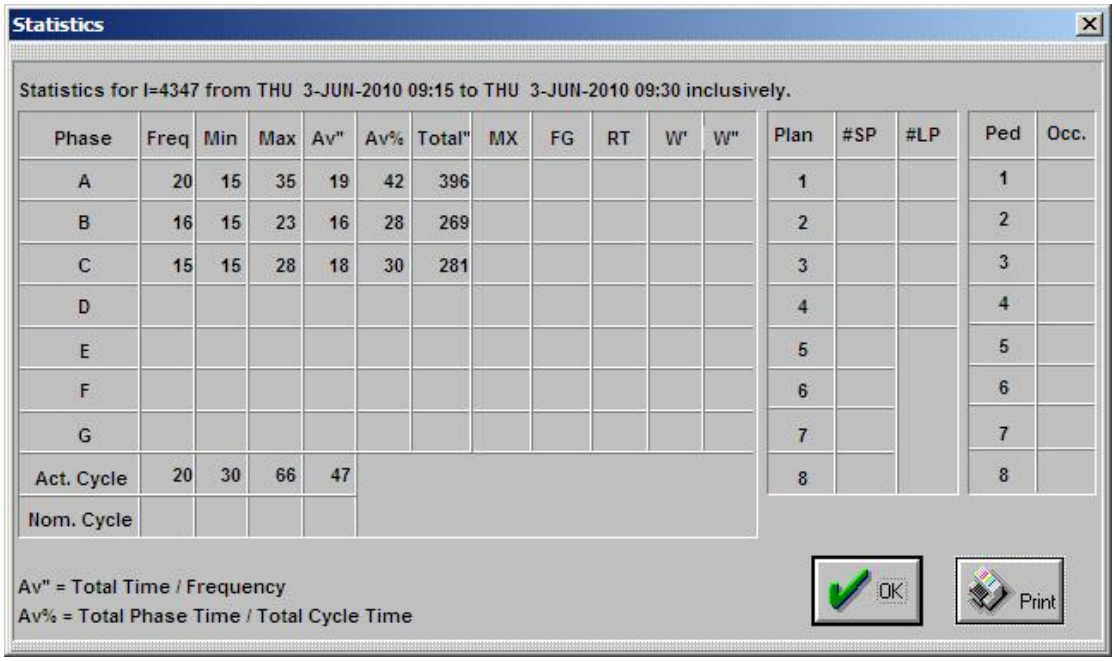
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B 16 15 23 16 28 269
C 15 15 28 18 30 281
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Act. Cycle 20 30 66 47
Nom. Cycle
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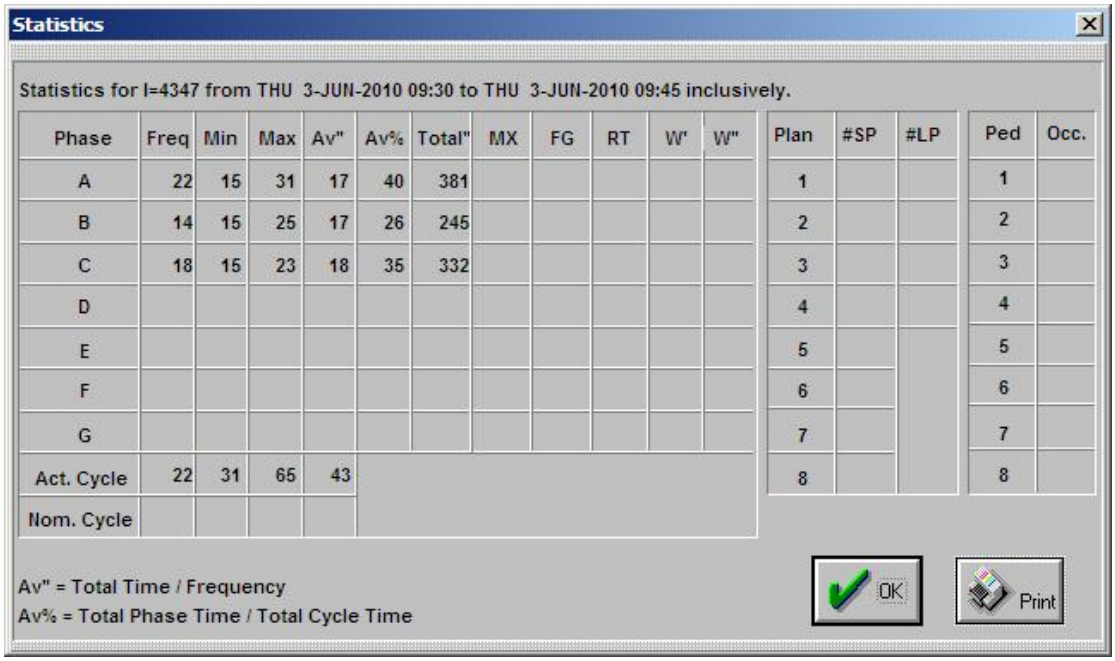
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A | 22 | 15 | 31 | 17 | 40 | 381
B | 14 | 15 | 25 | 17 | 26 | 245
C | 18 | 15 | 23 | 18 | 35 | 332
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Act. Cycle | 22 | 31 | 65 | 43
Nom. Cycle
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Av" = Total Time / Frequency
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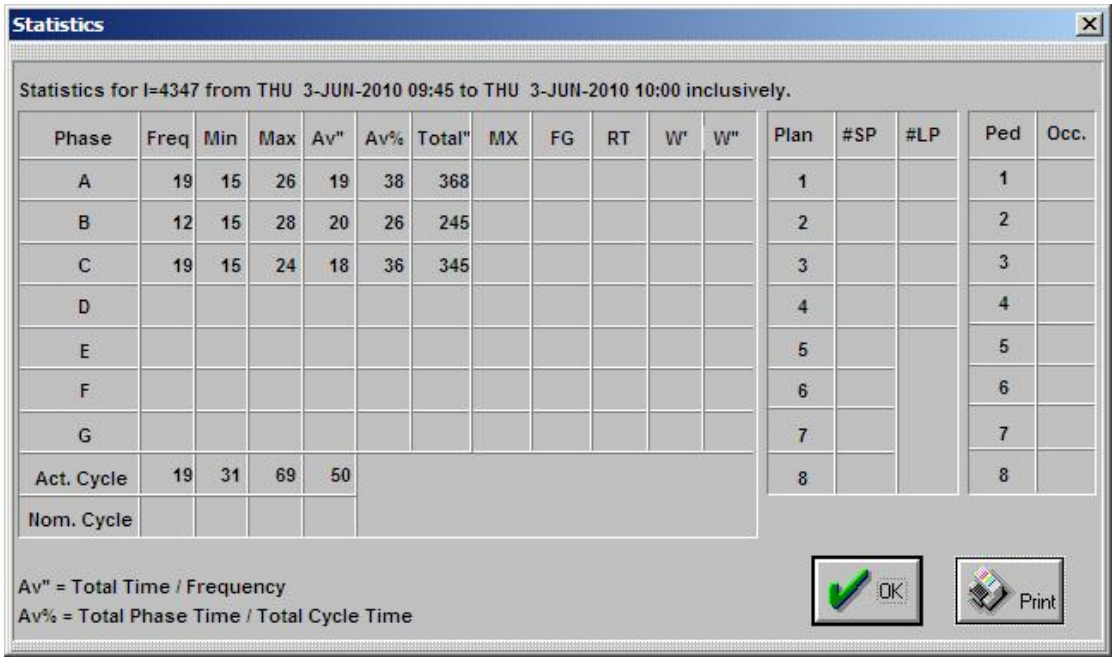
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B | 12 | 15 | 28 | 20 | 26 | 245
C | 19 | 15 | 24 | 18 | 36 | 345
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Act. Cycle | 19 | 31 | 69 | 50
Nom. Cycle
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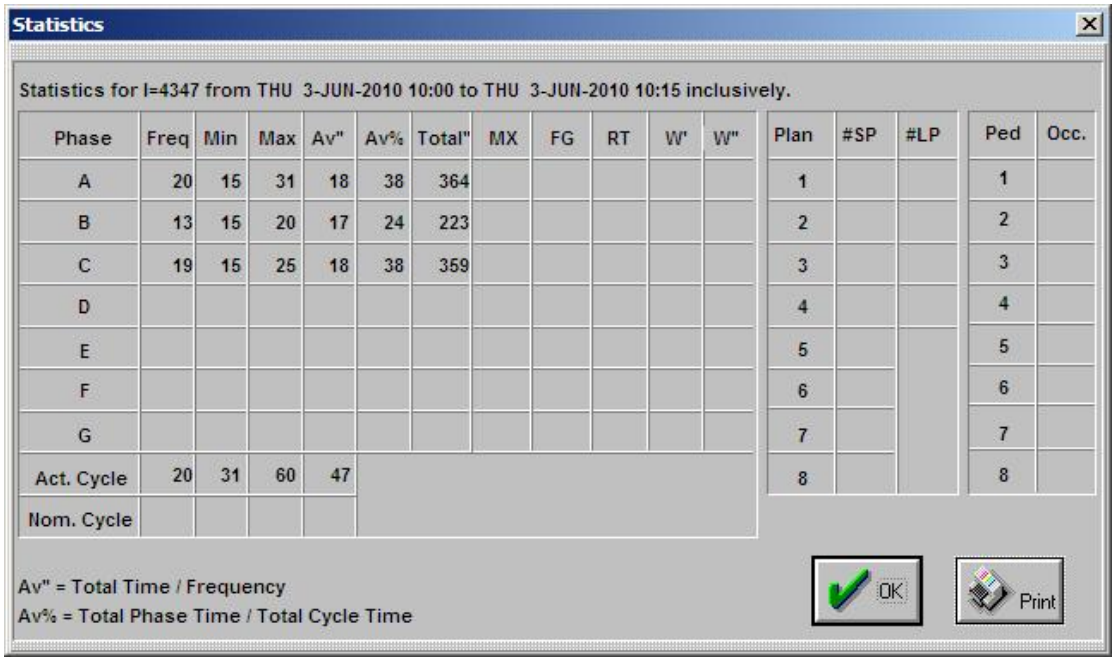
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B | 13 | 15 | 20 | 17 | 24 | 223
C | 19 | 15 | 25 | 18 | 38 | 359
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Act. Cycle | 20 | 31 | 60 | 47
Nom. Cycle
Plan | #SP | #LP
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Av" = Total Time / Frequency
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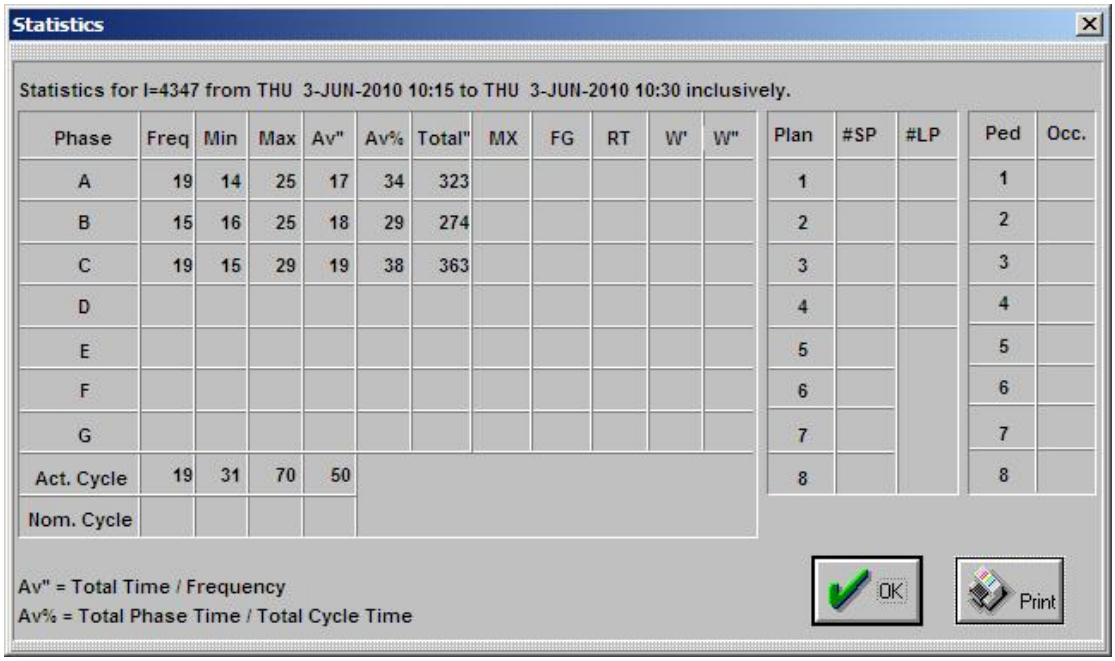
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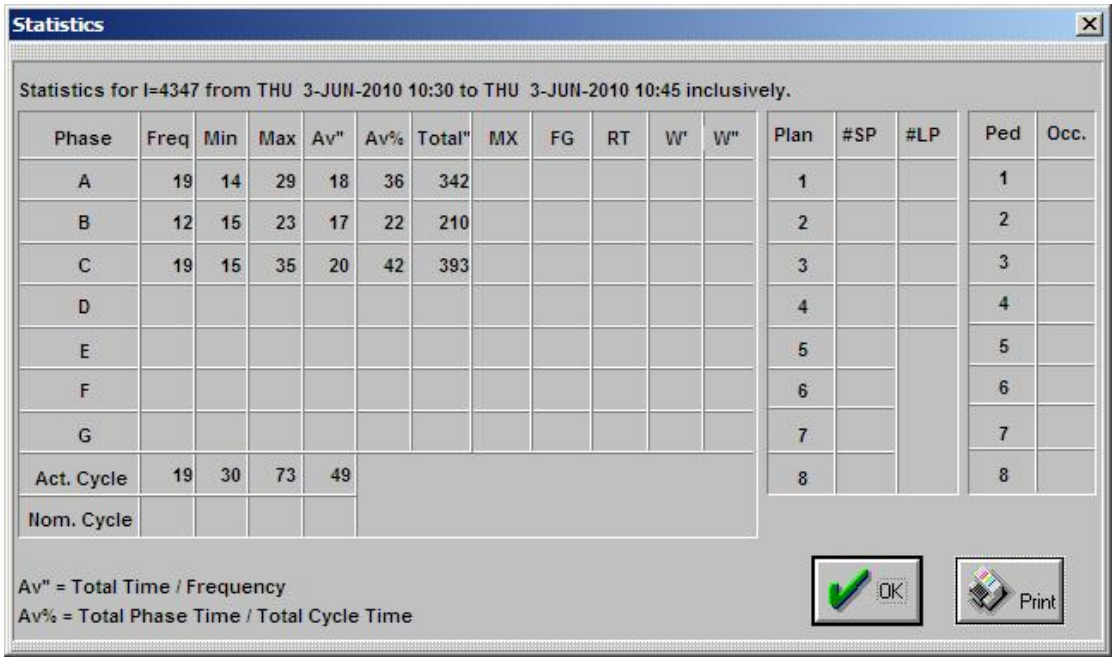
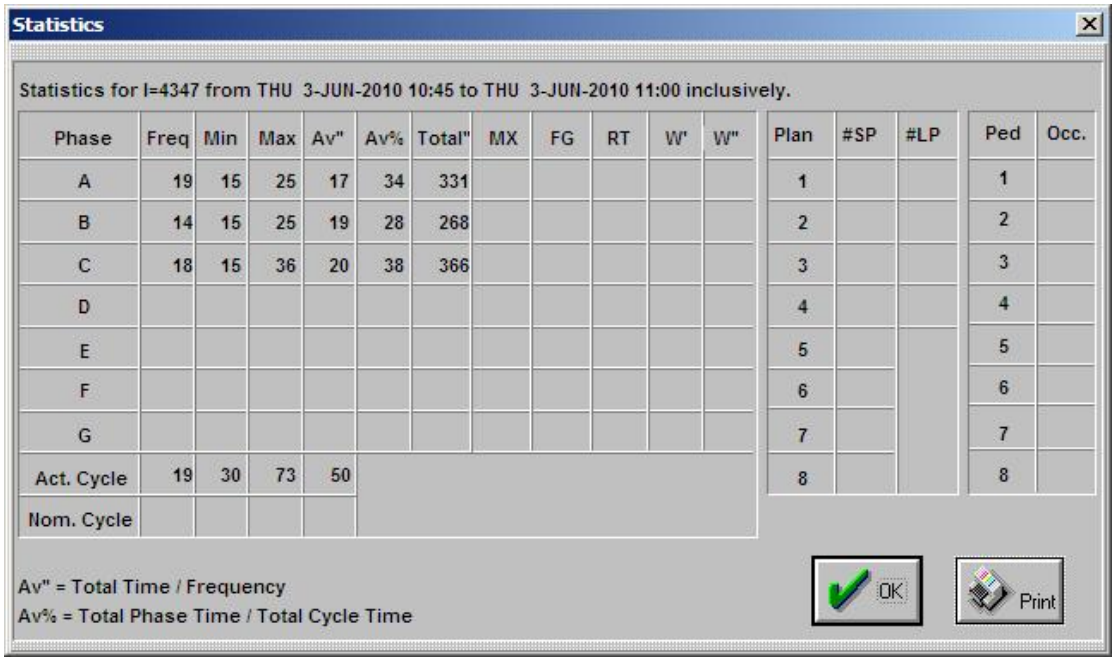
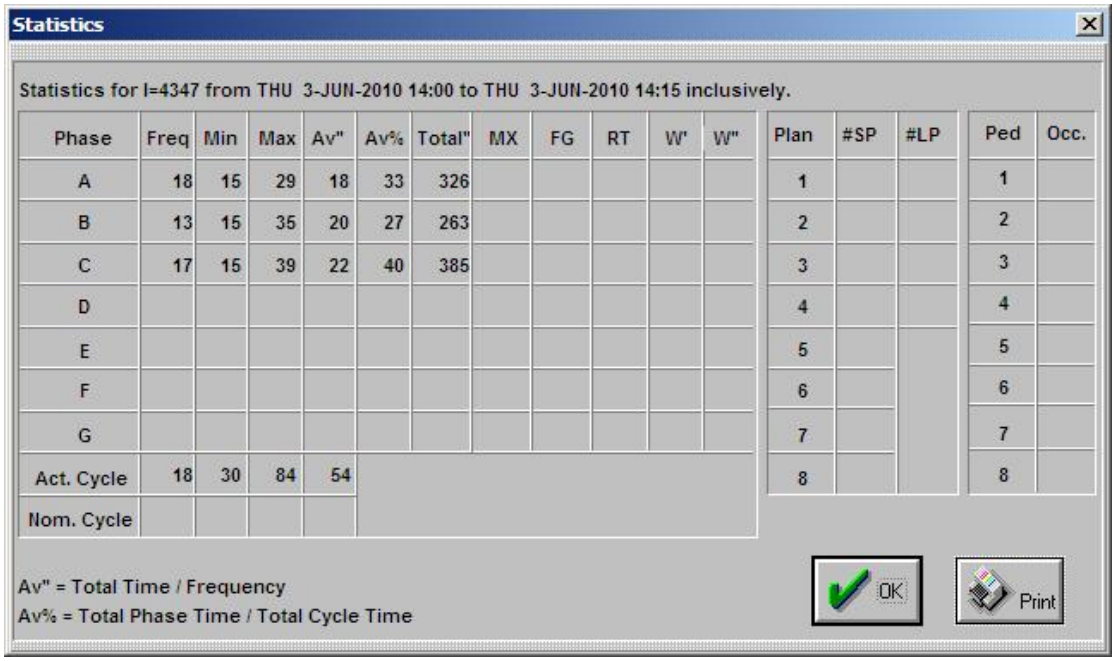
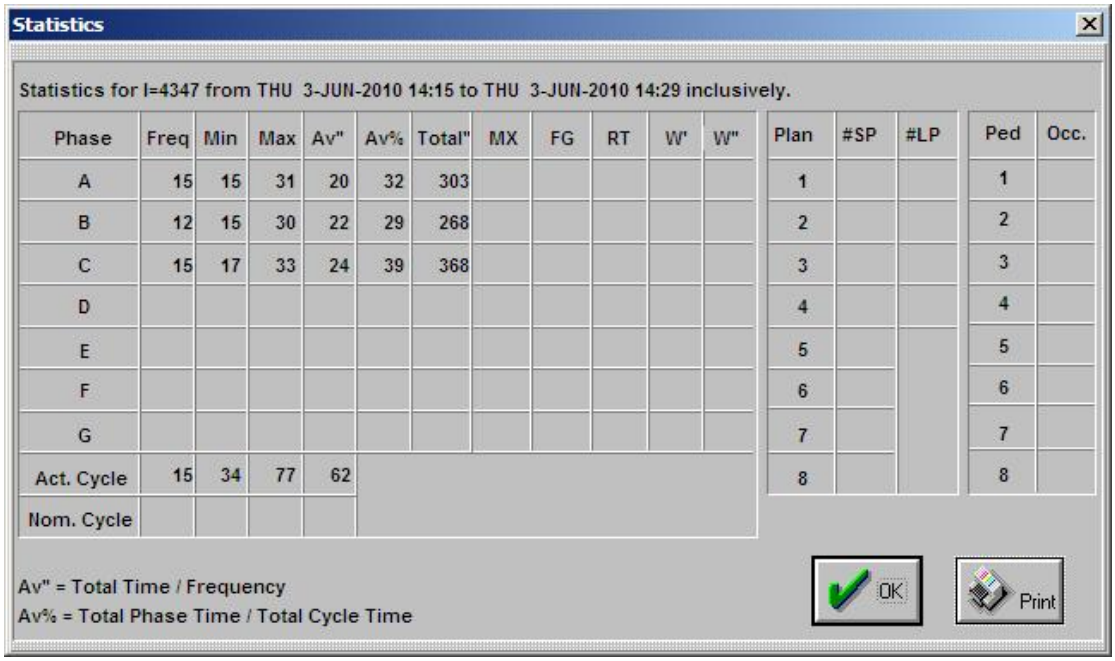
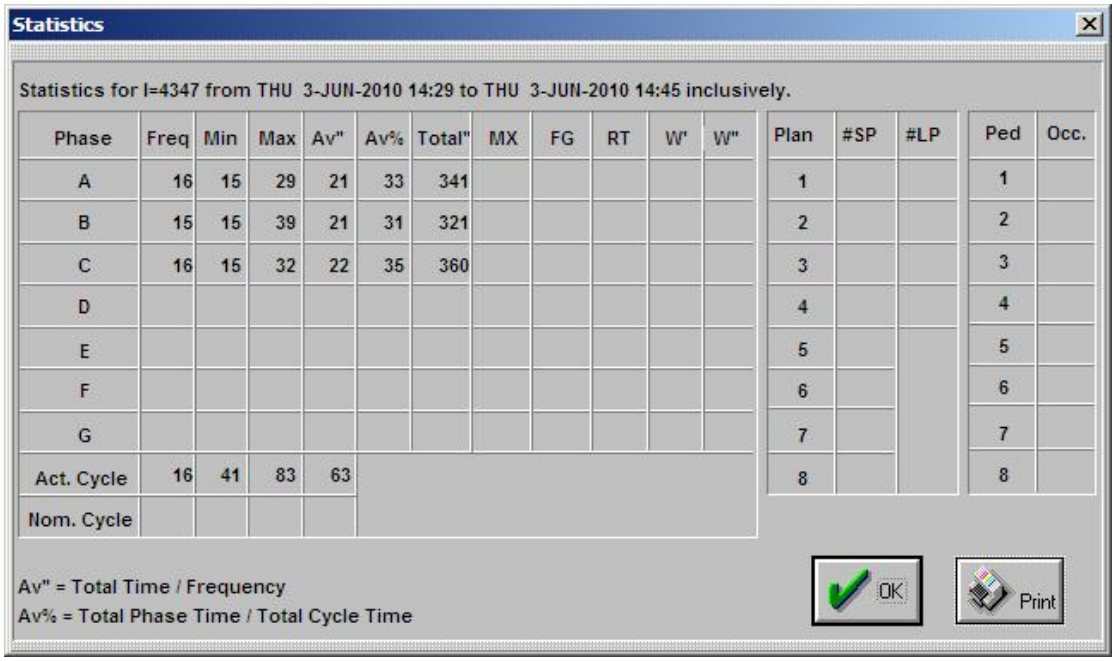
Statistics for I=4347 from THU 3-JUN-2010 10:15 to THU 3-JUN-2010 10:30 inclusively.
Phase | Freq | Min | Max | Av" | Av% | Total" | MX | FG | RT | W' | W"
A | 19 | 14 | 25 | 17 | 34 | 323
B | 15 | 16 | 25 | 18 | 29 | 274
C | 19 | 15 | 29 | 19 | 38 | 363
D
E
F
G
Act. Cycle | 19 | 31 | 70 | 50
Nom. Cycle
Plan | #SP | #LP
1
2
3
4
5
6
7
8
Ped | Occ.
1
2
3
4
5
6
7
8
Av" = Total Time / Frequency
Av% = Total Phase Time / Total Cycle Time
OK
Print

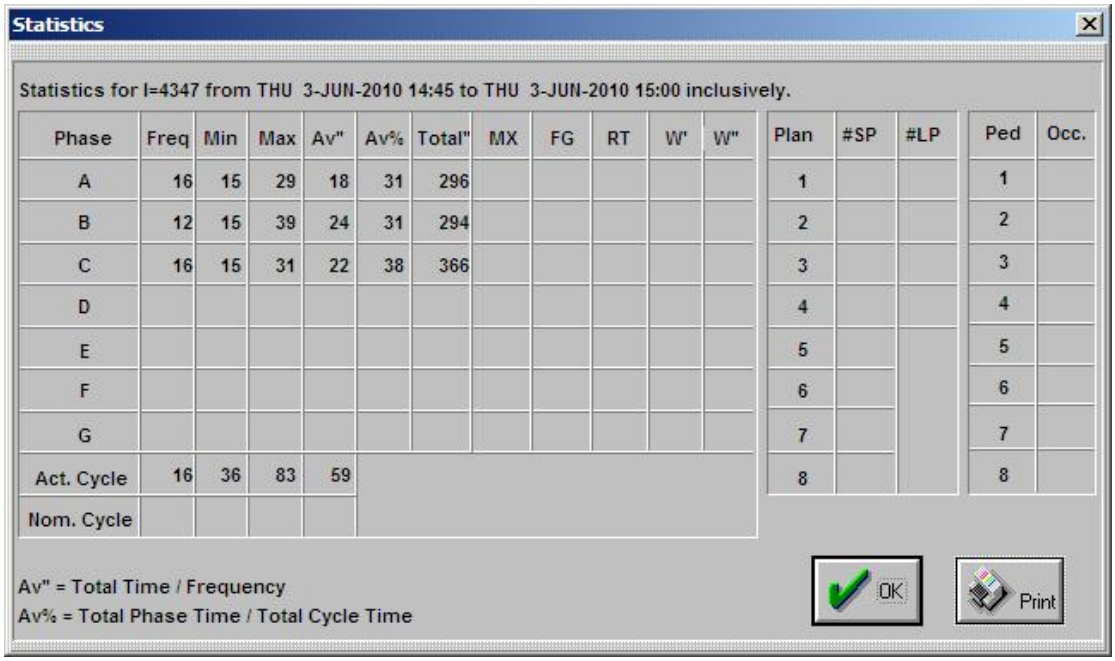

Statistics
Statistics for I=4347 from THU 3-JUN-2010 10:30 to THU 3-JUN-2010 10:45 inclusively.
Phase | Freq | Min | Max | Av" | Av% | Total" | MX | FG | RT | W' | W"
A | 19 | 14 | 29 | 18 | 36 | 342
B | 12 | 15 | 23 | 17 | 22 | 210
C | 19 | 15 | 35 | 20 | 42 | 393
D
E
F
G
Act. Cycle | 19 | 30 | 73 | 49
Nom. Cycle
Plan | #SP | #LP
1
2
3
4
5
6
7
8
Ped | Occ.
1
2
3
4
5
6
7
8
Av" = Total Time / Frequency
Av% = Total Phase Time / Total Cycle Time
OK
Print

