

# Bowral Town Centre – Microsimulation Model: Field Data Working Paper Update

Prepared for Wingecarribee Shire Council  
File 7300/10

**PREPARED BY HIGH RANGE ANALYTICS PTY LTD**

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# Bowral Town Centre – Field Data Working Paper

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Prepared for Wingecarribee Shire Council

## 1.0 Introduction

Wingecarribee Shire Council commissioned High Range Analytics to prepare a traffic microsimulation model of Bowral Town Centre. As part of this project, a field traffic data collection activity was undertaken to provide data with which to build and validate the microsimulation model. The main fieldwork was undertaken on Friday 31 April 2010.

This working paper describes the planned data collection activities and reports on how the fieldwork proceeded. A summary of the collected data is provided so that the reader can consider the findings of the survey work. Reference is also made to traffic signal detector data (SCATS VS data) kindly made available to Council by the RTA.

Since the initial version of this working paper was prepared (31 May 2010), the following additional information is included:

- Supplementary counts taken from video files from the main fieldwork of 30 April 2010
- A set of spot traffic counts taken in early June 2010
- Reduced and analysed information captured by video on 30 April 2010 covering:
  - Activity at marked pedestrian crossings
  - Signal timings
  - A sample of parking activity on Bong Bong Street

Based on this additional information, a revised count stick figure was prepared for the analysis hour of 3pm to 4pm.

Accompanying this report are a set of electronic files which are the raw data from the survey company and a traffic volume stick figure prepared from the traffic counts. Most of the intersection counts were taken using video; video files of the traffic at these intersections are included with the raw data.

This working paper is structured as follows:

- Chapter 2 provides a description of the study area, planned fieldwork and reports on the outcomes.
- Chapter 3 summarises the traffic volume data collected by the fieldwork.
- Chapter 4 reports the findings of the queue surveys.
- Chapter 5 reports the travel time surveys.
- Chapter 6 summarises the pedestrian counts.
- Chapter 7 summarises activity at pedestrian crossings, signal timings and parking.
- Appendix A contains the field data collection specification.

Accompanying this report are three disks:

Disk 1 – contains an electronic copy of this report, raw data files from the survey company, and a workbook containing the traffic volume stick figures referred to in this working paper and supplementary field data.

Disk 2 – video files of surveys.