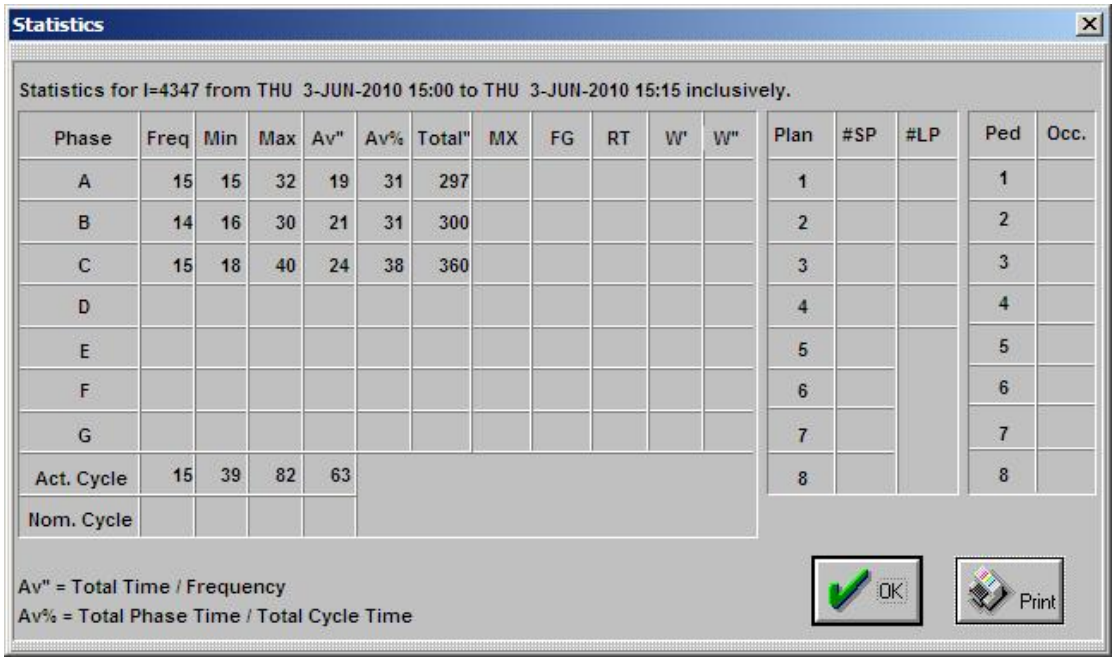

Statistics
Statistics for I=4347 from THU 3-JUN-2010 10:45 to THU 3-JUN-2010 11:00 inclusively.
Phase | Freq | Min | Max | Av" | Av% | Total" | MX | FG | RT | W' | W"
A | 19 | 15 | 25 | 17 | 34 | 331
B | 14 | 15 | 25 | 19 | 28 | 268
C | 18 | 15 | 36 | 20 | 38 | 366
D
E
F
G
Act. Cycle | 19 | 30 | 73 | 50
Nom. Cycle
Plan | #SP | #LP
1
2
3
4
5
6
7
8
Ped | Occ.
1
2
3
4
5
6
7
8
Av" = Total Time / Frequency
Av% = Total Phase Time / Total Cycle Time
OK
Print

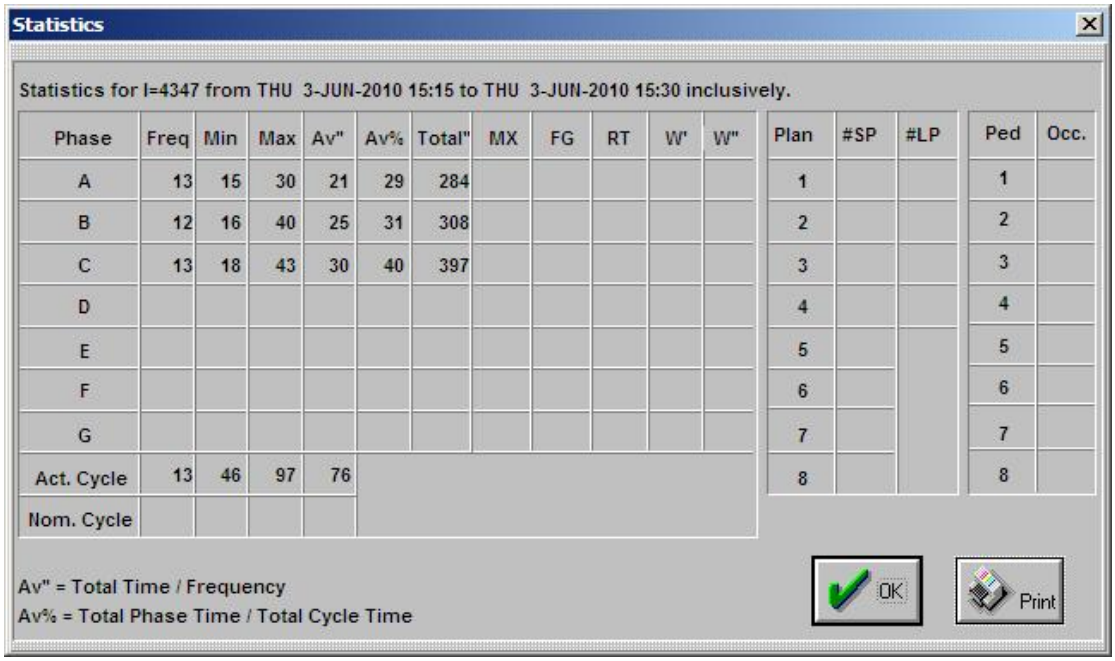

Statistics
Statistics for I=4347 from THU 3-JUN-2010 14:00 to THU 3-JUN-2010 14:15 inclusively.
Phase | Freq | Min | Max | Av" | Av% | Total" | MX | FG | RT | W' | W"
A | 18 | 15 | 29 | 18 | 33 | 326
B | 13 | 15 | 35 | 20 | 27 | 263
C | 17 | 15 | 39 | 22 | 40 | 385
D
E
F
G
Act. Cycle | 18 | 30 | 84 | 54
Nom. Cycle
Plan | #SP | #LP
1
2
3
4
5
6
7
8
Ped | Occ.
1
2
3
4
5
6
7
8
Av" = Total Time / Frequency
Av% = Total Phase Time / Total Cycle Time
OK
Print

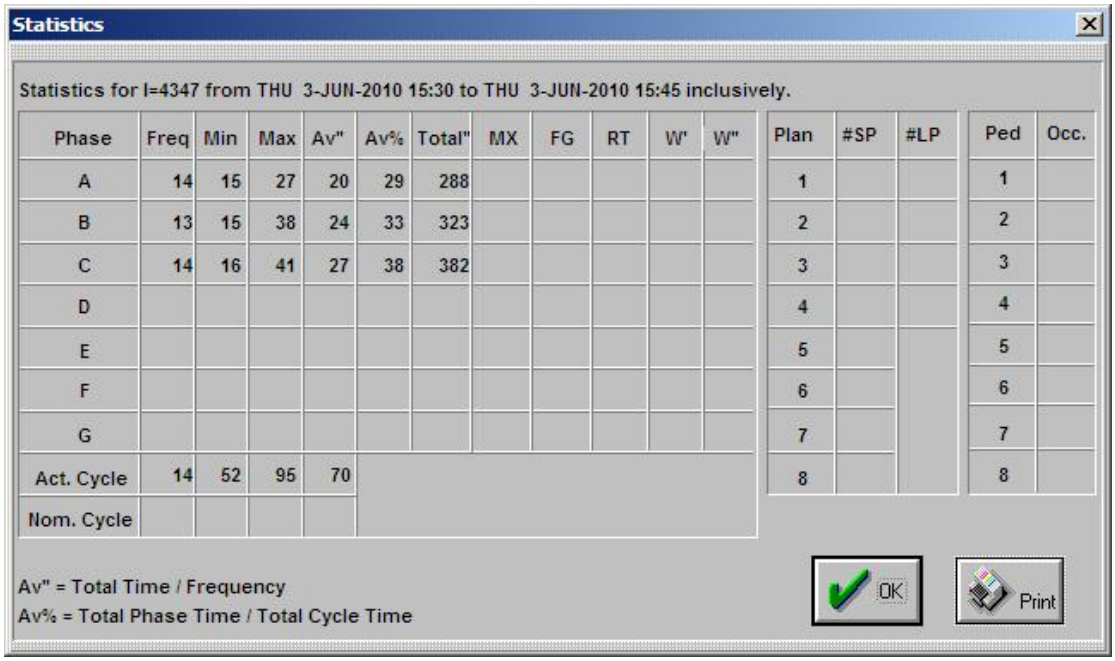

Statistics
Statistics for I=4347 from THU 3-JUN-2010 14:15 to THU 3-JUN-2010 14:29 inclusively.
Phase | Freq | Min | Max | Av" | Av% | Total" | MX | FG | RT | W' | W"
A | 15 | 15 | 31 | 20 | 32 | 303
B | 12 | 15 | 30 | 22 | 29 | 268
C | 15 | 17 | 33 | 24 | 39 | 368
D
E
F
G
Act. Cycle | 15 | 34 | 77 | 62
Nom. Cycle
Plan | #SP | #LP
1
2
3
4
5
6
7
8
Ped | Occ.
1
2
3
4
5
6
7
8
Av" = Total Time / Frequency
Av% = Total Phase Time / Total Cycle Time
OK
Print

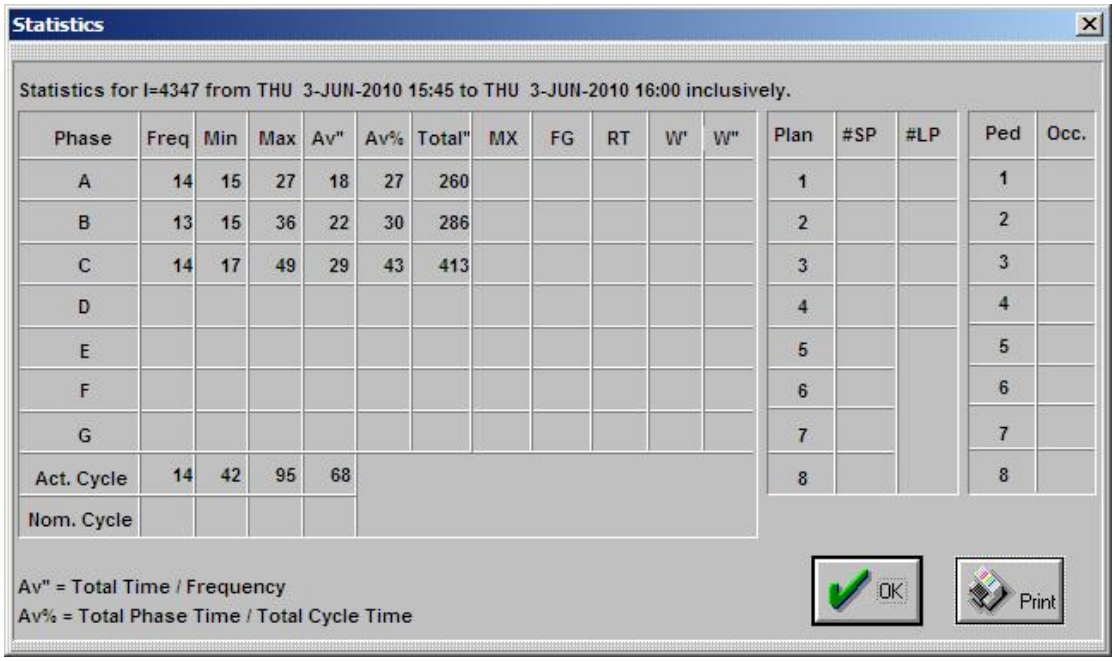

Statistics
Statistics for I=4347 from THU 3-JUN-2010 14:29 to THU 3-JUN-2010 14:45 inclusively.
Phase | Freq | Min | Max | Av" | Av% | Total" | MX | FG | RT | W' | W"
A | 16 | 15 | 29 | 21 | 33 | 341
B | 15 | 15 | 39 | 21 | 31 | 321
C | 16 | 15 | 32 | 22 | 35 | 360
D
E
F
G
Act. Cycle | 16 | 41 | 83 | 63
Nom. Cycle
Plan | #SP | #LP
1
2
3
4
5
6
7
8
Ped | Occ.
1
2
3
4
5
6
7
8
Av" = Total Time / Frequency
Av% = Total Phase Time / Total Cycle Time
OK
Print

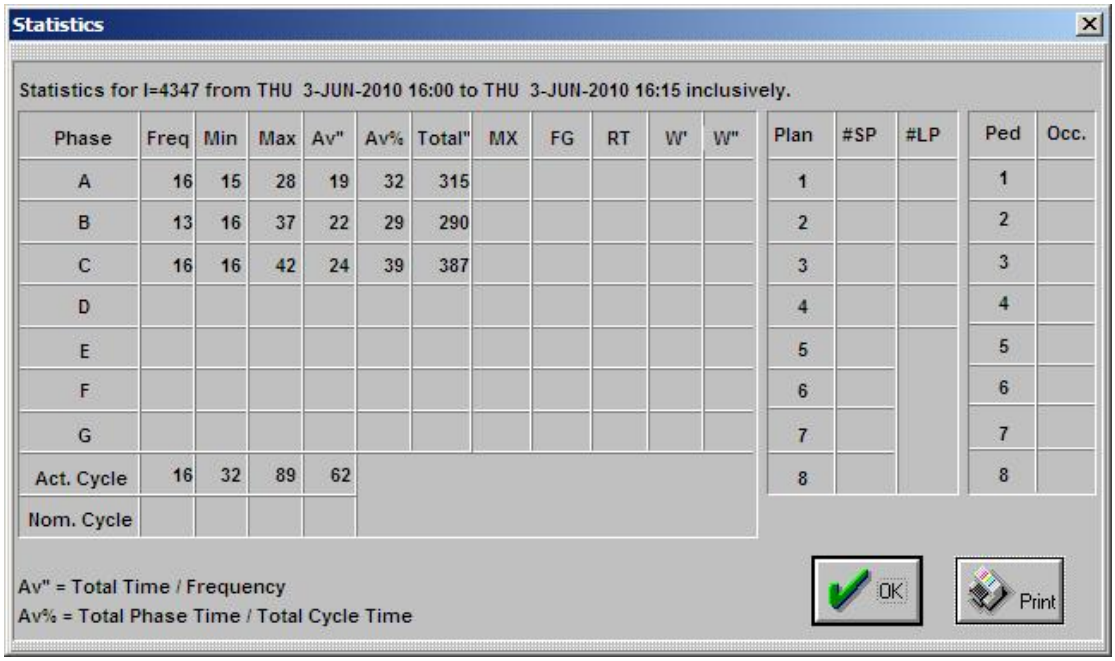

Statistics
Statistics for I=4347 from THU 3-JUN-2010 14:45 to THU 3-JUN-2010 15:00 inclusively.
Phase | Freq | Min | Max | Av" | Av% | Total" | MX | FG | RT | W' | W"
A | 16 | 15 | 29 | 18 | 31 | 296
B | 12 | 15 | 39 | 24 | 31 | 294
C | 16 | 15 | 31 | 22 | 38 | 366
D
E
F
G
Act. Cycle | 16 | 36 | 83 | 59
Nom. Cycle
Plan | #SP | #LP
1
2
3
4
5
6
7
8
Ped | Occ.
1
2
3
4
5
6
7
8
Av" = Total Time / Frequency
Av% = Total Phase Time / Total Cycle Time
OK
Print


Statistics
Statistics for I=4347 from THU 3-JUN-2010 15:00 to THU 3-JUN-2010 15:15 inclusively.
Phase Freq Min Max Av" Av% Total" MX FG RT W' W"
A 15 15 32 19 31 297
B 14 16 30 21 31 300
C 15 18 40 24 38 360
D
E
F
G
Act. Cycle 15 39 82 63
Nom. Cycle
Plan #SP #LP
1
2
3
4
5
6
7
8
Ped Occ.
1
2
3
4
5
6
7
8
Av" = Total Time / Frequency
Av% = Total Phase Time / Total Cycle Time
OK
Print


Statistics
Statistics for I=4347 from THU 3-JUN-2010 15:15 to THU 3-JUN-2010 15:30 inclusively.
Phase Freq Min Max Av" Av% Total" MX FG RT W' W"
A 13 15 30 21 29 284
B 12 16 40 25 31 308
C 13 18 43 30 40 397
D
E
F
G
Act. Cycle 13 46 97 76
Nom. Cycle
Plan #SP #LP
1
2
3
4
5
6
7
8
Ped Occ.
1
2
3
4
5
6
7
8
Av" = Total Time / Frequency
Av% = Total Phase Time / Total Cycle Time
OK
Print


Statistics
Statistics for I=4347 from THU 3-JUN-2010 15:30 to THU 3-JUN-2010 15:45 inclusively.
Phase | Freq | Min | Max | Av" | Av% | Total" | MX | FG | RT | W' | W"
A | 14 | 15 | 27 | 20 | 29 | 288
B | 13 | 15 | 38 | 24 | 33 | 323
C | 14 | 16 | 41 | 27 | 38 | 382
D
E
F
G
Act. Cycle | 14 | 52 | 95 | 70
Nom. Cycle
Plan | #SP | #LP
1
2
3
4
5
6
7
8
Ped | Occ.
1
2
3
4
5
6
7
8
Av" = Total Time / Frequency
Av% = Total Phase Time / Total Cycle Time
OK
Print

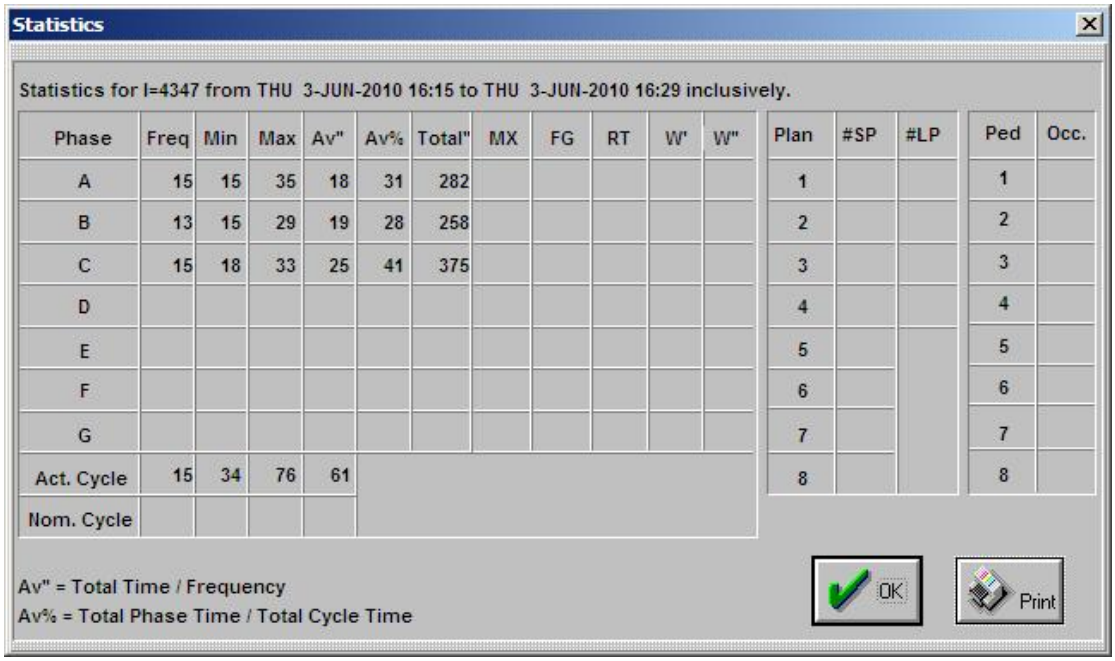

Statistics
Statistics for I=4347 from THU 3-JUN-2010 15:45 to THU 3-JUN-2010 16:00 inclusively.
Phase | Freq | Min | Max | Av" | Av% | Total" | MX | FG | RT | W' | W"
A | 14 | 15 | 27 | 18 | 27 | 260
B | 13 | 15 | 36 | 22 | 30 | 286
C | 14 | 17 | 49 | 29 | 43 | 413
D
E
F
G
Act. Cycle | 14 | 42 | 95 | 68
Nom. Cycle
Plan | #SP | #LP
1
2
3
4
5
6
7
8
Ped | Occ.
1
2
3
4
5
6
7
8
Av" = Total Time / Frequency
Av% = Total Phase Time / Total Cycle Time
OK
Print



Phase	Freq	Min	Max	Av"	Av%	Total"	MX	FG	RT	W'	W"
A	16	15	28	19	32	315					
B	13	16	37	22	29	290					
C	16	16	42	24	39	387					
D											
E											
F											
G											
Act. Cycle	16	32	89	62							
Nom. Cycle											

Plan	#SP	#LP
1		
2		
3		
4		
5		
6		
7		
8		

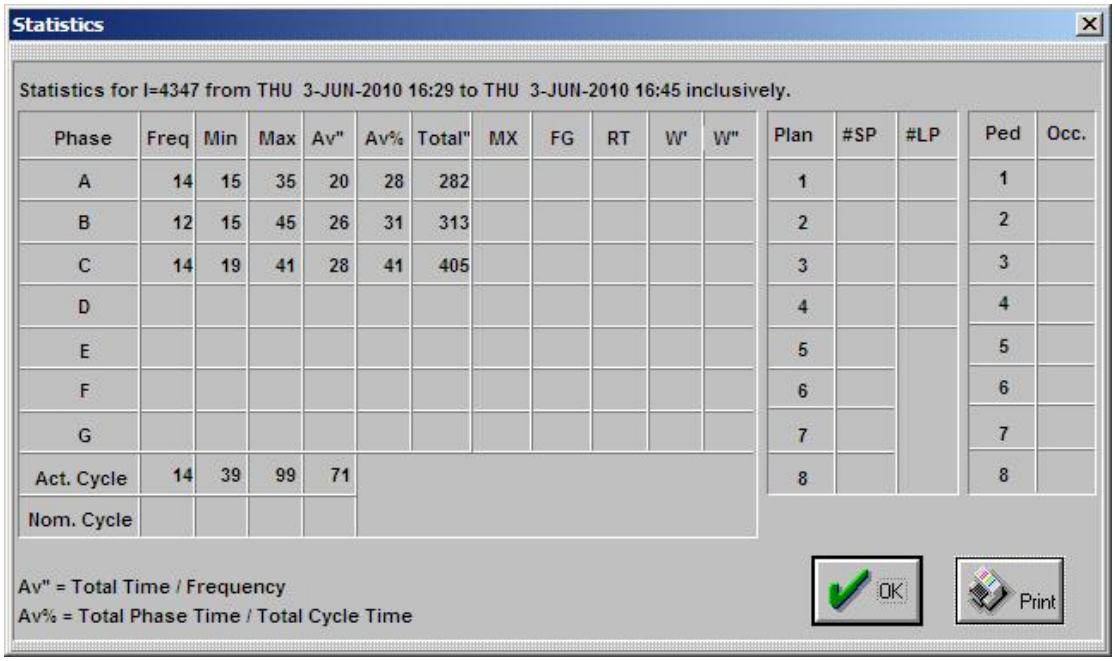
Ped	Occ.
1	
2	
3	
4	
5	
6	
7	
8	

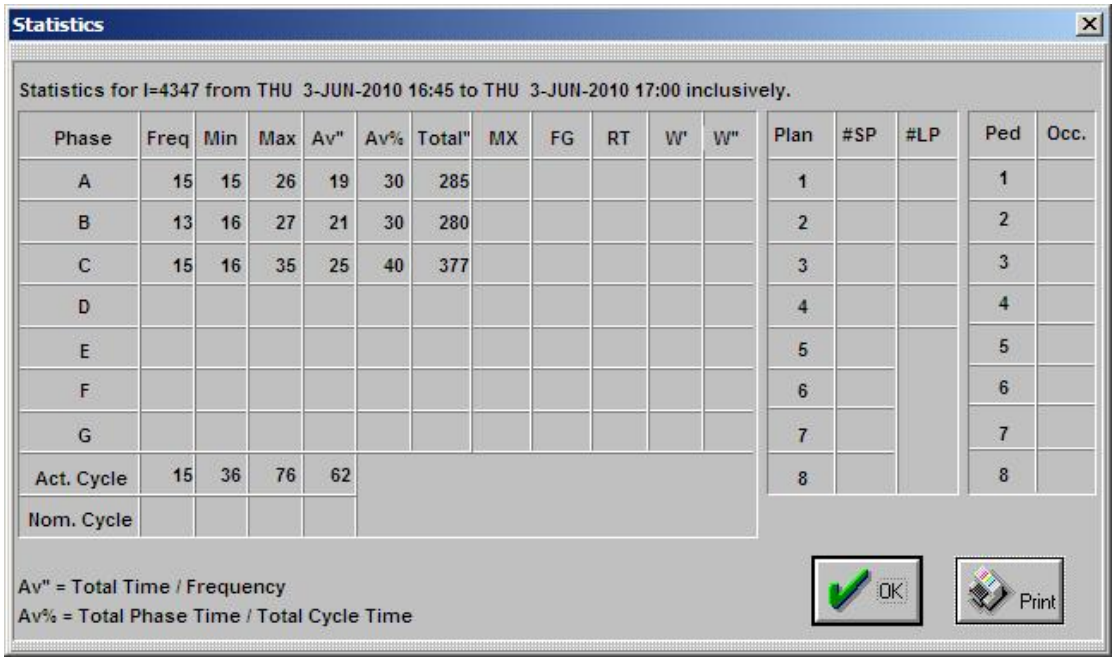


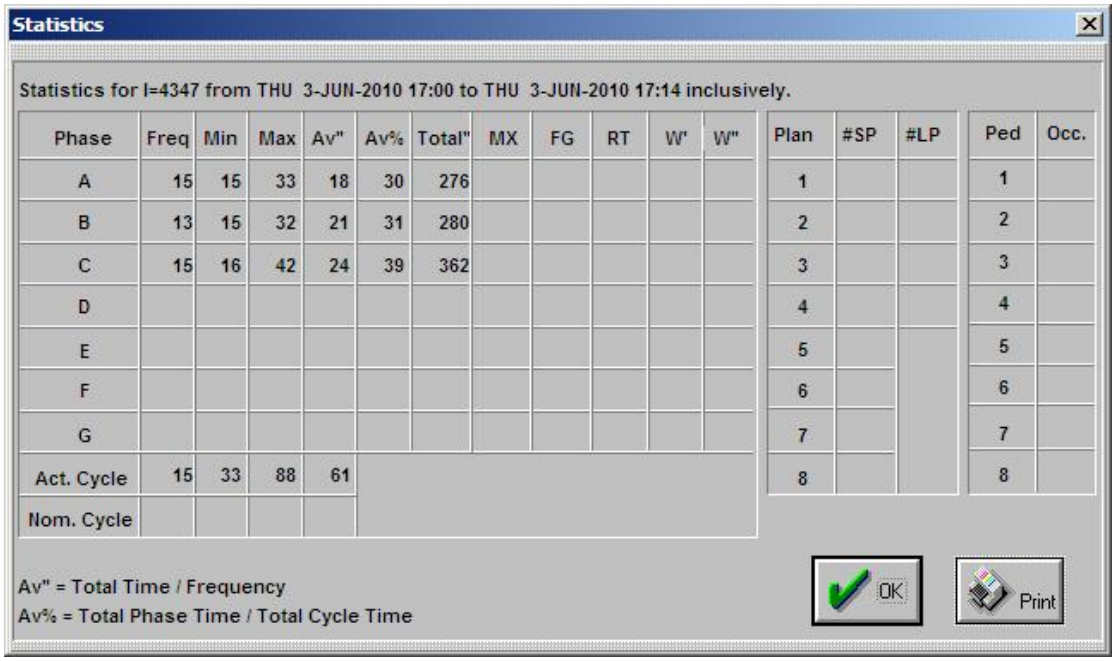
Phase	Freq	Min	Max	Av"	Av%	Total"	MX	FG	RT	W'	W"
A	15	15	35	18	31	282					
B	13	15	29	19	28	258					
C	15	18	33	25	41	375					
D											
E											
F											
G											
Act. Cycle	15	34	76	61							
Nom. Cycle											

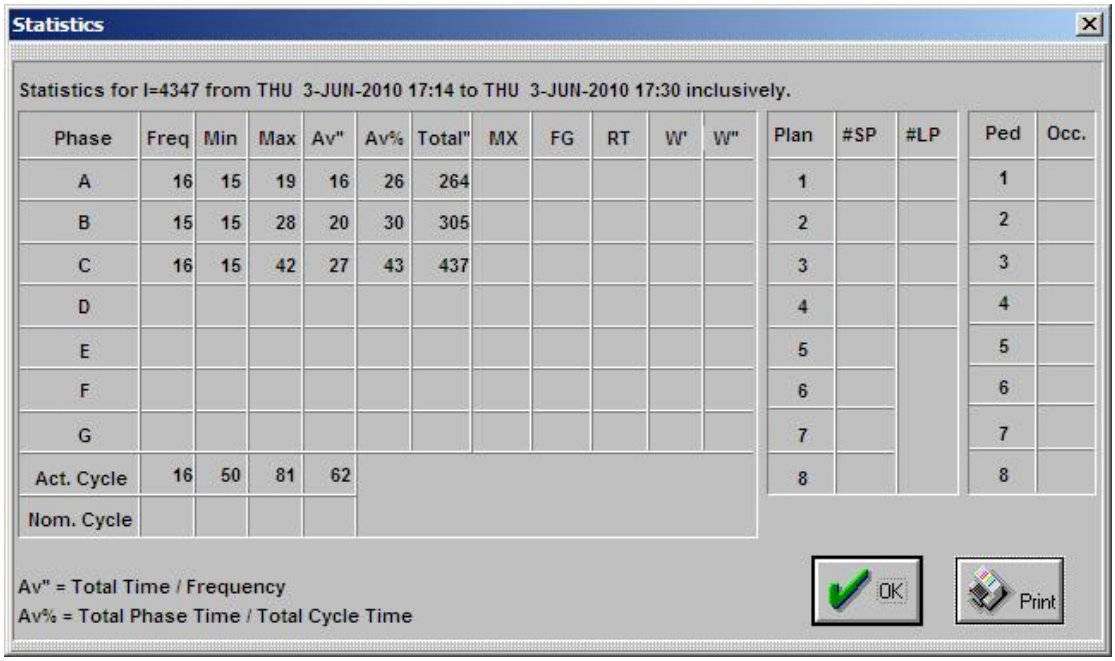
Plan	#SP	#LP
1		
2		
3		
4		
5		
6		
7		
8		

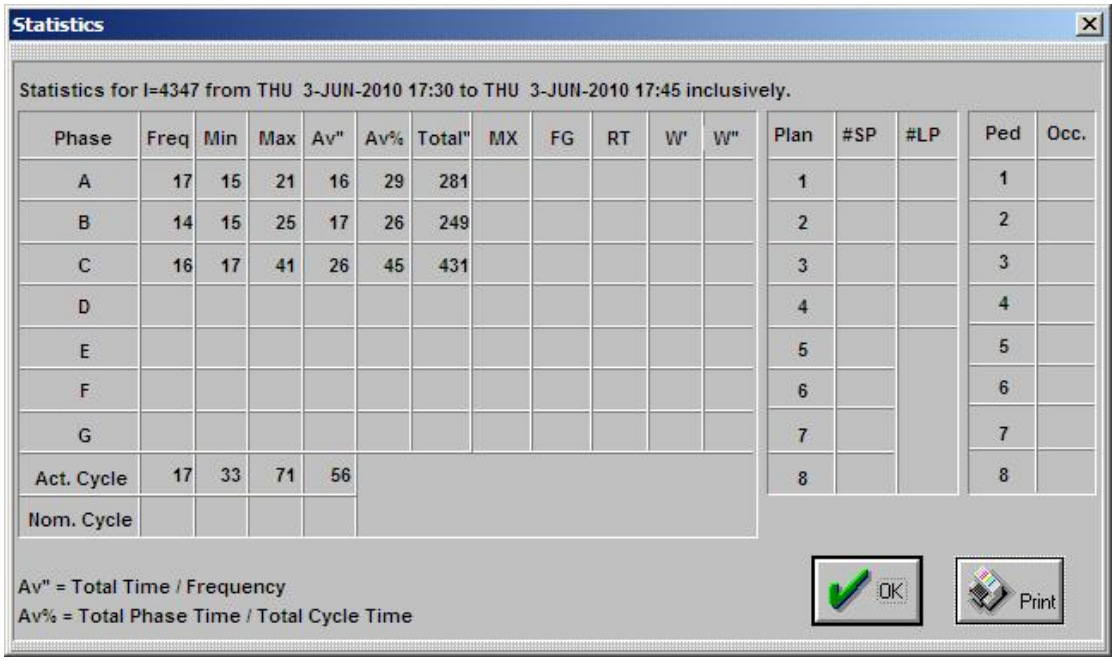
Ped	Occ.
1	
2	
3	
4	
5	
6	
7	
8	

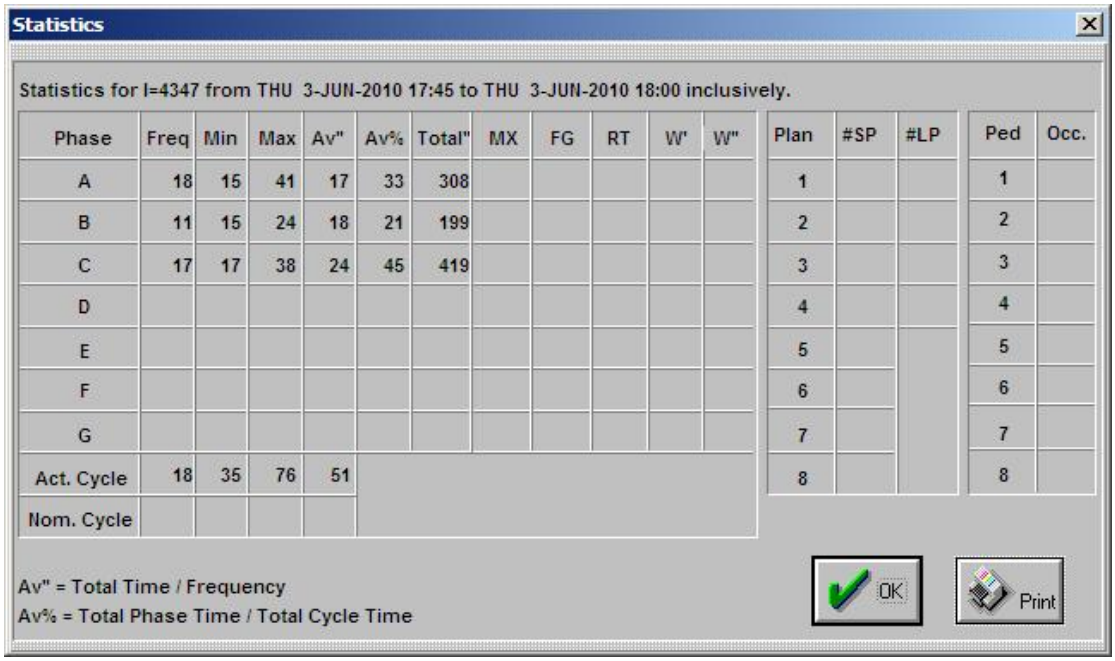

Statistics
Statistics for I=4347 from THU 3-JUN-2010 16:29 to THU 3-JUN-2010 16:45 inclusively.
Phase | Freq | Min | Max | Av" | Av% | Total" | MX | FG | RT | W' | W"
A | 14 | 15 | 35 | 20 | 28 | 282
B | 12 | 15 | 45 | 26 | 31 | 313
C | 14 | 19 | 41 | 28 | 41 | 405
D
E
F
G
Act. Cycle | 14 | 39 | 99 | 71
Nom. Cycle
Plan | #SP | #LP
1
2
3
4
5
6
7
8
Ped | Occ.
1
2
3
4
5
6
7
8
Av" = Total Time / Frequency
Av% = Total Phase Time / Total Cycle Time
OK
Print

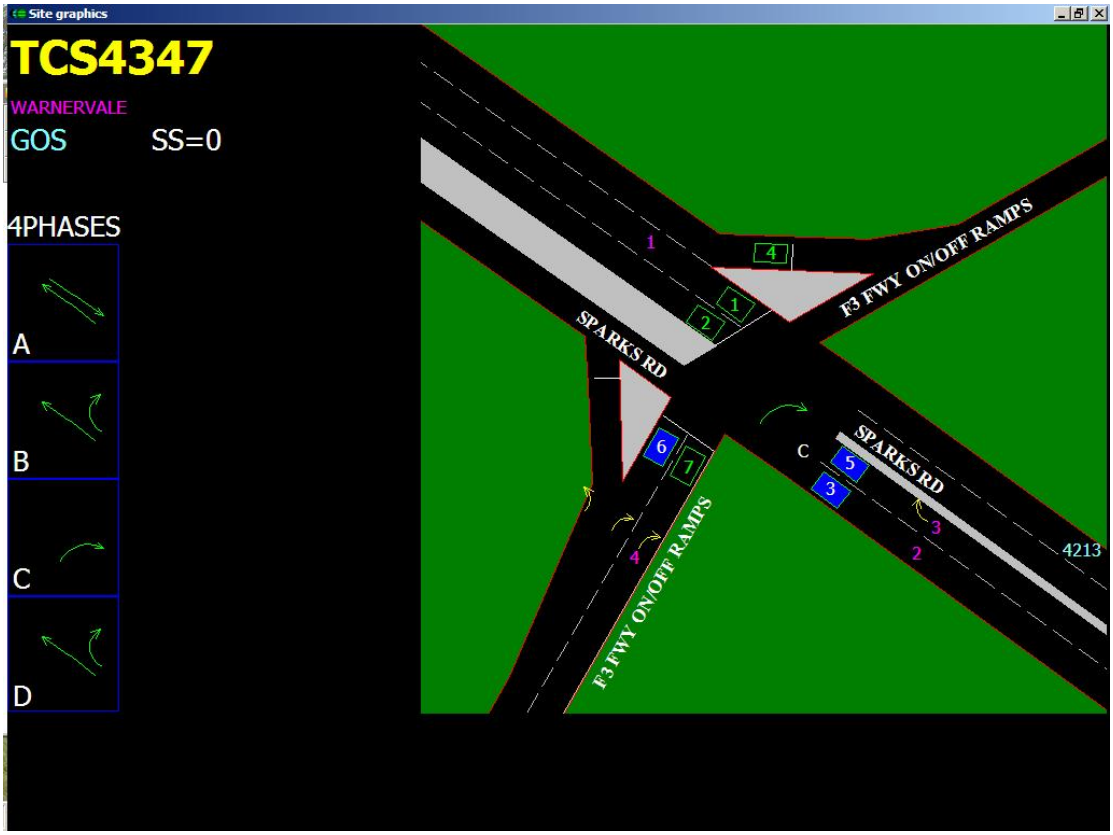

Statistics
Statistics for I=4347 from THU 3-JUN-2010 16:45 to THU 3-JUN-2010 17:00 inclusively.
Phase | Freq | Min | Max | Av" | Av% | Total" | MX | FG | RT | W' | W"
A | 15 | 15 | 26 | 19 | 30 | 285
B | 13 | 16 | 27 | 21 | 30 | 280
C | 15 | 16 | 35 | 25 | 40 | 377
D
E
F
G
Act. Cycle | 15 | 36 | 76 | 62
Nom. Cycle
Plan | #SP | #LP
1
2
3
4
5
6
7
8
Ped | Occ.
1
2
3
4
5
6
7
8
Av" = Total Time / Frequency
Av% = Total Phase Time / Total Cycle Time
OK
Print

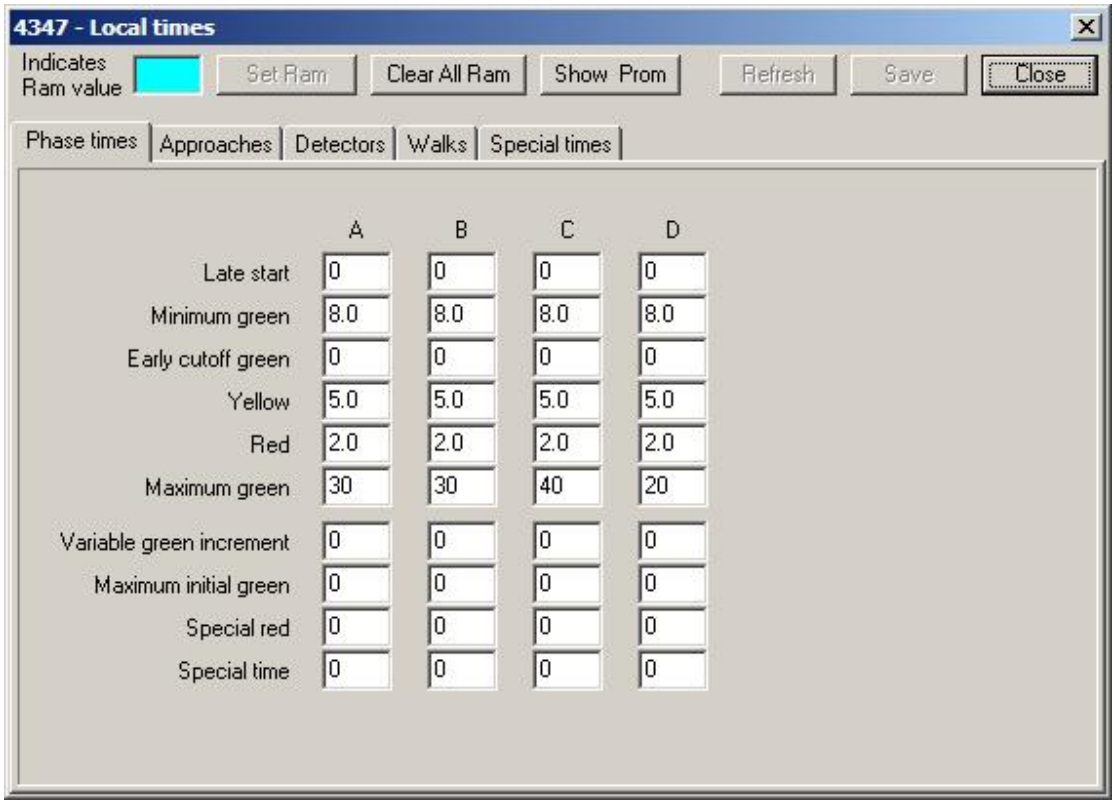

Statistics
Statistics for I=4347 from THU 3-JUN-2010 17:00 to THU 3-JUN-2010 17:14 inclusively.
Phase Freq Min Max Av" Av% Total" MX FG RT W' W"
A 15 15 33 18 30 276
B 13 15 32 21 31 280
C 15 16 42 24 39 362
D
E
F
G
Act. Cycle 15 33 88 61
Nom. Cycle
Plan #SP #LP
1
2
3
4
5
6
7
8
Ped Occ.
1
2
3
4
5
6
7
8
Av" = Total Time / Frequency
Av% = Total Phase Time / Total Cycle Time
OK
Print

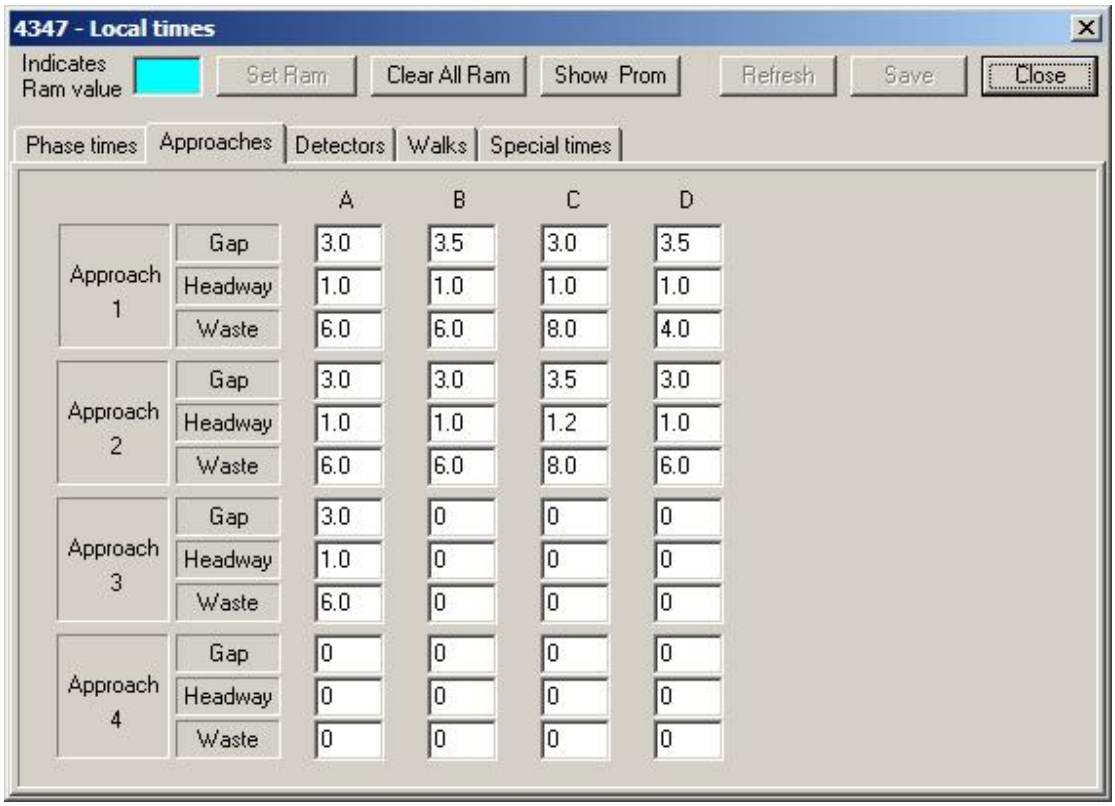

Statistics
Statistics for I=4347 from THU 3-JUN-2010 17:14 to THU 3-JUN-2010 17:30 inclusively.
Phase Freq Min Max Av" Av% Total" MX FG RT W' W"
A 16 15 19 16 26 264
B 15 15 28 20 30 305
C 16 15 42 27 43 437
D
E
F
G
Act. Cycle 16 50 81 62
Nom. Cycle
Plan #SP #LP
1
2
3
4
5
6
7
8
Ped Occ.
1
2
3
4
5
6
7
8
Av" = Total Time / Frequency
Av% = Total Phase Time / Total Cycle Time
OK
Print


Statistics
Statistics for I=4347 from THU 3-JUN-2010 17:30 to THU 3-JUN-2010 17:45 inclusively.
Phase | Freq | Min | Max | Av" | Av% | Total" | MX | FG | RT | W' | W"
A | 17 | 15 | 21 | 16 | 29 | 281
B | 14 | 15 | 25 | 17 | 26 | 249
C | 16 | 17 | 41 | 26 | 45 | 431
D
E
F
G
Act. Cycle | 17 | 33 | 71 | 56
Nom. Cycle
Plan | #SP | #LP
1
2
3
4
5
6
7
8
Ped | Occ.
1
2
3
4
5
6
7
8
Av" = Total Time / Frequency
Av% = Total Phase Time / Total Cycle Time
OK
Print


Statistics
Statistics for I=4347 from THU 3-JUN-2010 17:45 to THU 3-JUN-2010 18:00 inclusively.
Phase | Freq | Min | Max | Av" | Av% | Total" | MX | FG | RT | W' | W"
A | 18 | 15 | 41 | 17 | 33 | 308
B | 11 | 15 | 24 | 18 | 21 | 199
C | 17 | 17 | 38 | 24 | 45 | 419
D
E
F
G
Act. Cycle | 18 | 35 | 76 | 51
Nom. Cycle
Plan | #SP | #LP
1
2
3
4
5
6
7
8
Ped | Occ.
1
2
3
4
5
6
7
8
Av" = Total Time / Frequency
Av% = Total Phase Time / Total Cycle Time
OK
Print


Site graphics
TCS4347
WARNERVALE
GOS
SS=0
4PHASES
A
B
C
D
SPARKS RD
F3 FWY ON/OFF RAMPS
SPARKS RD
F3 FWY ON/OFF RAMPS
4213


4347 - Local times
Indicates Ram value
Set Ram
Clear All Ram
Show Prom
Refresh
Save
Close
Phase times
Approaches
Detectors
Walks
Special times
A
B
C
D
Late start 0 0 0 0
Minimum green 8.0 8.0 8.0 8.0
Early cutoff green 0 0 0 0
Yellow 5.0 5.0 5.0 5.0
Red 2.0 2.0 2.0 2.0
Maximum green 30 30 40 20
Variable green increment 0 0 0 0
Maximum initial green 0 0 0 0
Special red 0 0 0 0
Special time 0 0 0 0


4347 - Local times
Indicates Ram value
Set Ram
Clear All Ram
Show Prom
Refresh
Save
Close
Phase times
Approaches
Detectors
Walks
Special times
A
B
C
D
Approach 1
Gap 3.0 3.5 3.0 3.5
Headway 1.0 1.0 1.0 1.0
Waste 6.0 6.0 8.0 4.0
Approach 2
Gap 3.0 3.0 3.5 3.0
Headway 1.0 1.0 1.2 1.0
Waste 6.0 6.0 8.0 6.0
Approach 3
Gap 3.0 0 0 0
Headway 1.0 0 0 0
Waste 6.0 0 0 0
Approach 4
Gap 0 0 0 0
Headway 0 0 0 0
Waste 0 0 0 0

Appendix B

Distribution by time of day

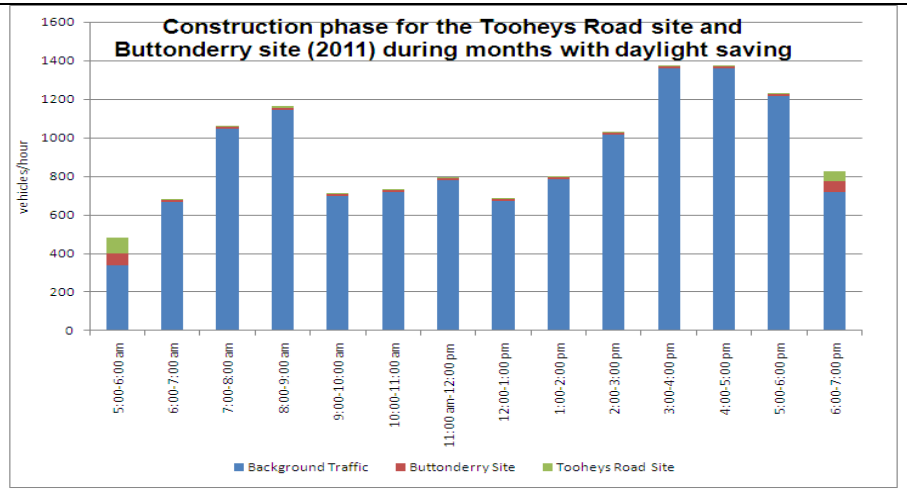
Selection of peak hours at key intersections by assessment years

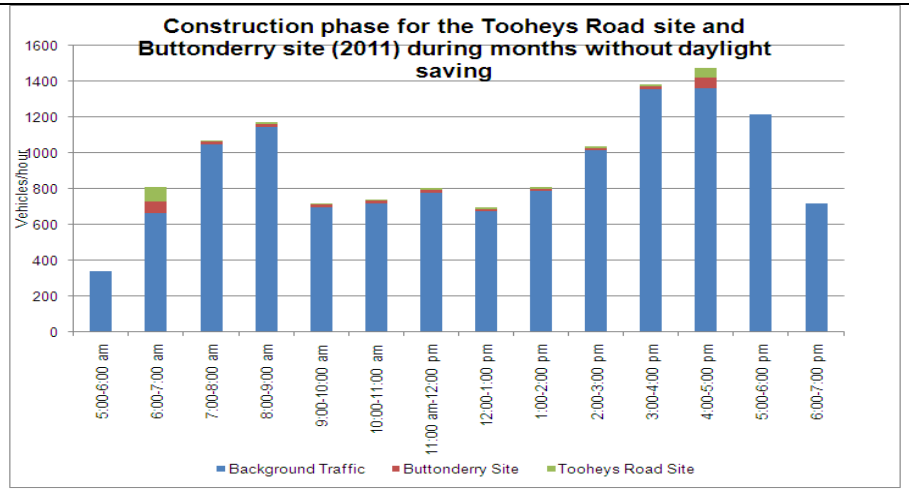
One-hour intervals were used to match with the traffic associated with working shift hours at the mine sites and Precinct 14.

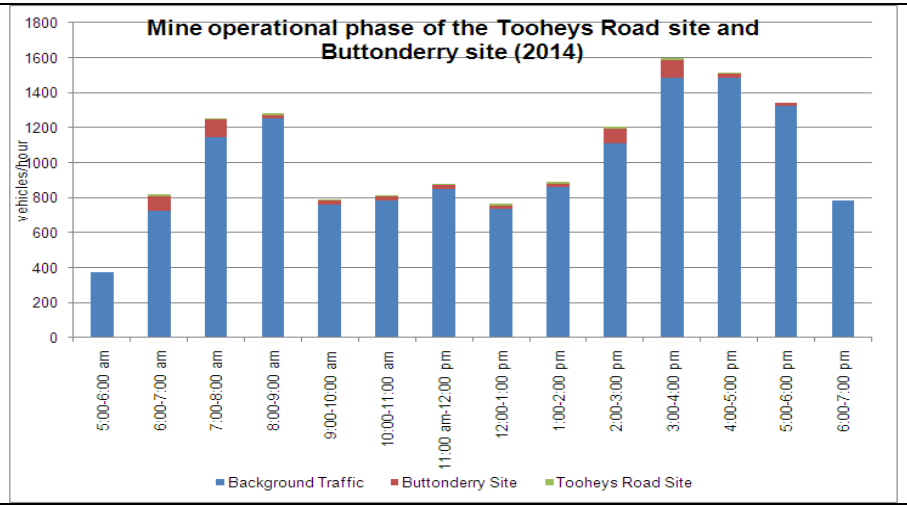
A conversion factor was derived based on the tube count data to estimate the background traffic demand between 5:00 am and 6:00 am. This is because intersection volumes were not collected during this hour in the intersection count survey.

Sydney–Newcastle Fwy/ Sparks Rd interchange (western side)

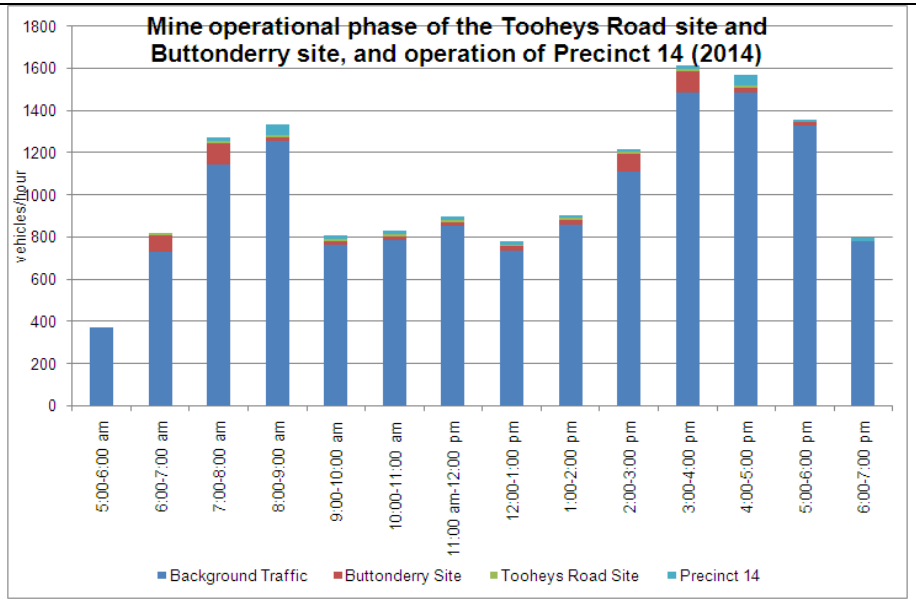
Sydney–Newcastle Fwy/ Sparks Rd interchange (western side)

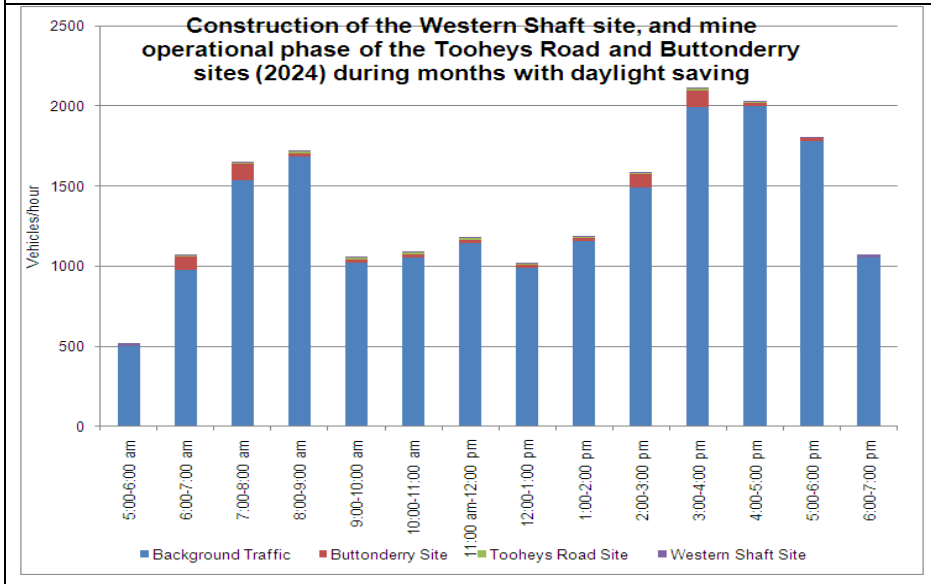


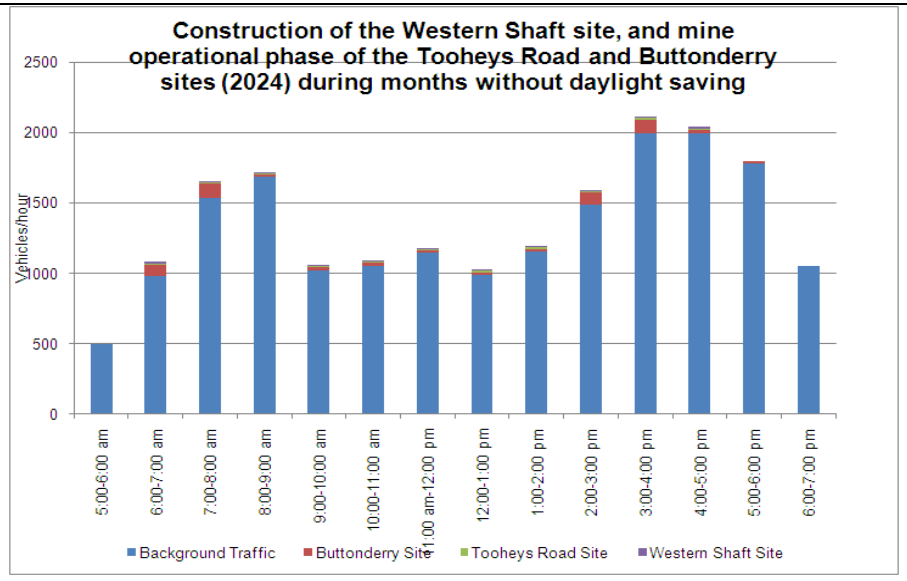


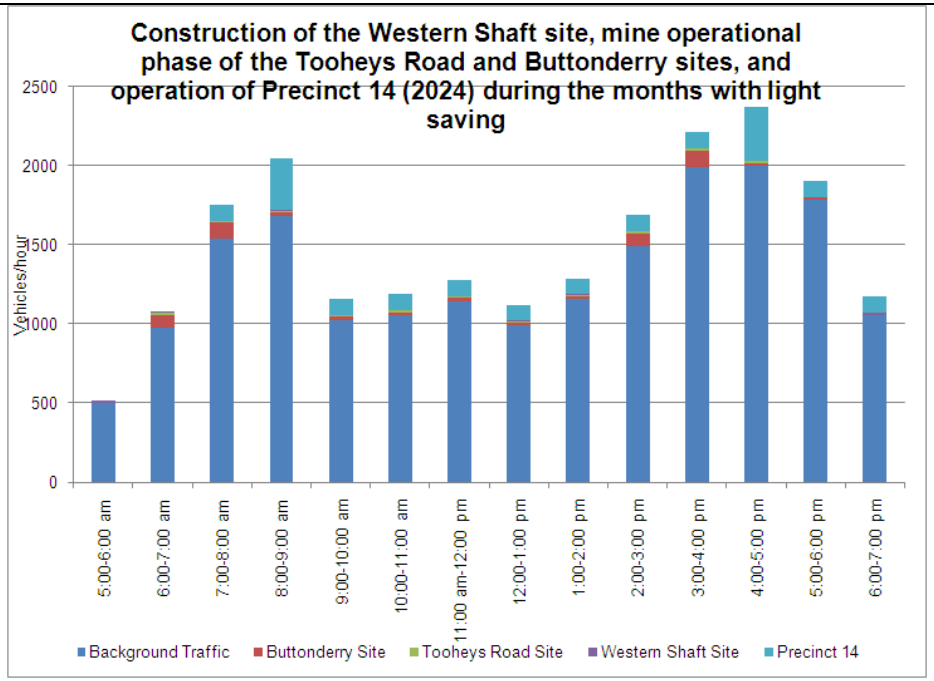
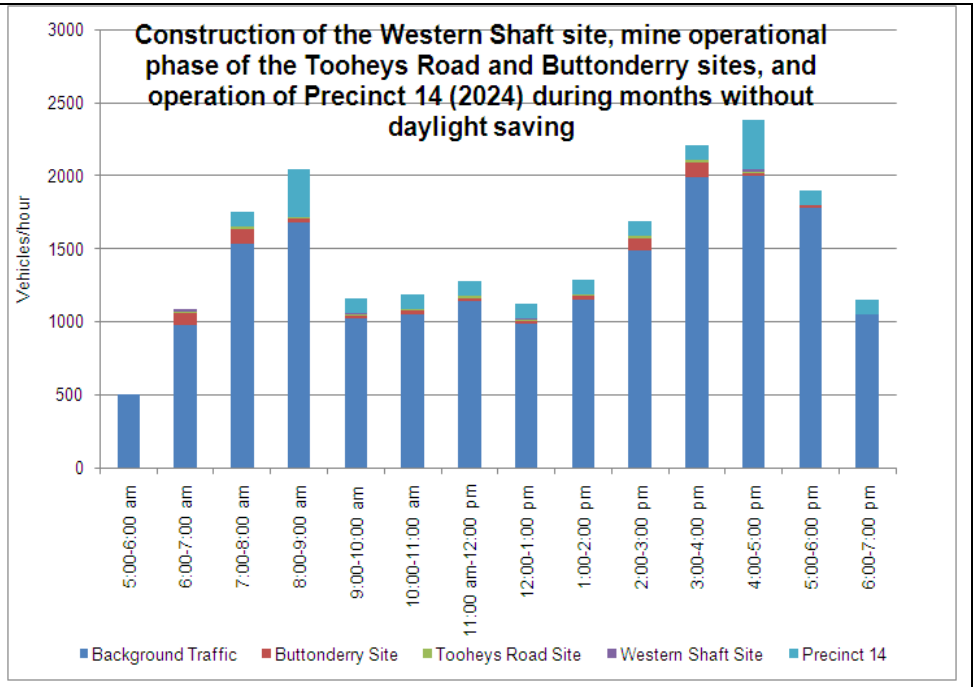


Sydney–Newcastle Fwy/ Sparks Rd interchange (western side)



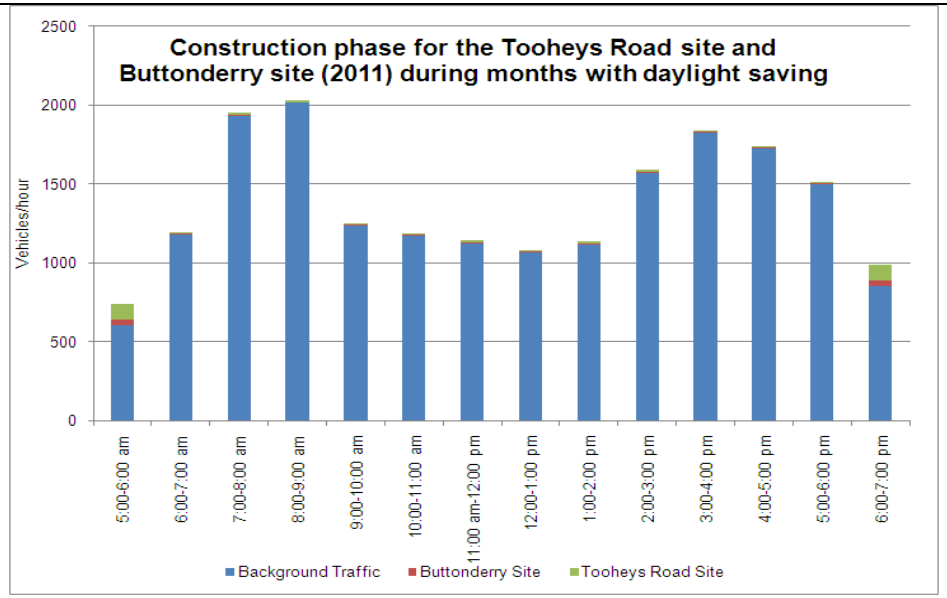


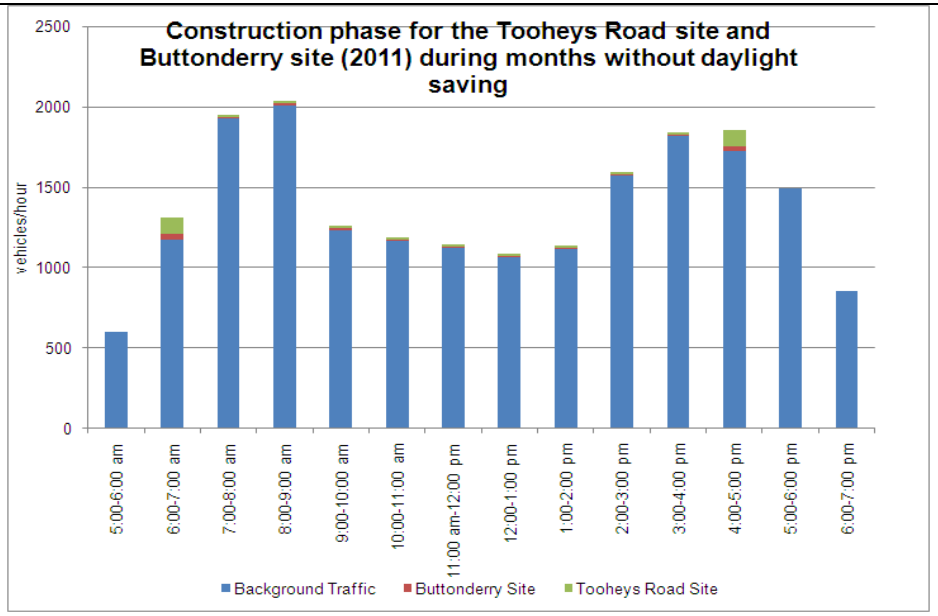


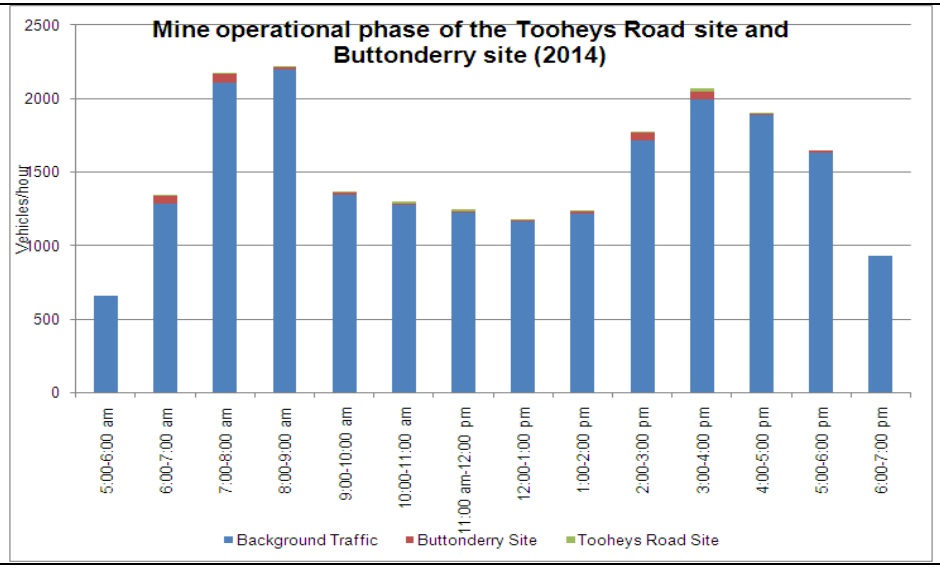
Sydney–Newcastle Fwy/ Sparks Rd interchange (western side)		

Sydney–Newcastle Fwy/ Sparks Rd interchange (eastern side)

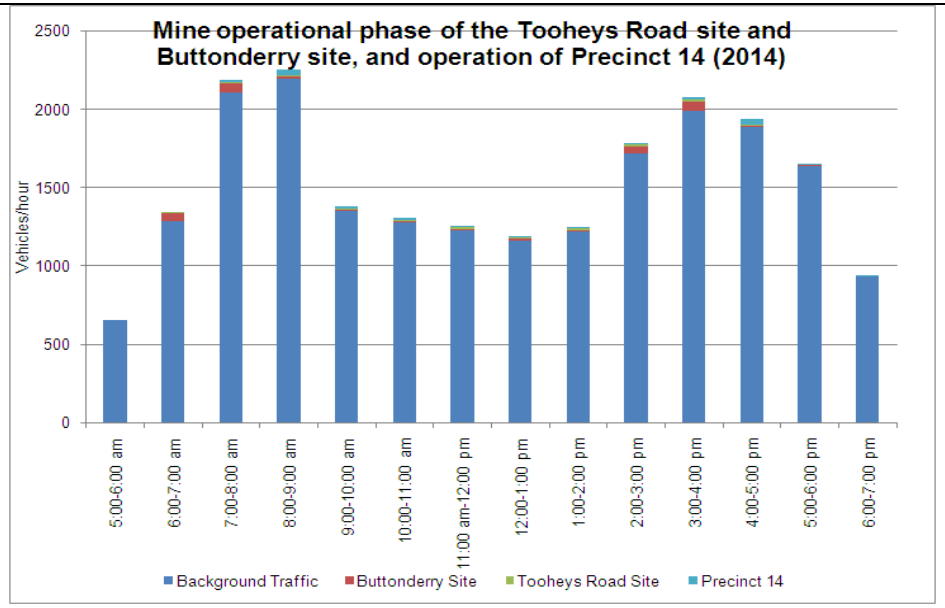
Sydney–Newcastle Fwy/ Sparks Rd interchange (eastern side)

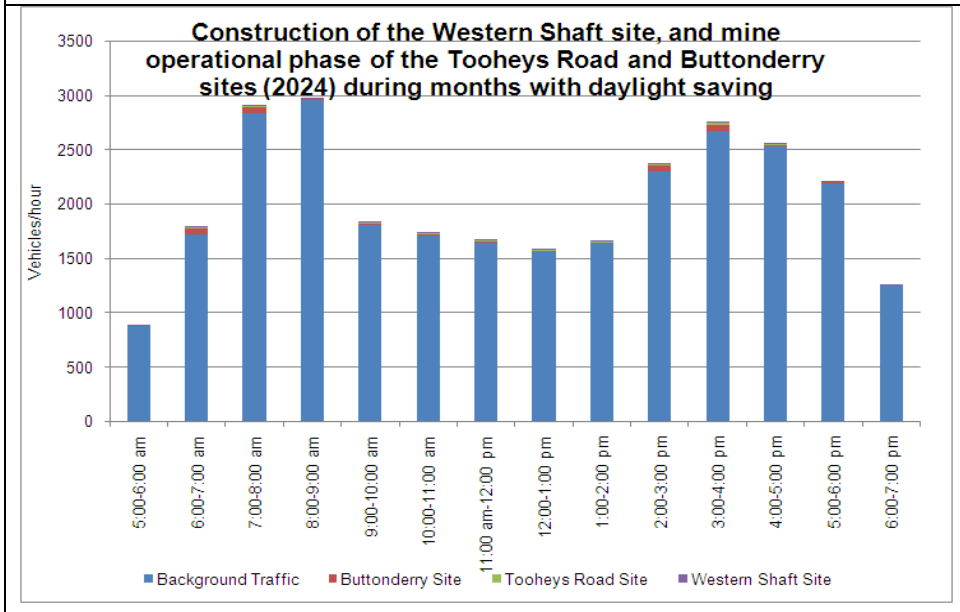


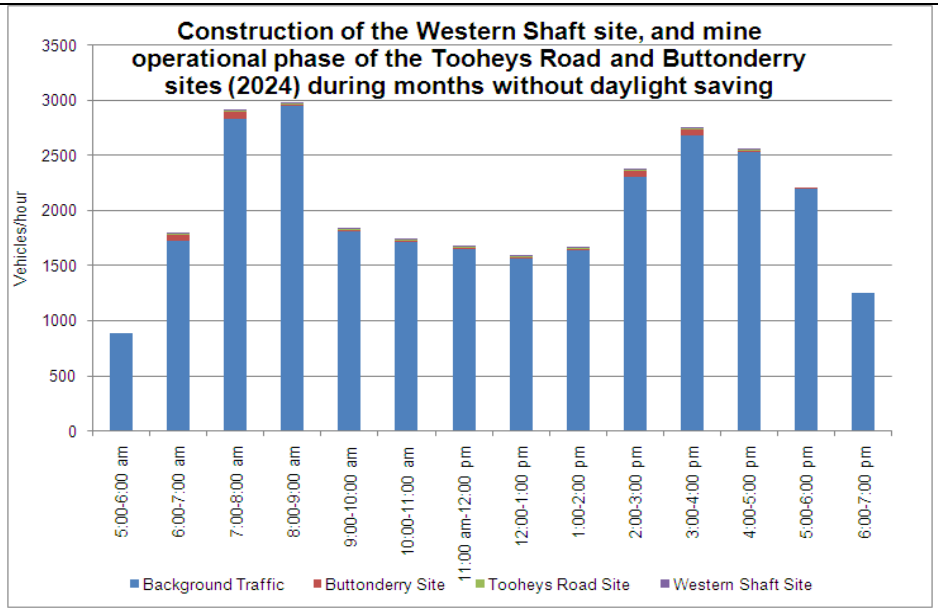


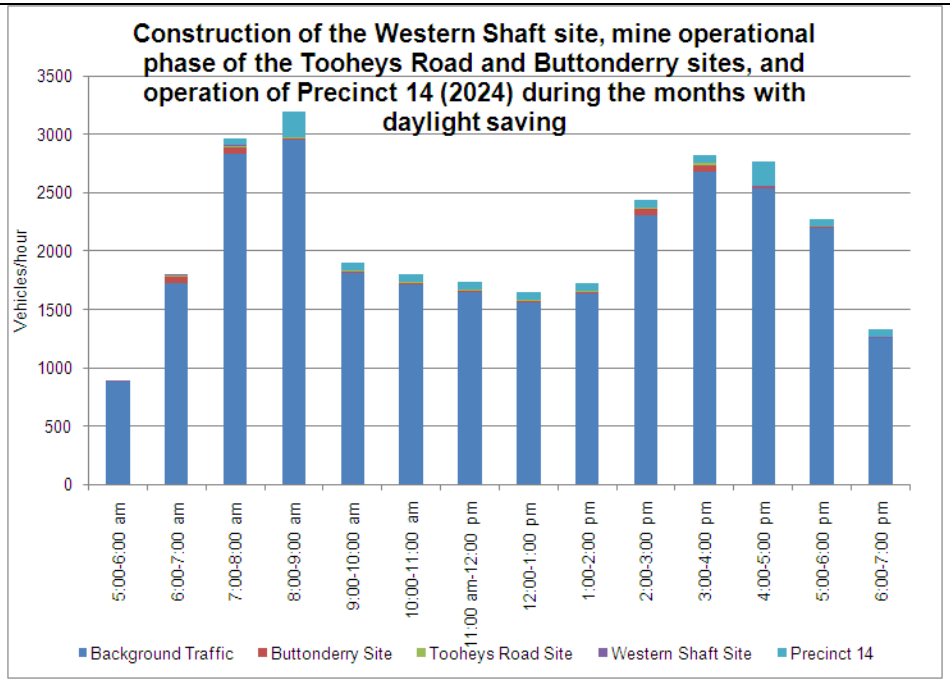
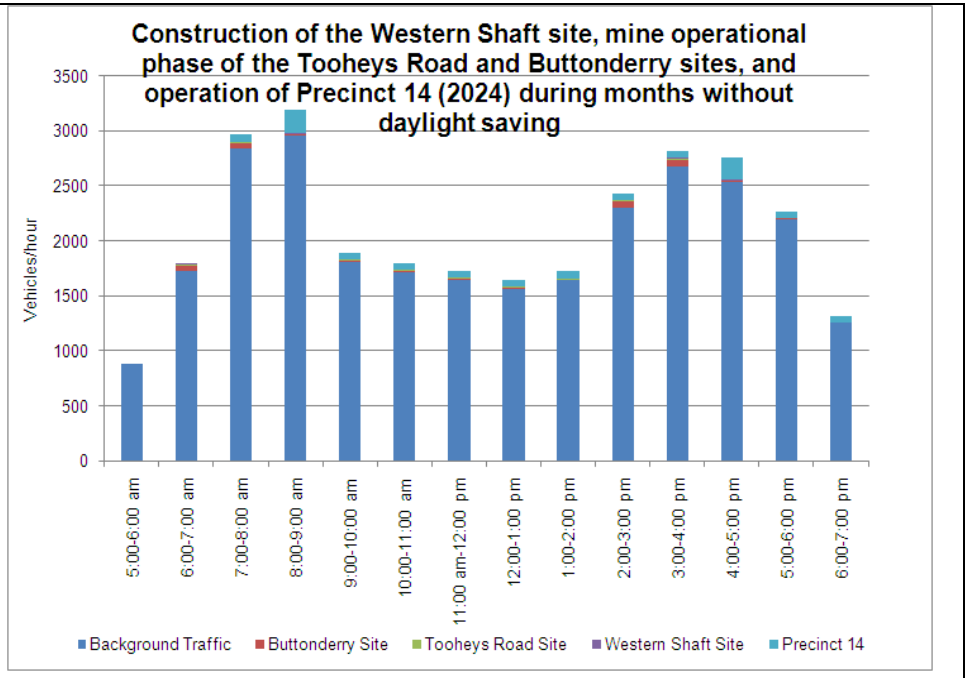


Sydney–Newcastle Fwy/ Sparks Rd interchange (eastern side)

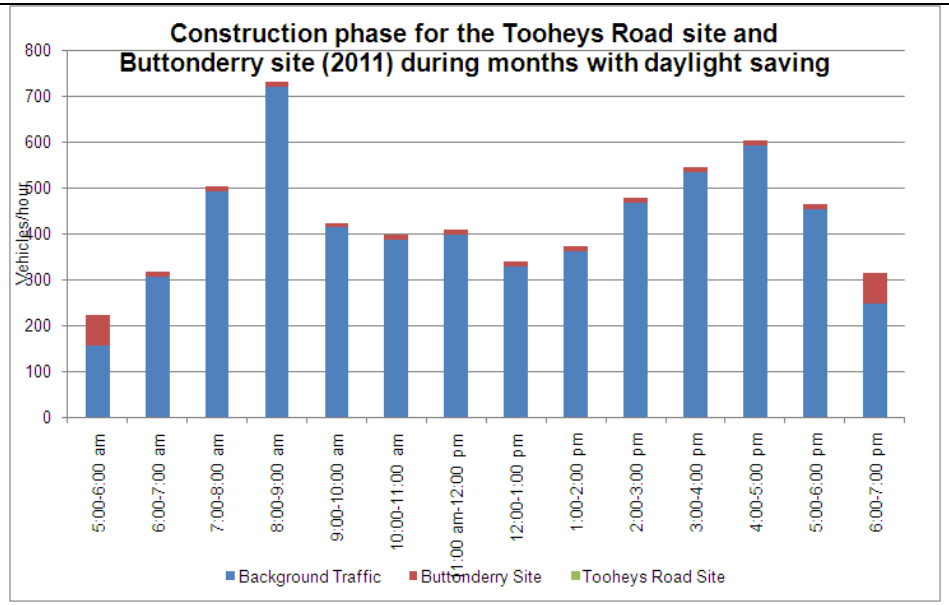
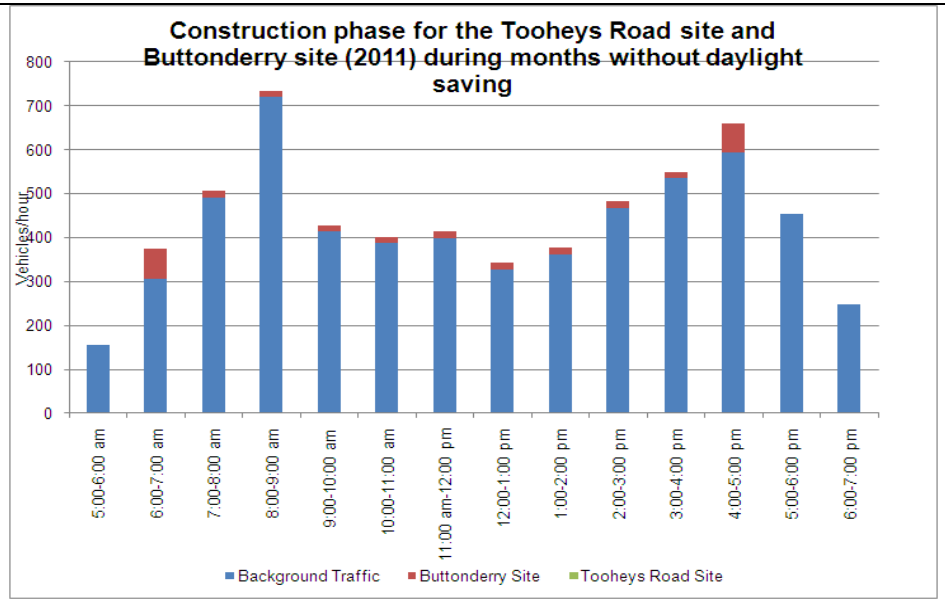
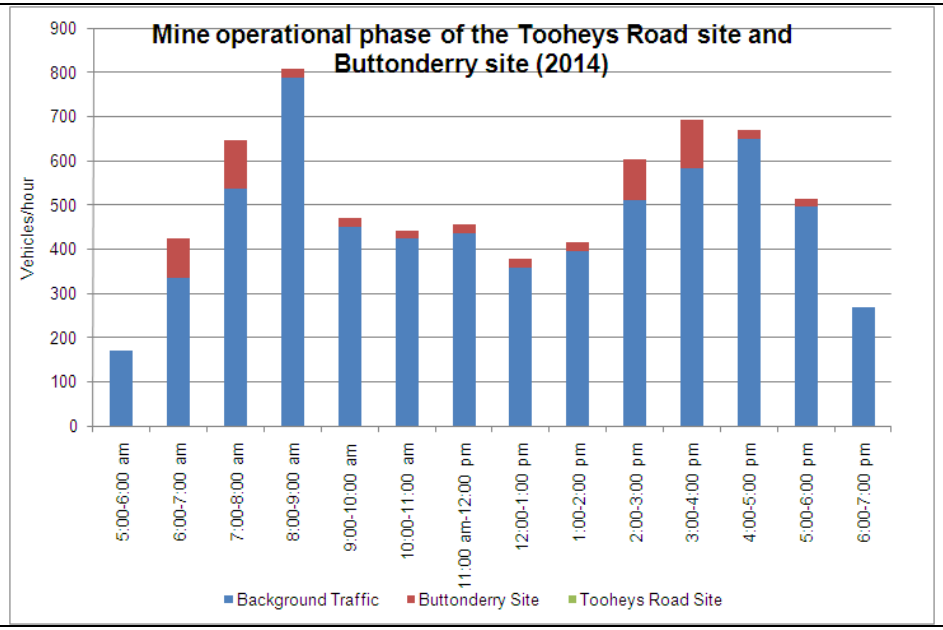




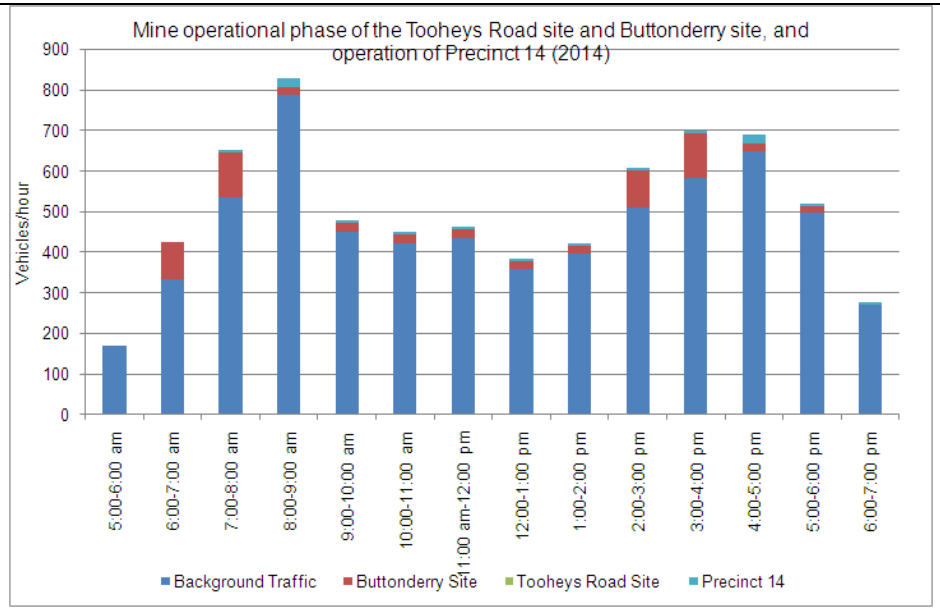


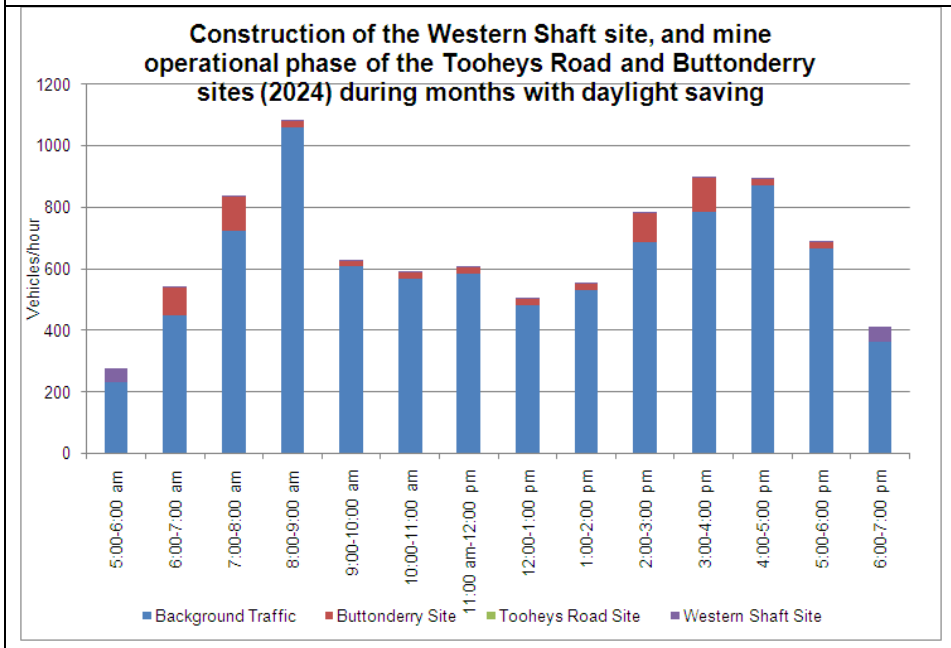
Sydney–Newcastle Fwy/ Sparks Rd interchange (eastern side)		

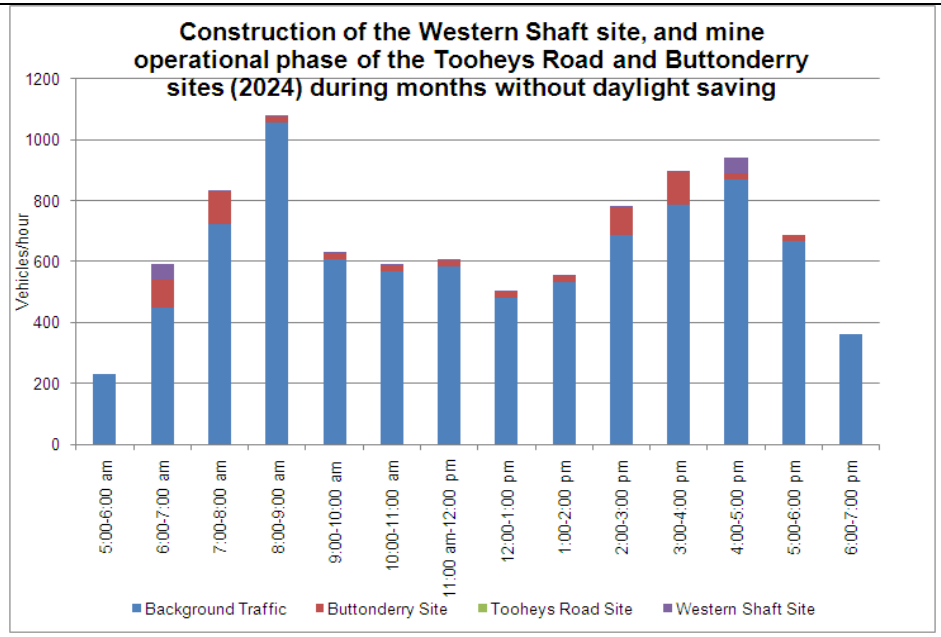
Sparks Rd/Hue Hue Rd

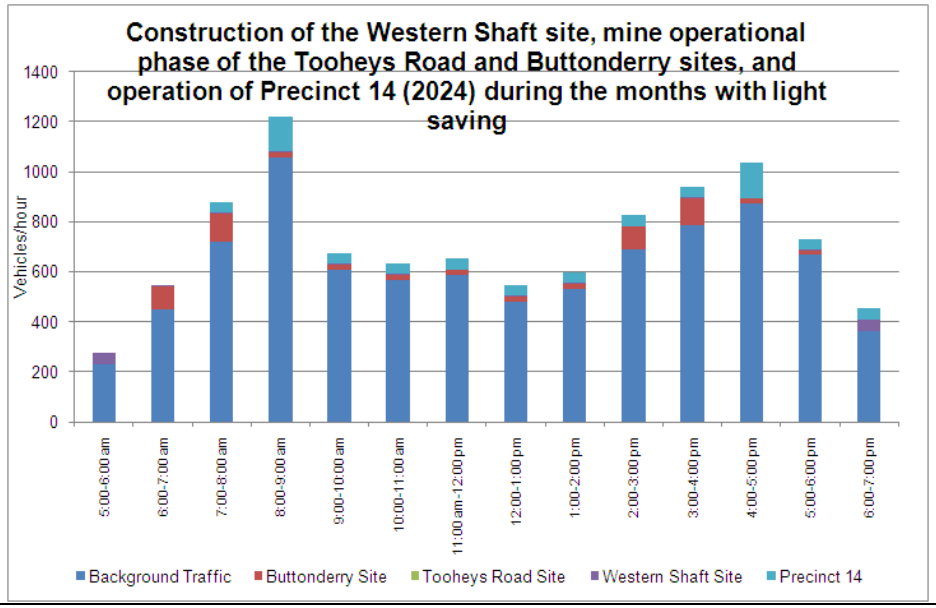
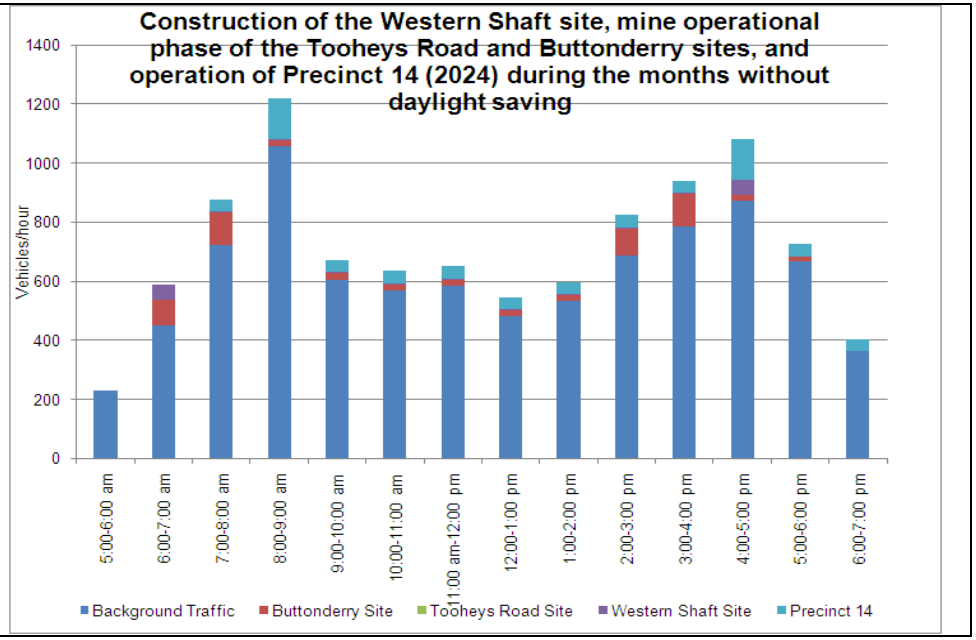
Sparks Rd/Hue Hue Rd		
		

Sparks Rd/Hue Hue Rd

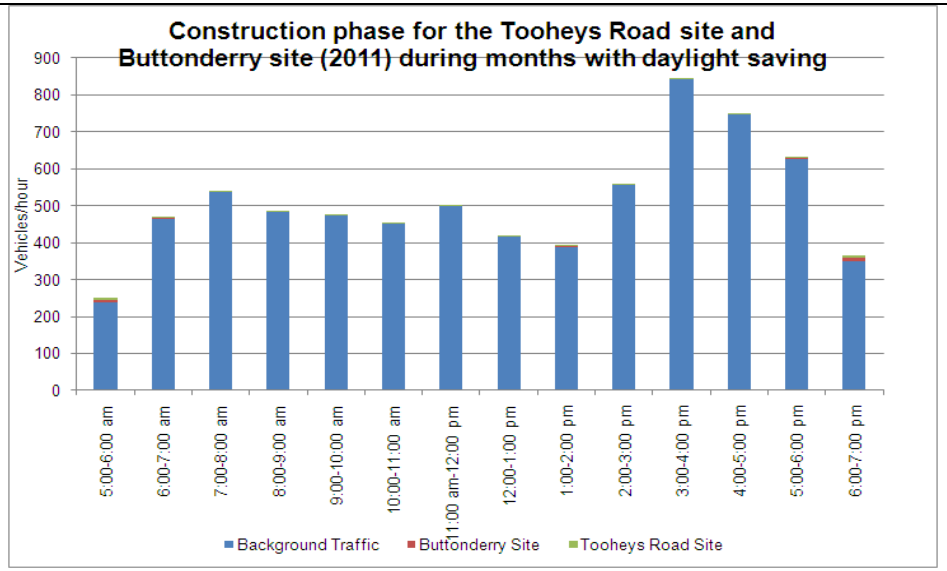
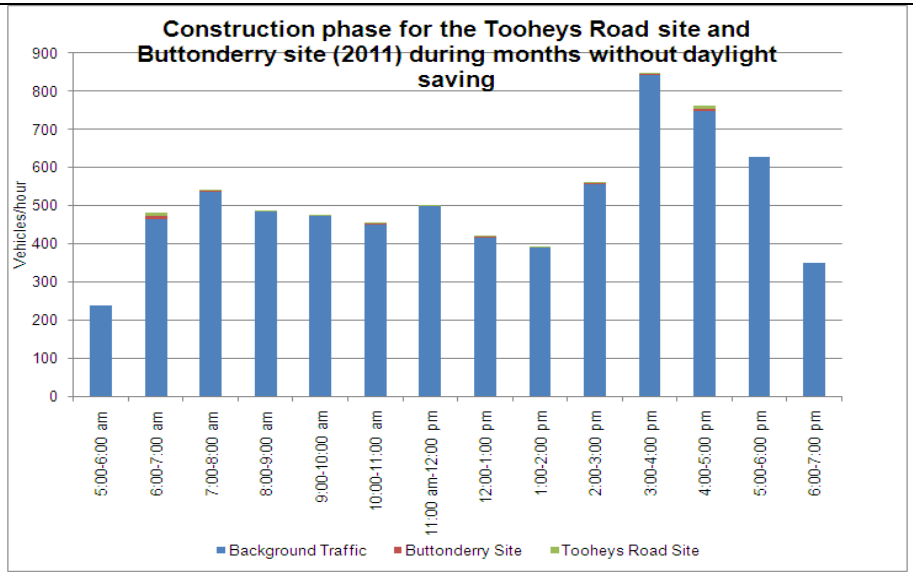
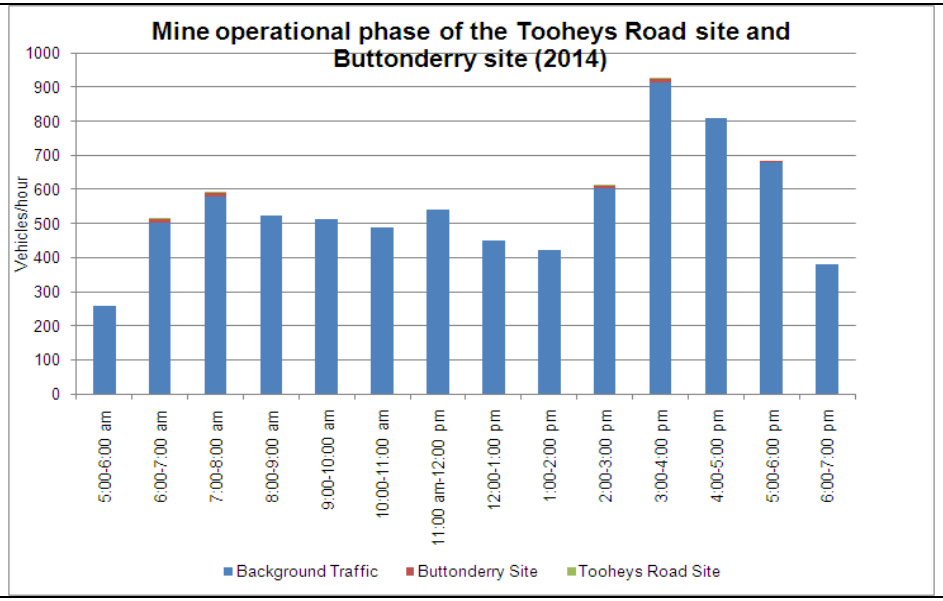




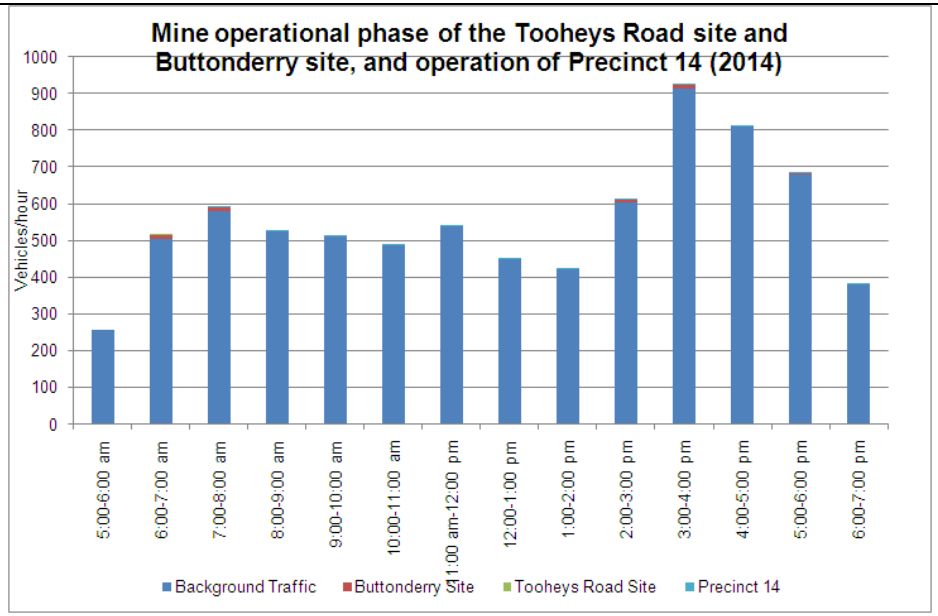


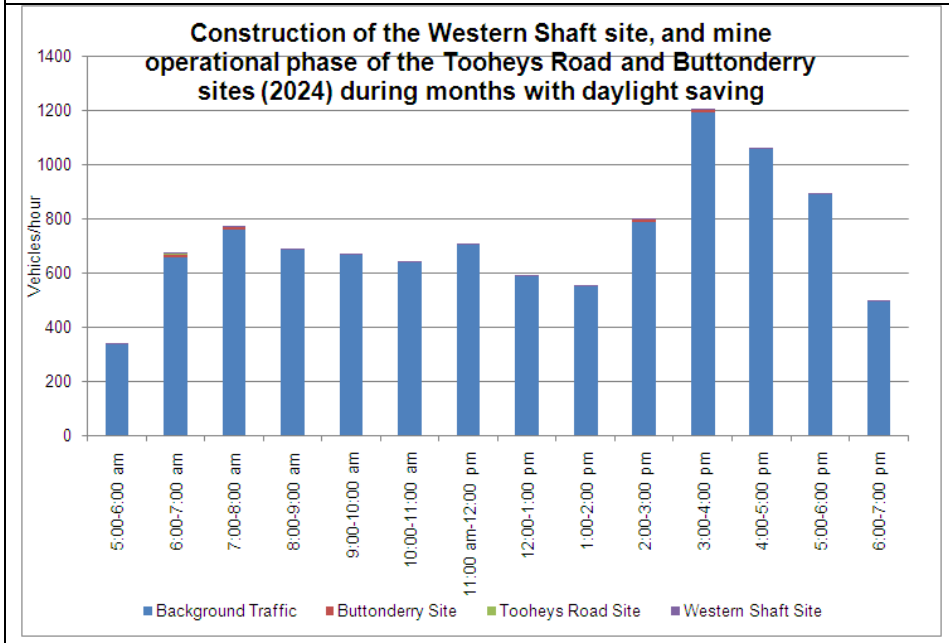
Sparks Rd/Hue Hue Rd		

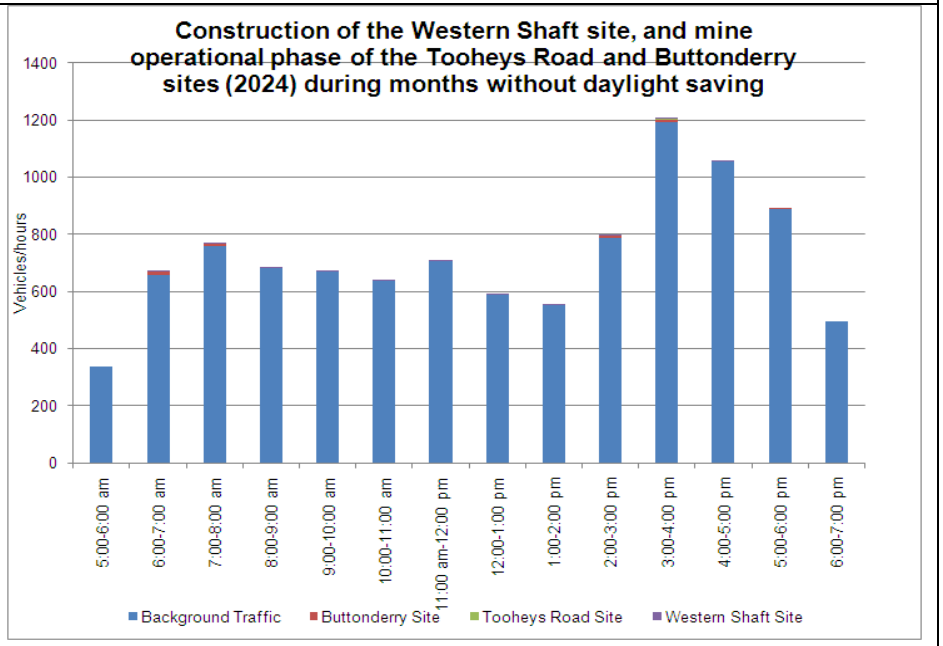
Hue Hue Rd/Wyee Rd

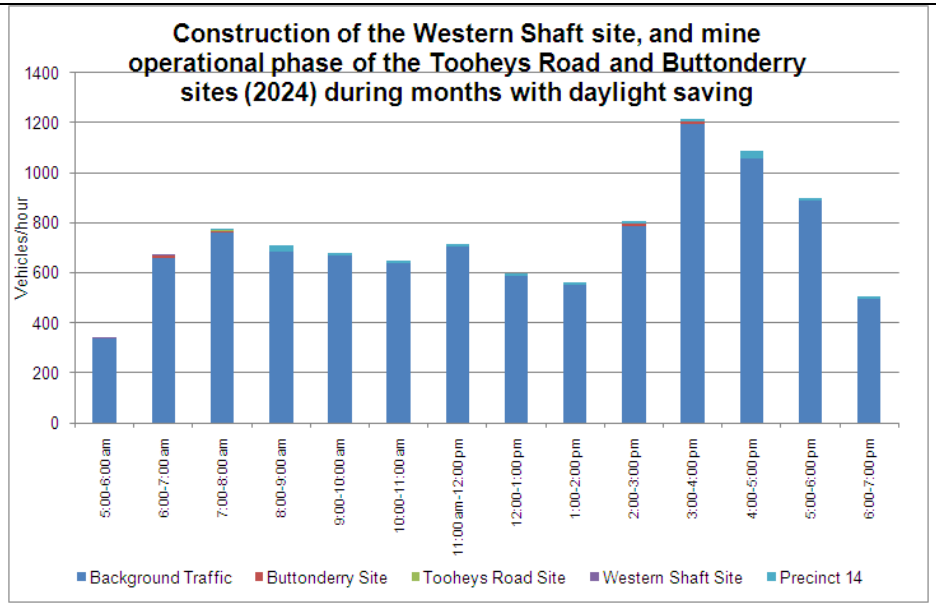
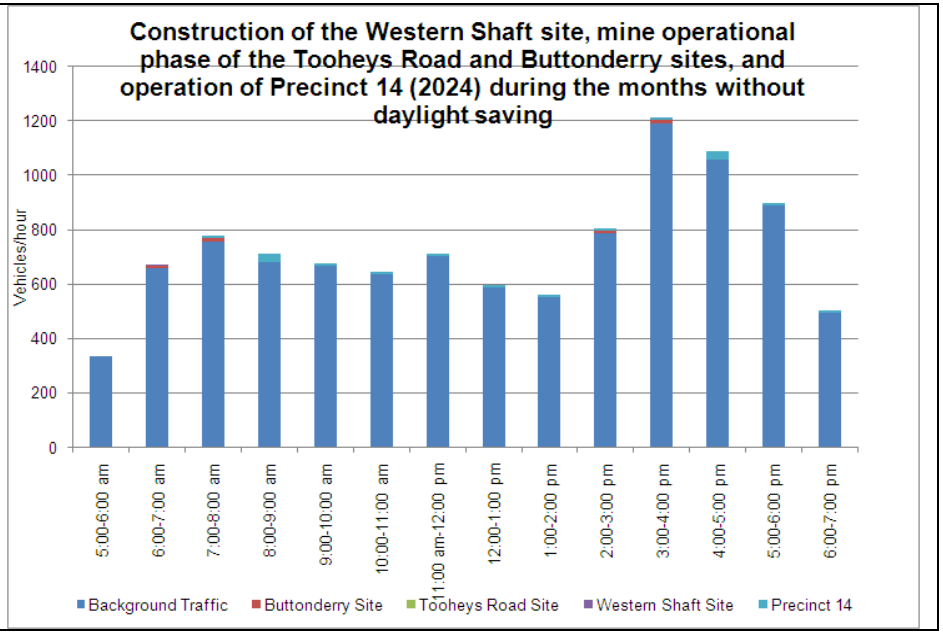
Hue Hue Rd/Wyee Rd		
		

Hue Hue Rd/Wyee Rd



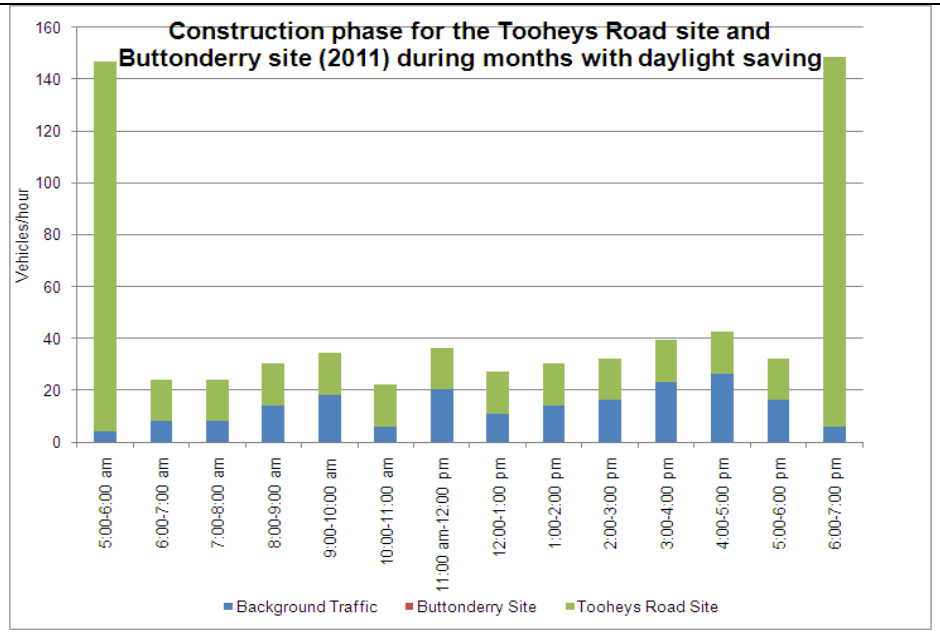


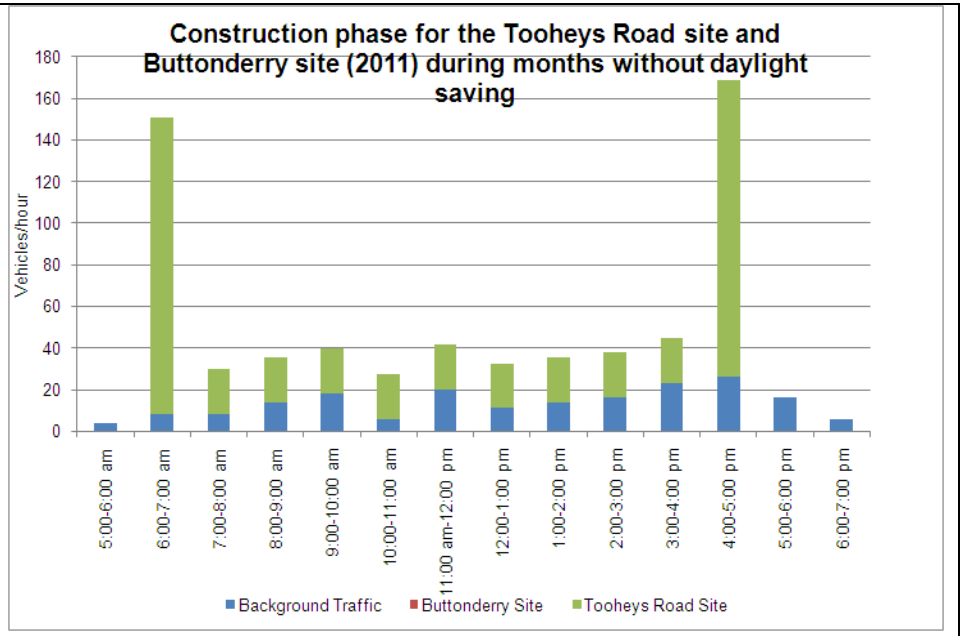


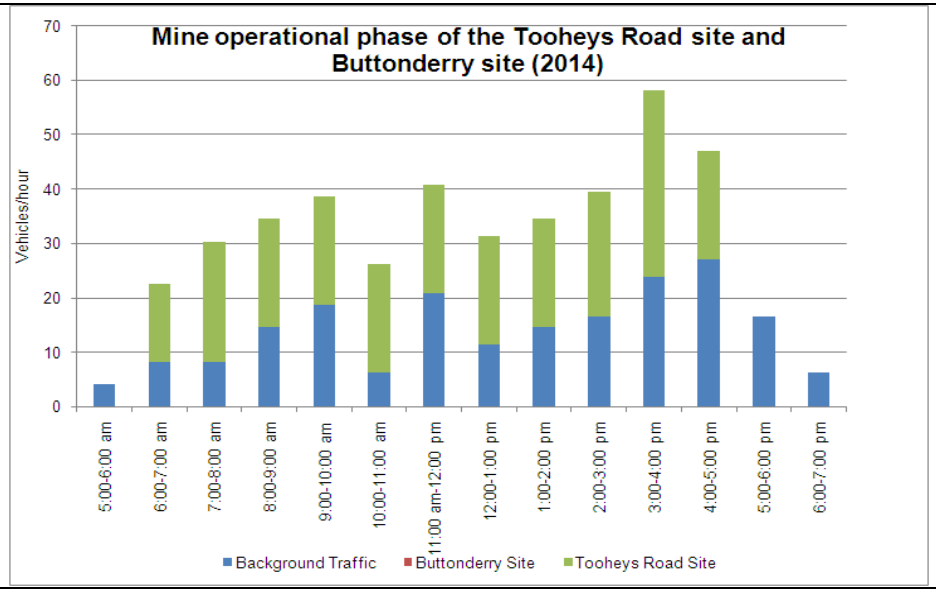
Hue Hue Rd/Wyee Rd		

Motorway Link Rd/ Tooheys Rd interchange (north side of the interchange)

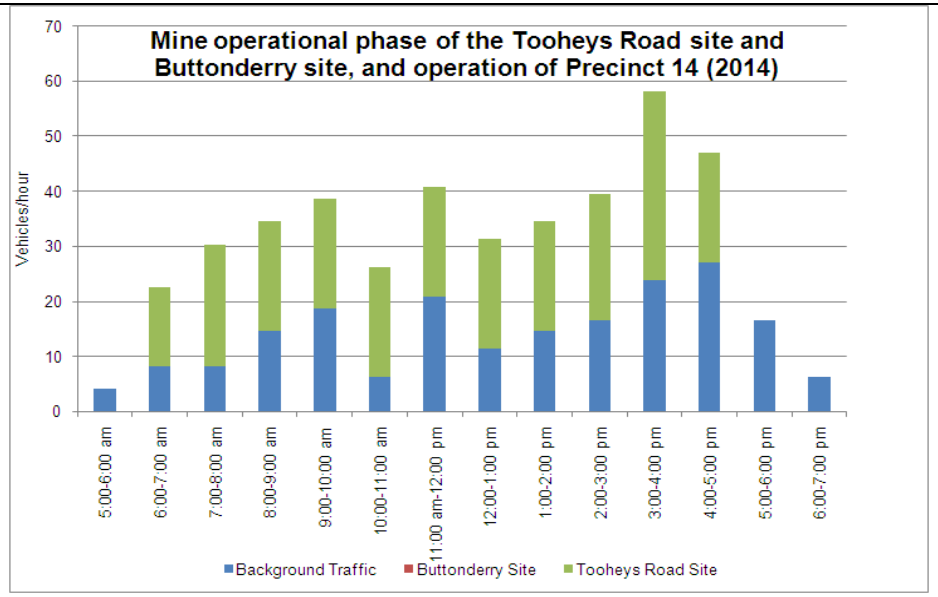
Motorway Link Rd/ Tooheys Rd interchange (north side of the interchange)

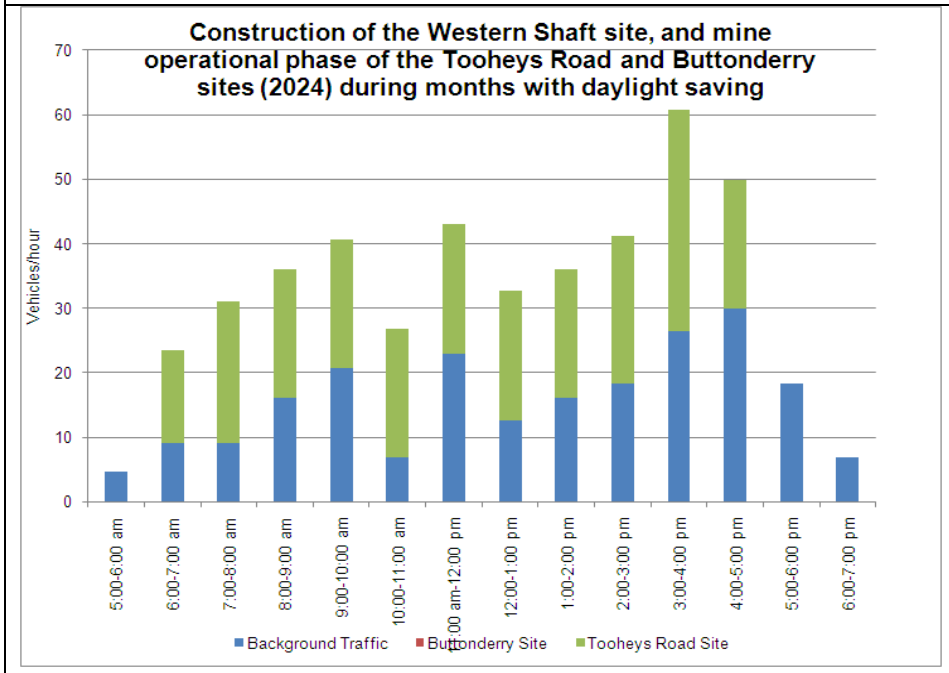


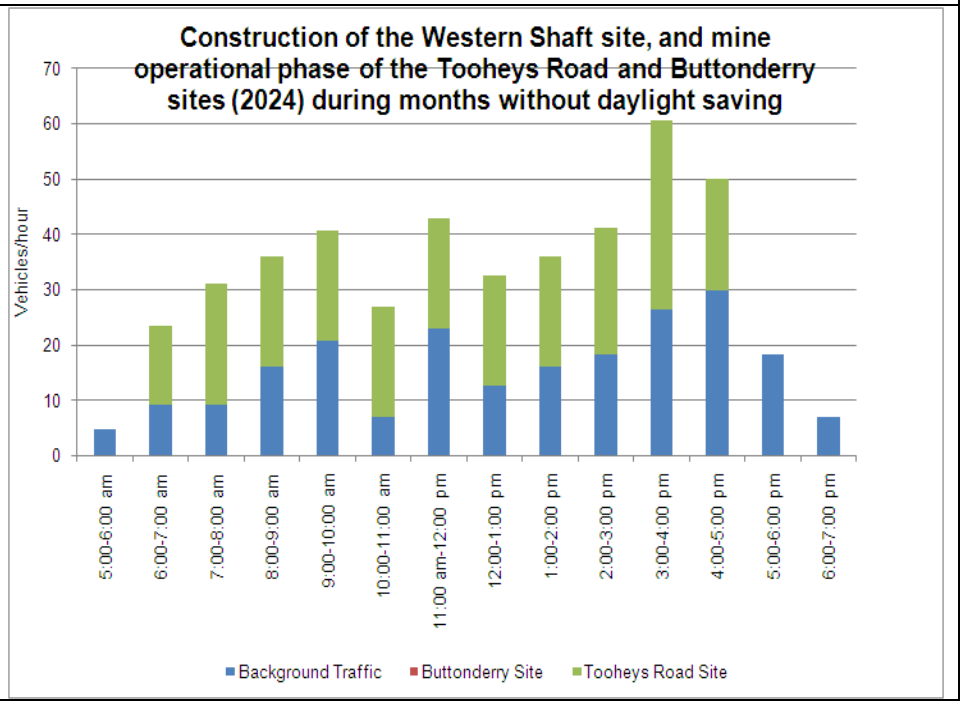


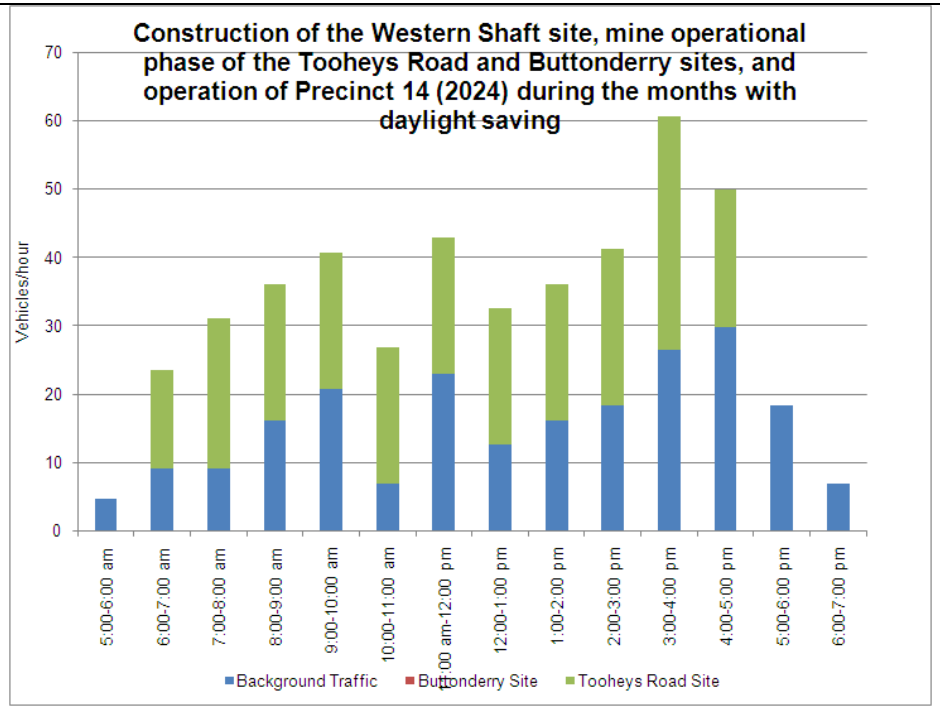
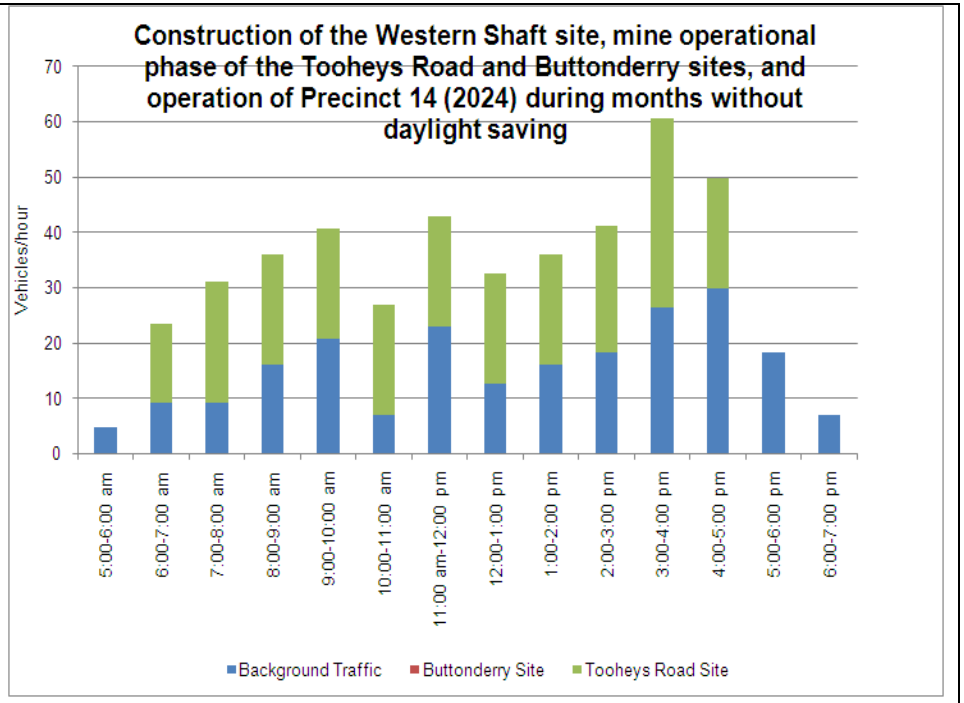


Motorway Link Rd/ Tooheys Rd interchange (north side of the interchange)





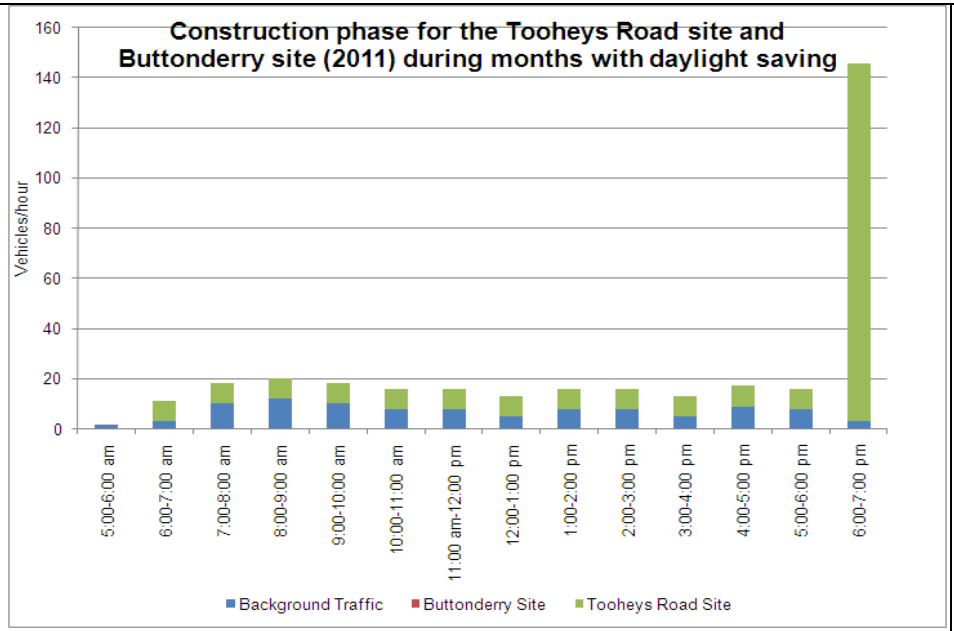


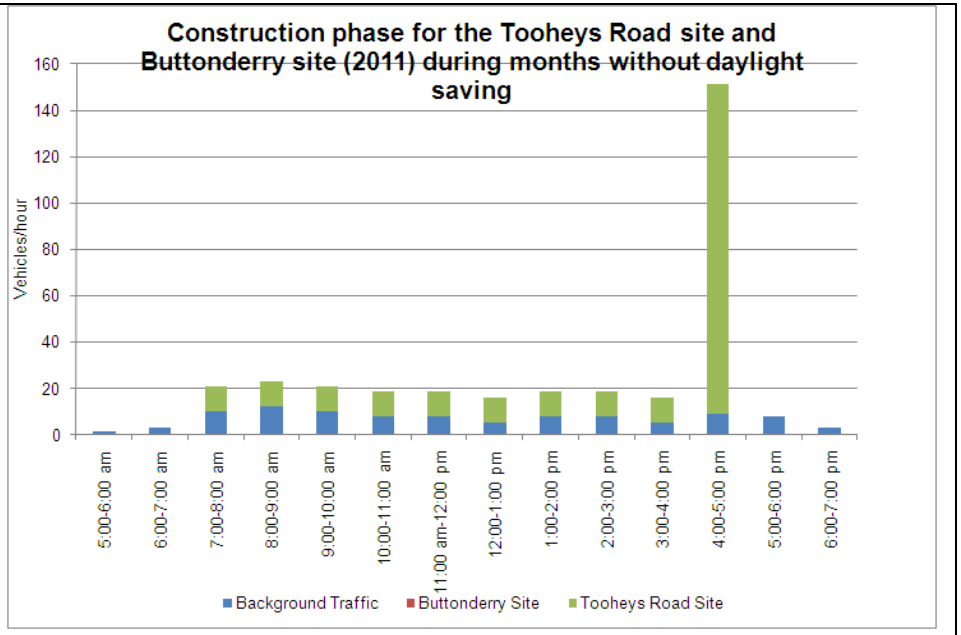
Motorway Link Rd/ Tooheys Rd interchange (north side of the interchange)		

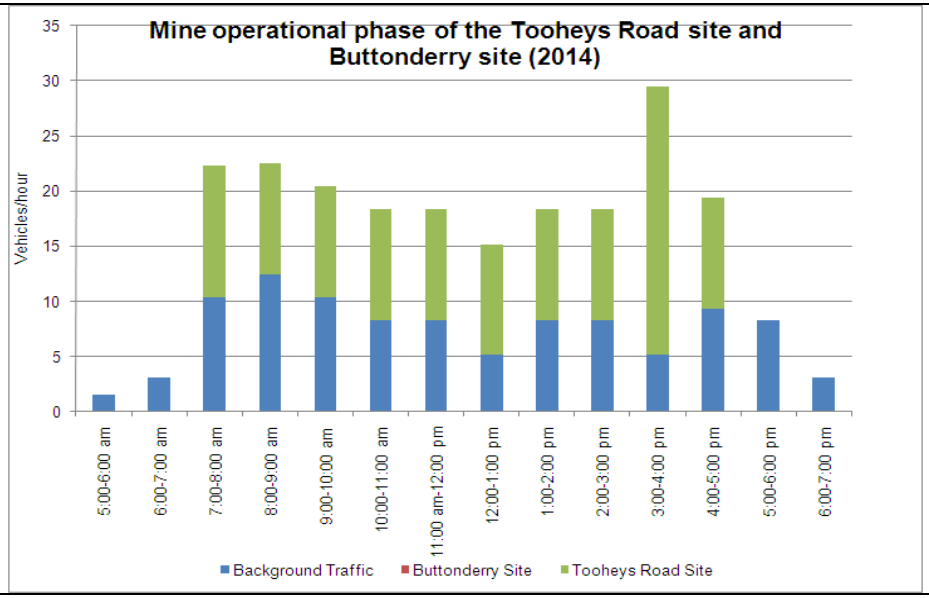
Notes: the Precinct 14 related traffic has not been assigned to this interchange based on *Wyong Employment Zone Sparks Road Intersection Analysis 2005*. Therefore the peak hours at this interchange are the same in the scenarios with or without Precinct 14.

Motorway Link Rd/ Tooheys Rd interchange (south side of the interchange)

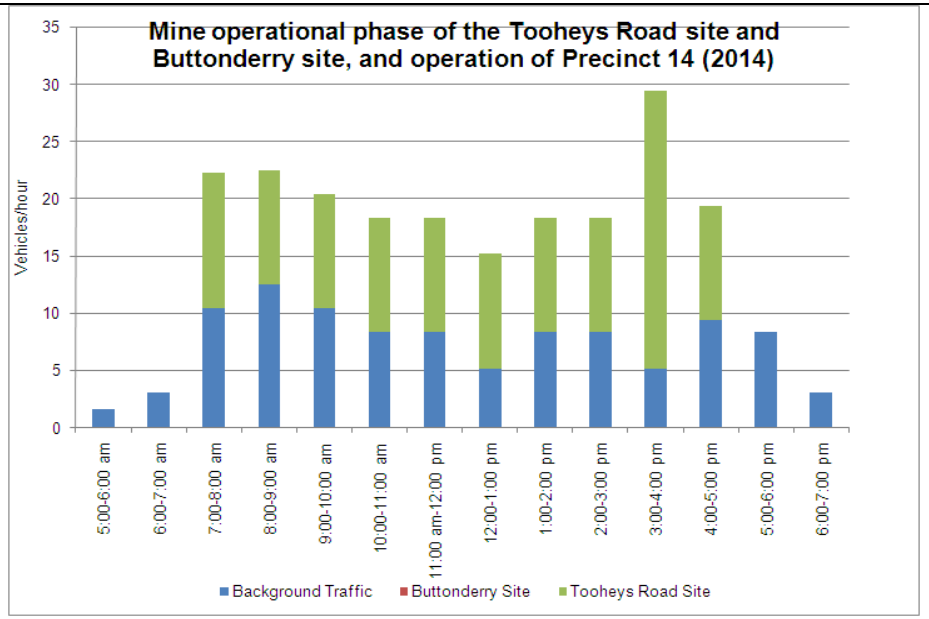
Motorway Link Rd/ Tooheys Rd interchange (south side of the interchange)

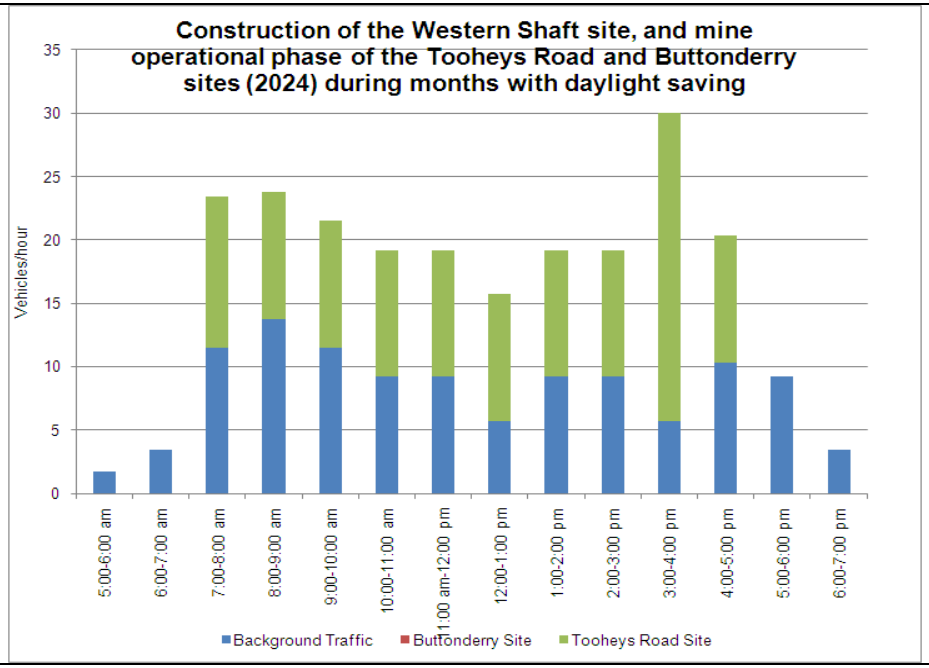


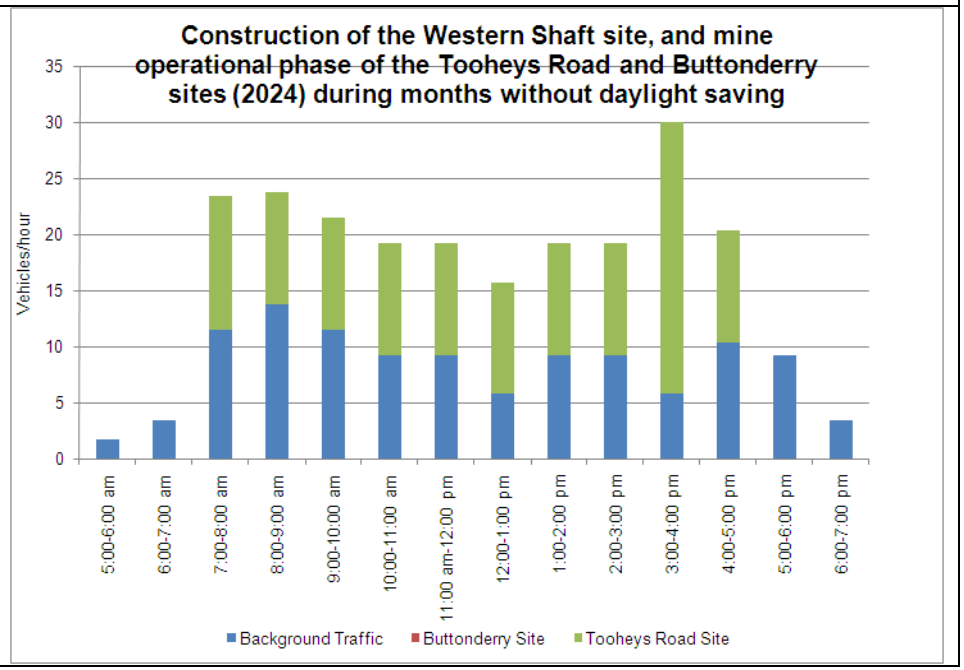


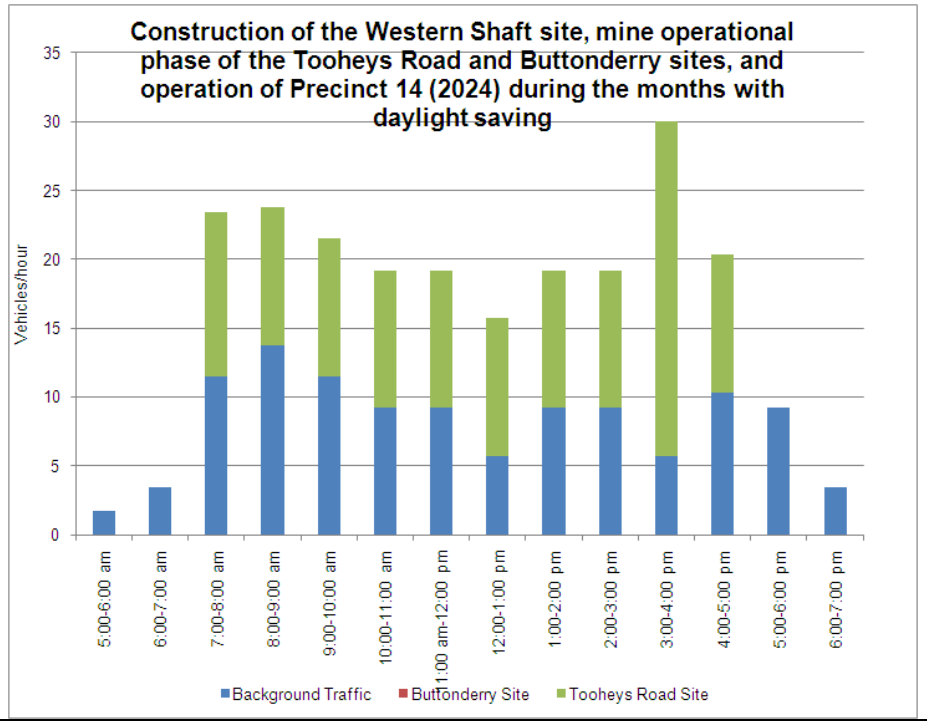
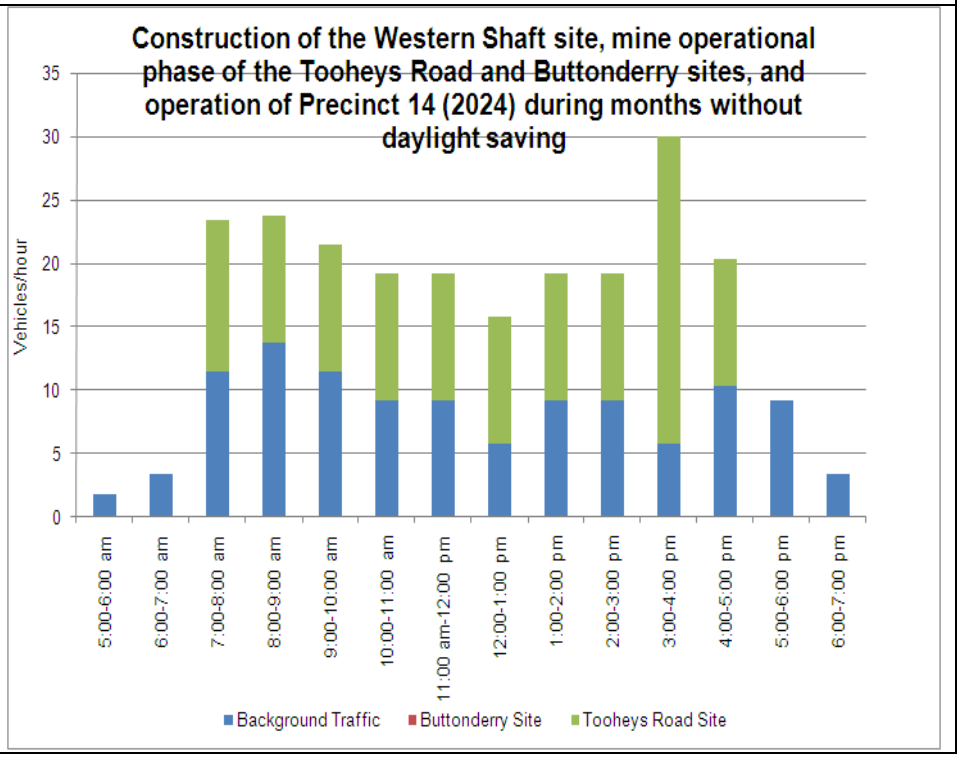


Motorway Link Rd/ Tooheys Rd interchange (south side of the interchange)





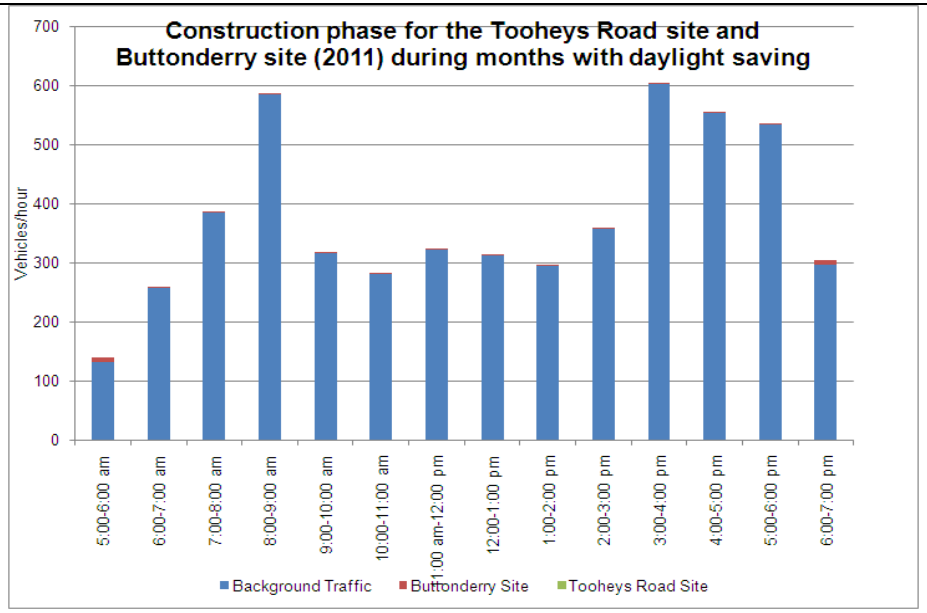


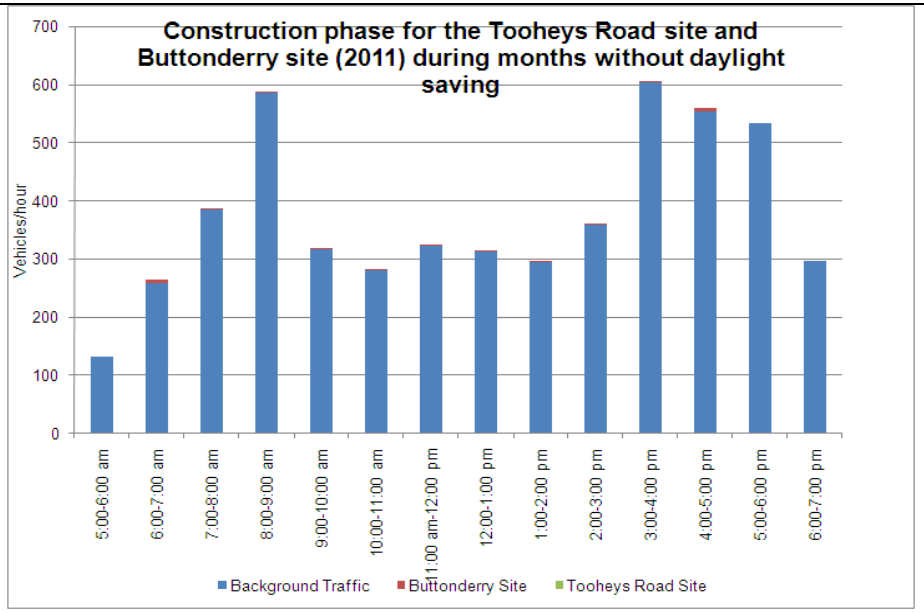
Motorway Link Rd/ Tooheys Rd interchange (south side of the interchange)		

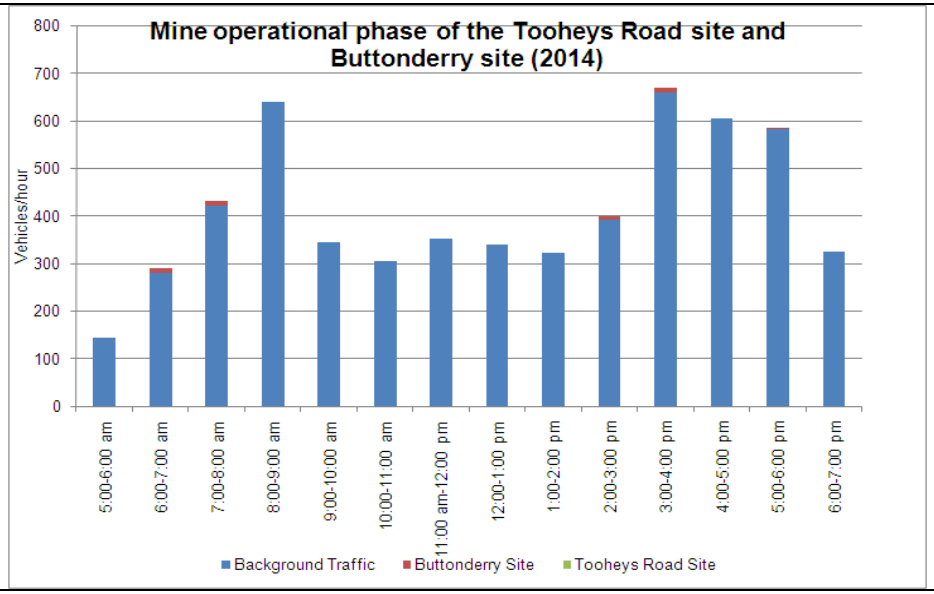
Notes: the Precinct 14 related traffic has not been assigned to this interchange based on *Wyong Employment Zone Sparks Road Intersection Analysis 2005*. Therefore the peak hours at this interchange are the same in the scenarios with or without Precinct 14.

Hue Hue Rd/Jilliby Rd

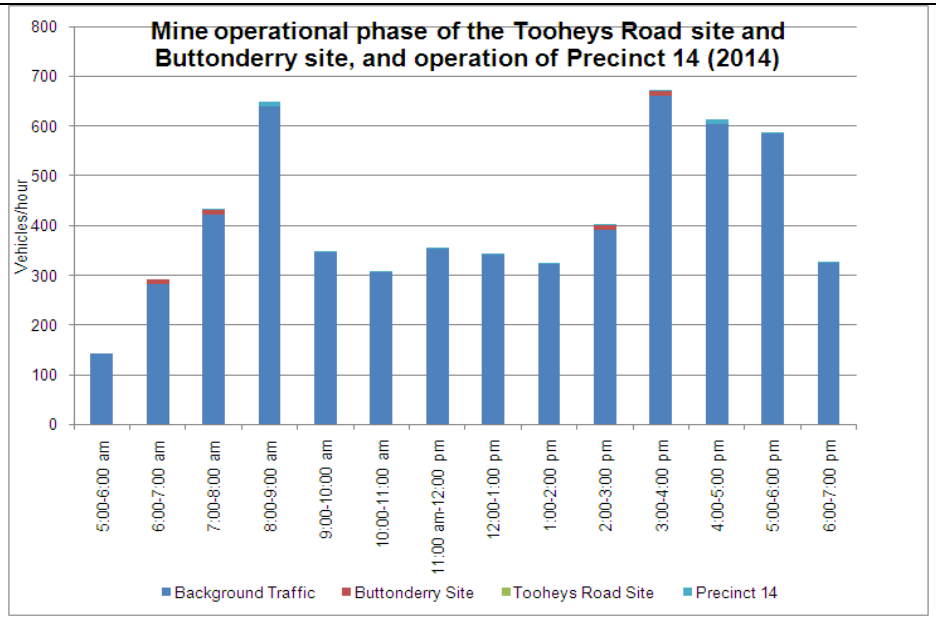
Hue Hue Rd/Jilliby Rd

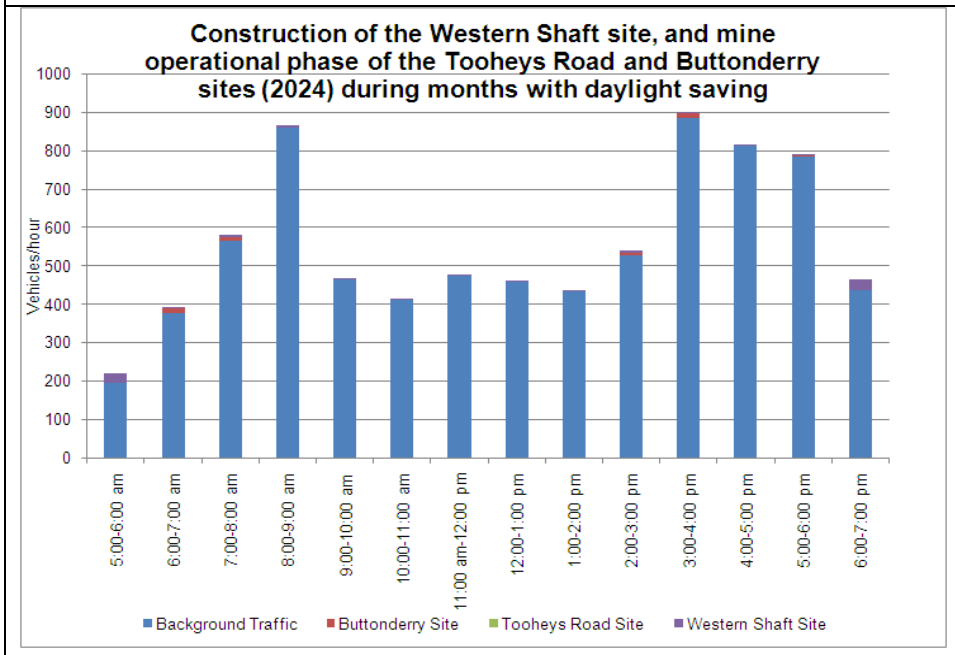


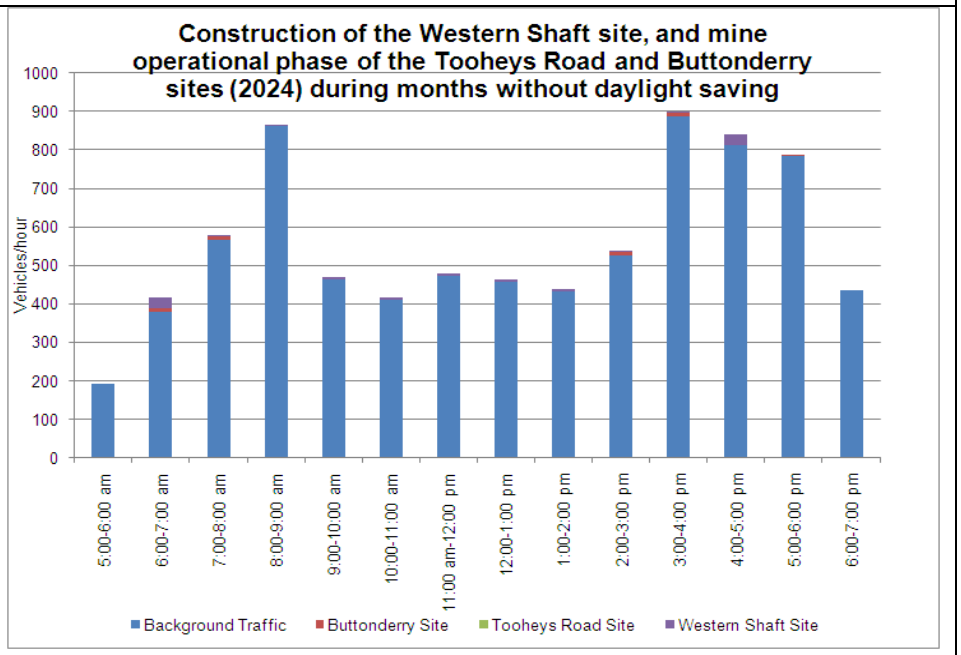


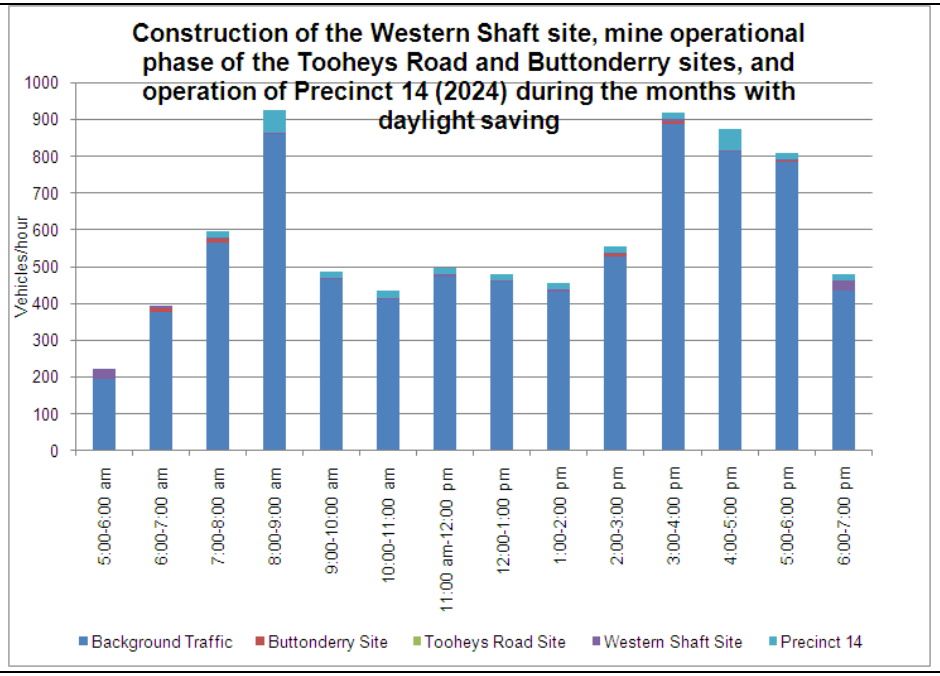
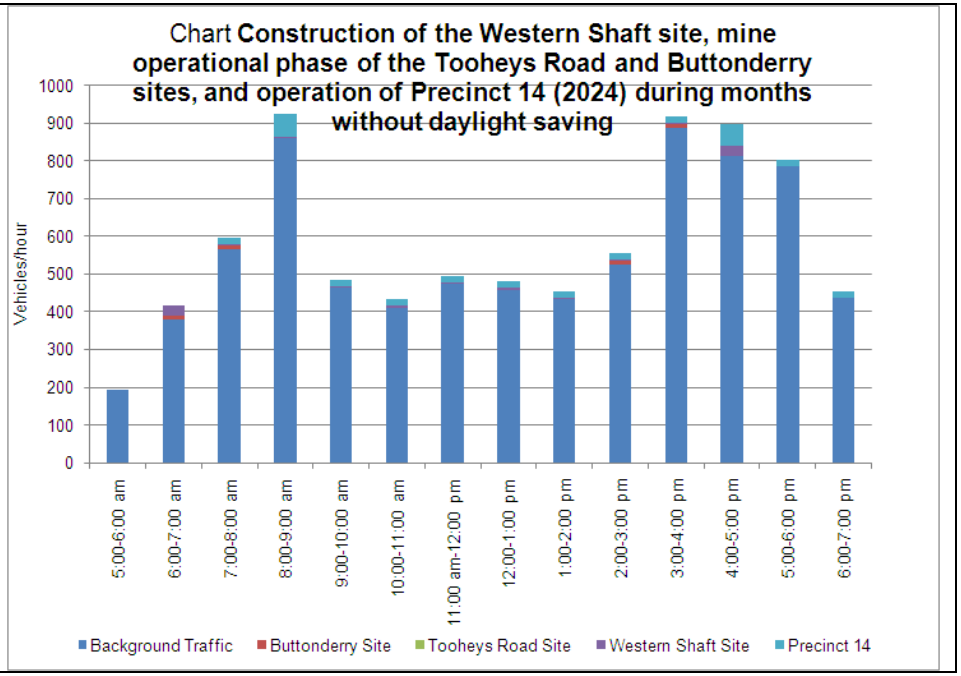


Hue Hue Rd/Jilliby Rd







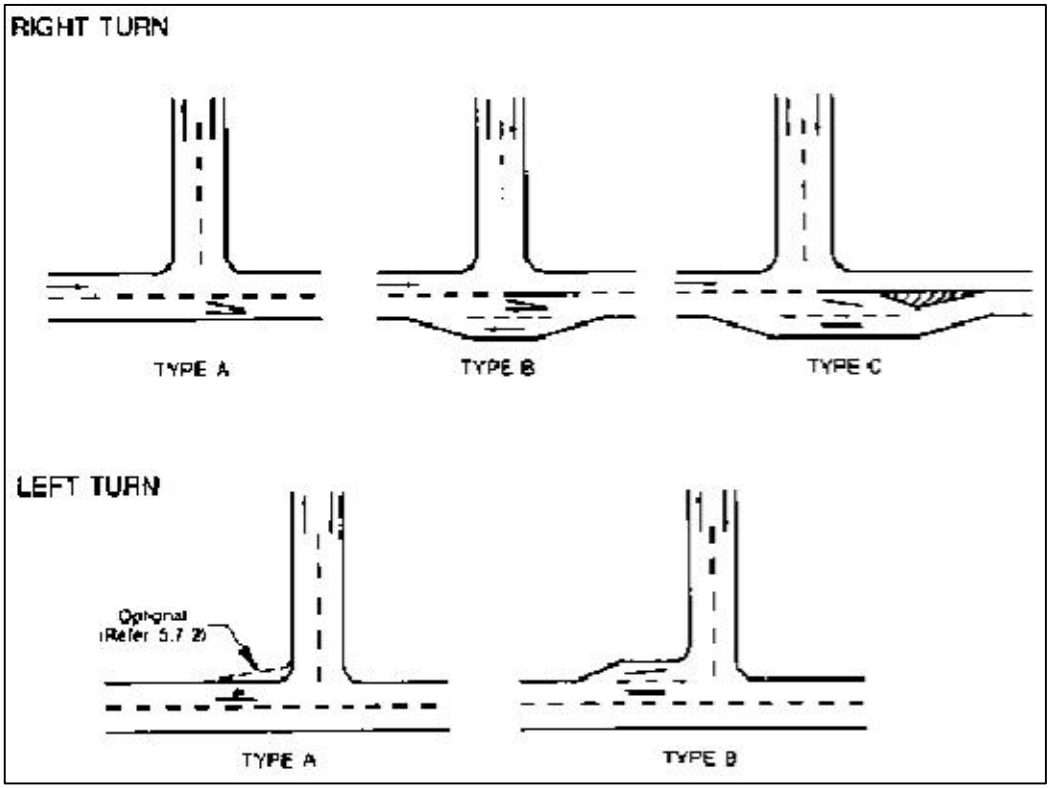
Hue Hue Rd/Jilliby Rd		

Appendix C

Recommended intersection layout

W2CP site accesses

During both the construction period and operational phases, the Hue Hue Road/ Buttonderry site access and the Tooheys Road/ Tooheys Road site access would operate satisfactorily, without the need for additional turning lanes from a capacity perspective. However, it is recommended that for safety purposes, that the Hue Hue Road intersection with the Buttonderry access be installed as a Type B (right turn) intersection. The figure below shows various rural turning lane treatments.



Source: AUSTROADS, Intersection at Grade

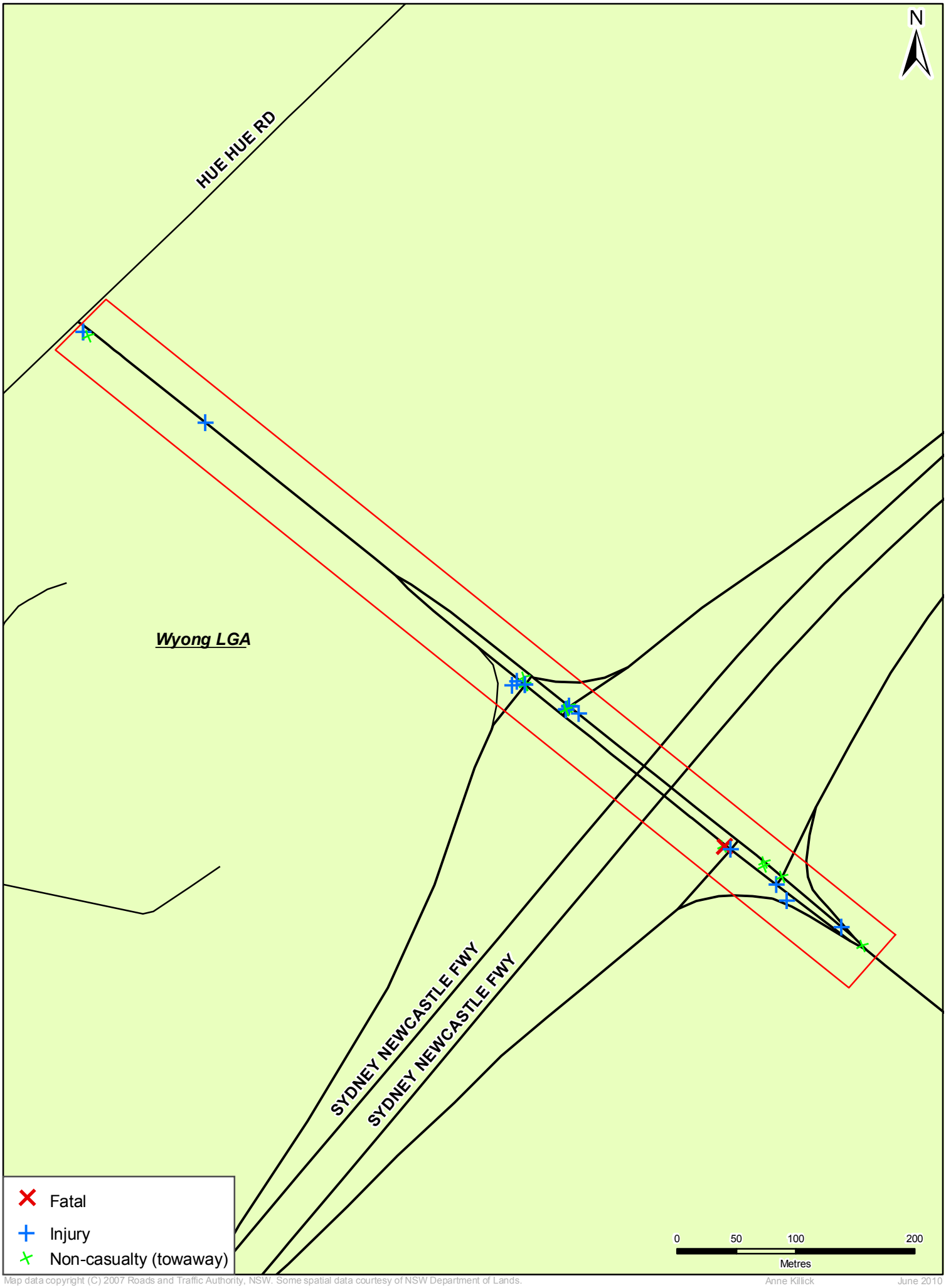
Appendix D

RTA crash data

Sparks Rd, Hue Hue Rd to 100m E of F3 interchange, Kiar

Crashes period 1/7/2004 to 30/6/2009 (Finalised data).

Plus Provisional data (which is incomplete & subject to change) from June Quarter 2009.



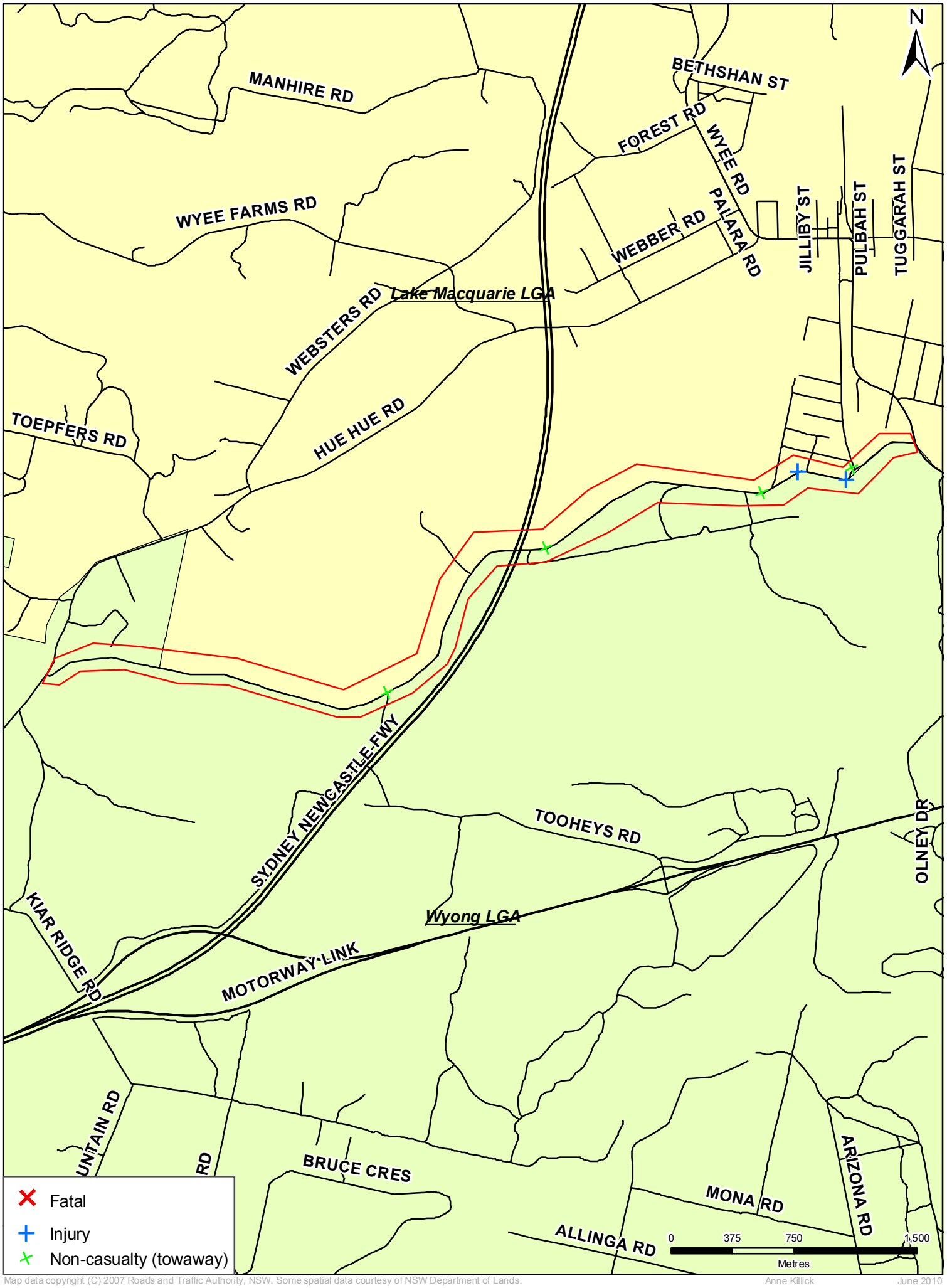
Anne Killick

June 2010

Bushells Ridge Rd, Hue Hue Rd to Wyee Rd, Kiar

Crashes period 1/7/2004 to 30/6/2009 (Finalised data).

Plus Provisional data (which is incomplete & subject to change) from June Quarter 2009.



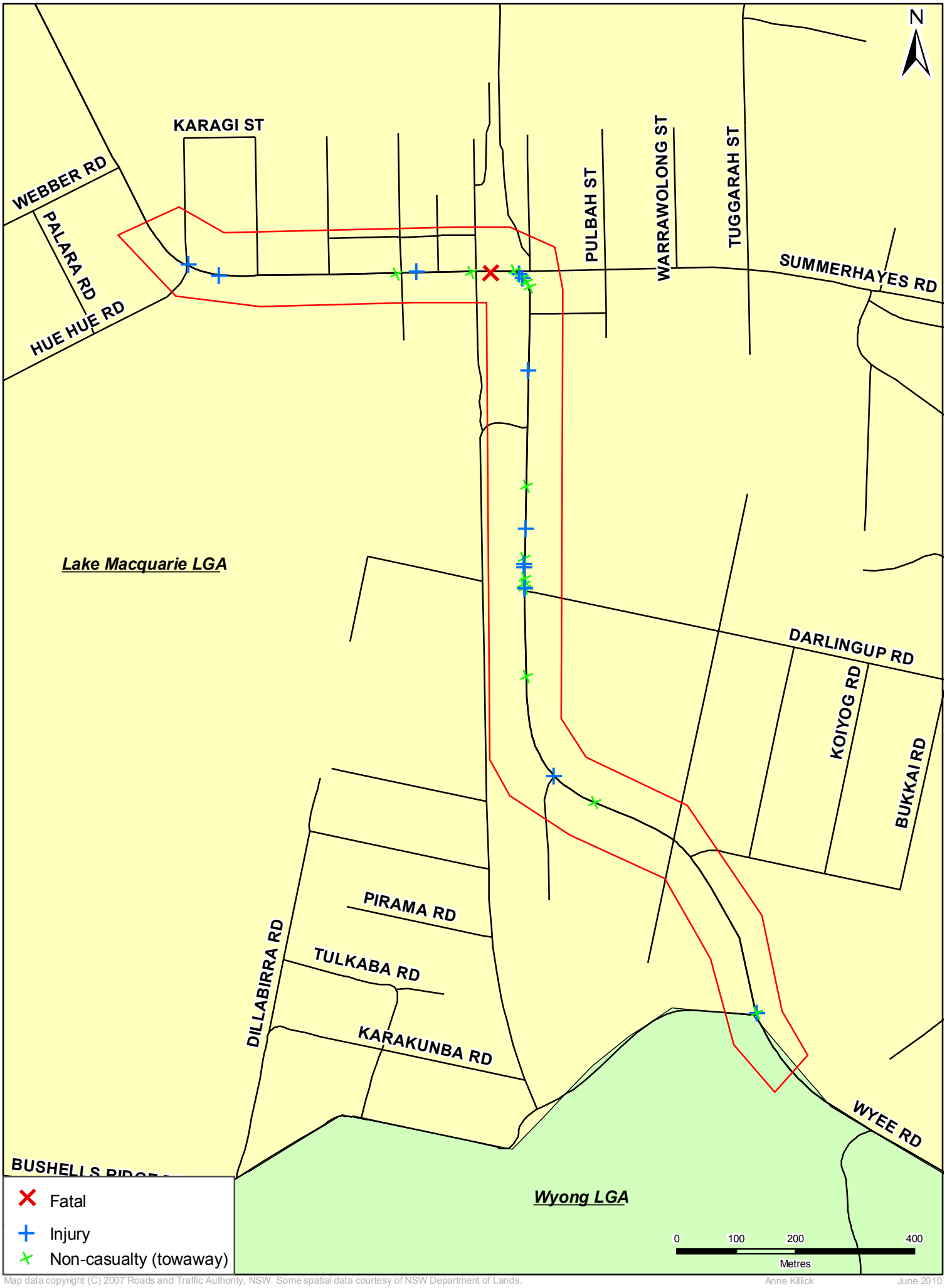
Anne Killick

June 2010

Wyee Rd, 100m N Hue Hue Rd to 100m S Gosford Rd, Wyee

Crashes period 1/7/2004 to 30/6/2009 (Finalised data).

Plus Provisional data (which is incomplete & subject to change) from June Quarter 2009.



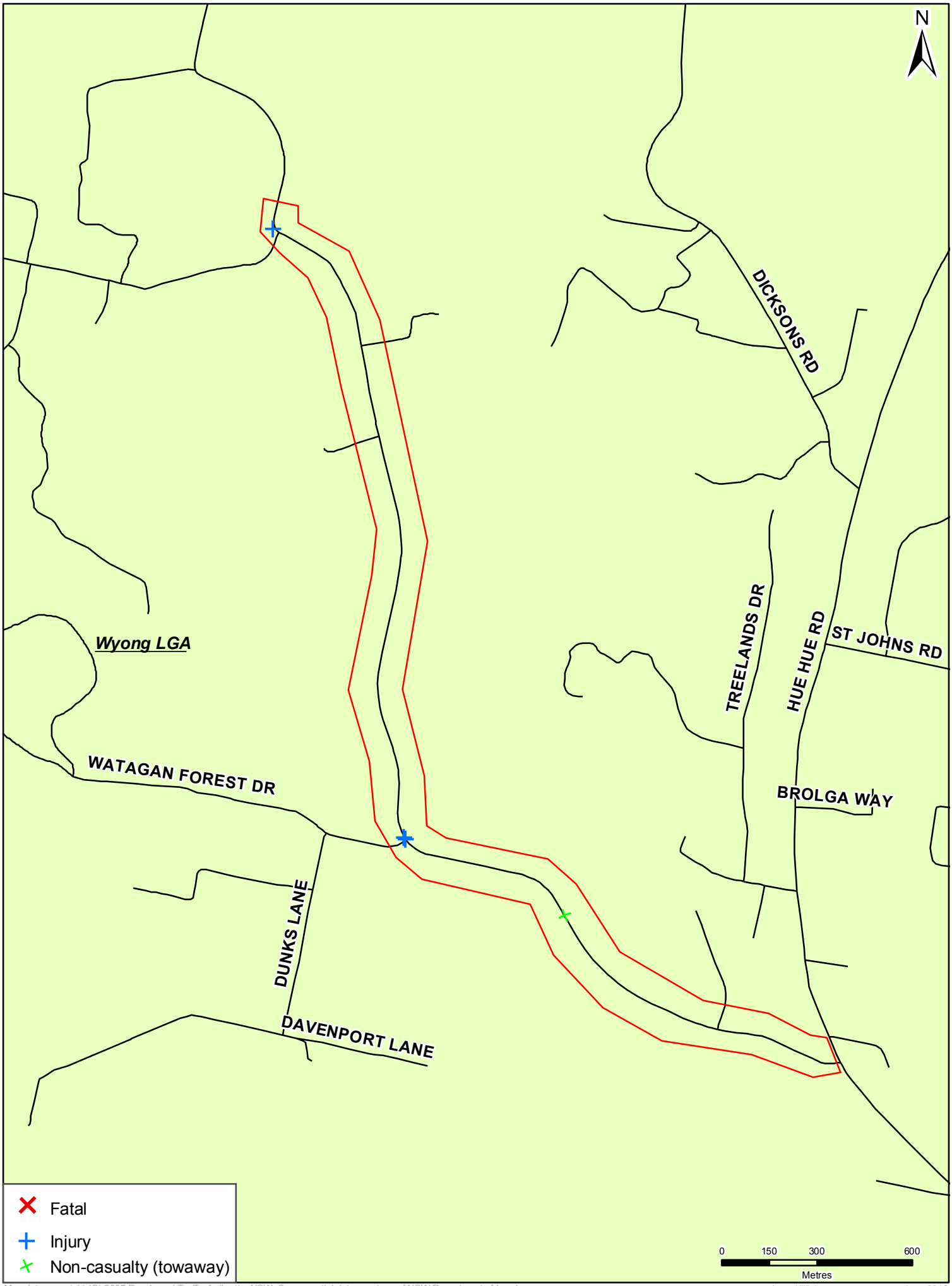
Anne Killick

June 2010

Jilliby Rd, 100m N of Little Jilliby Rd to Hue Hue Rd, Kiar

Crashes period 1/7/2004 to 30/6/2009 (Finalised data).

Plus Provisional data (which is incomplete & subject to change) from June Quarter 2009.

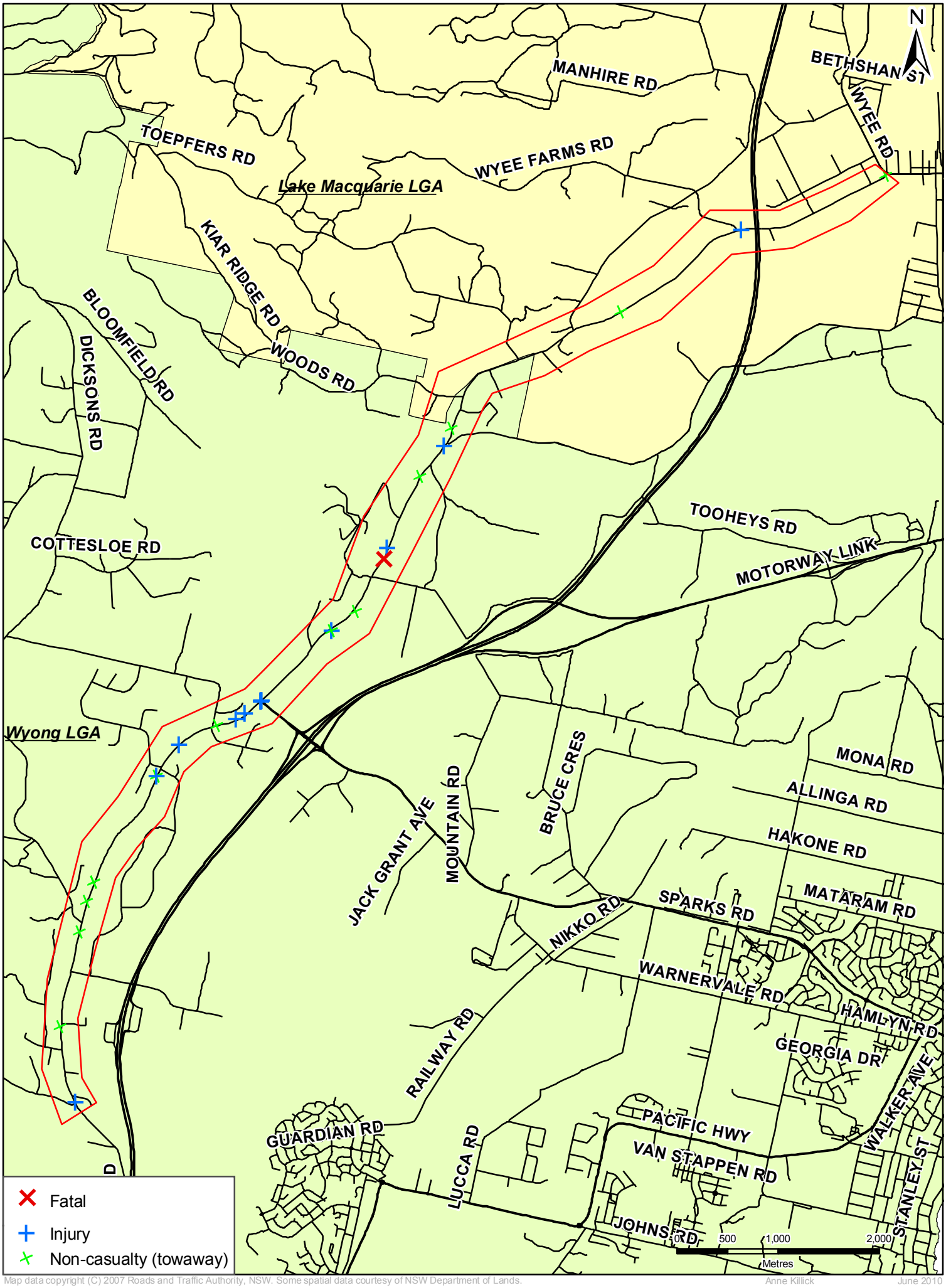


Anne Killick June 2010

Hue Hue Rd, Wyee Rd to 100m S of Jilliby Rd, Kiar

Crashes period 1/7/2004 to 30/6/2009 (Finalised data).

Plus Provisional data (which is incomplete & subject to change) from June Quarter 2009.



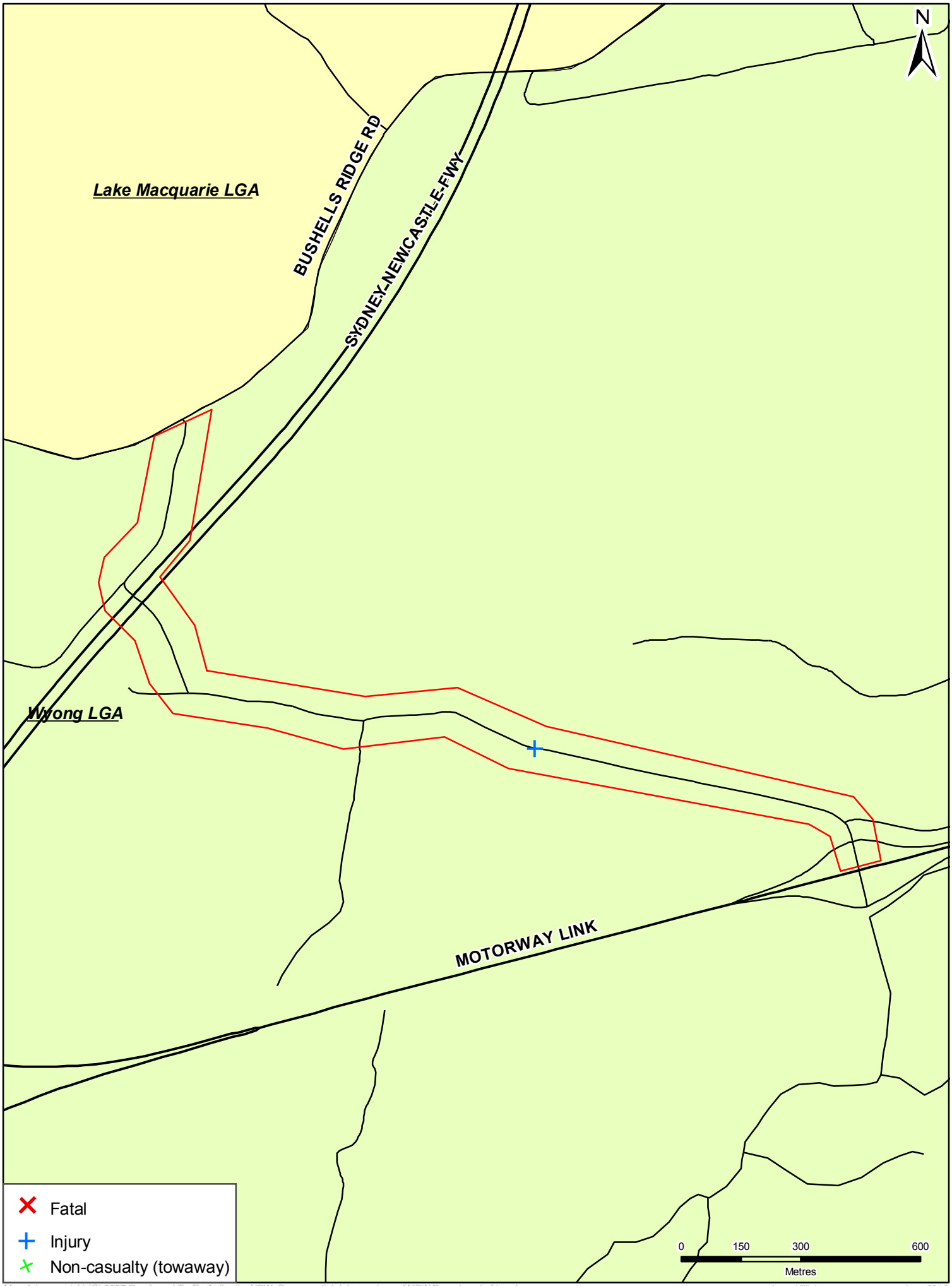
Anne Killick

June 2010

Tooheys Rd, Bushells Ridge Rd to Motorway Link interchange, Kiar

Crashes period 1/7/2004 to 30/6/2009 (Finalised data).

Plus Provisional data (which is incomplete & subject to change) from June Quarter 2009.



Anne Killick

June 2010

Appendix E

Photos of road safety deficiencies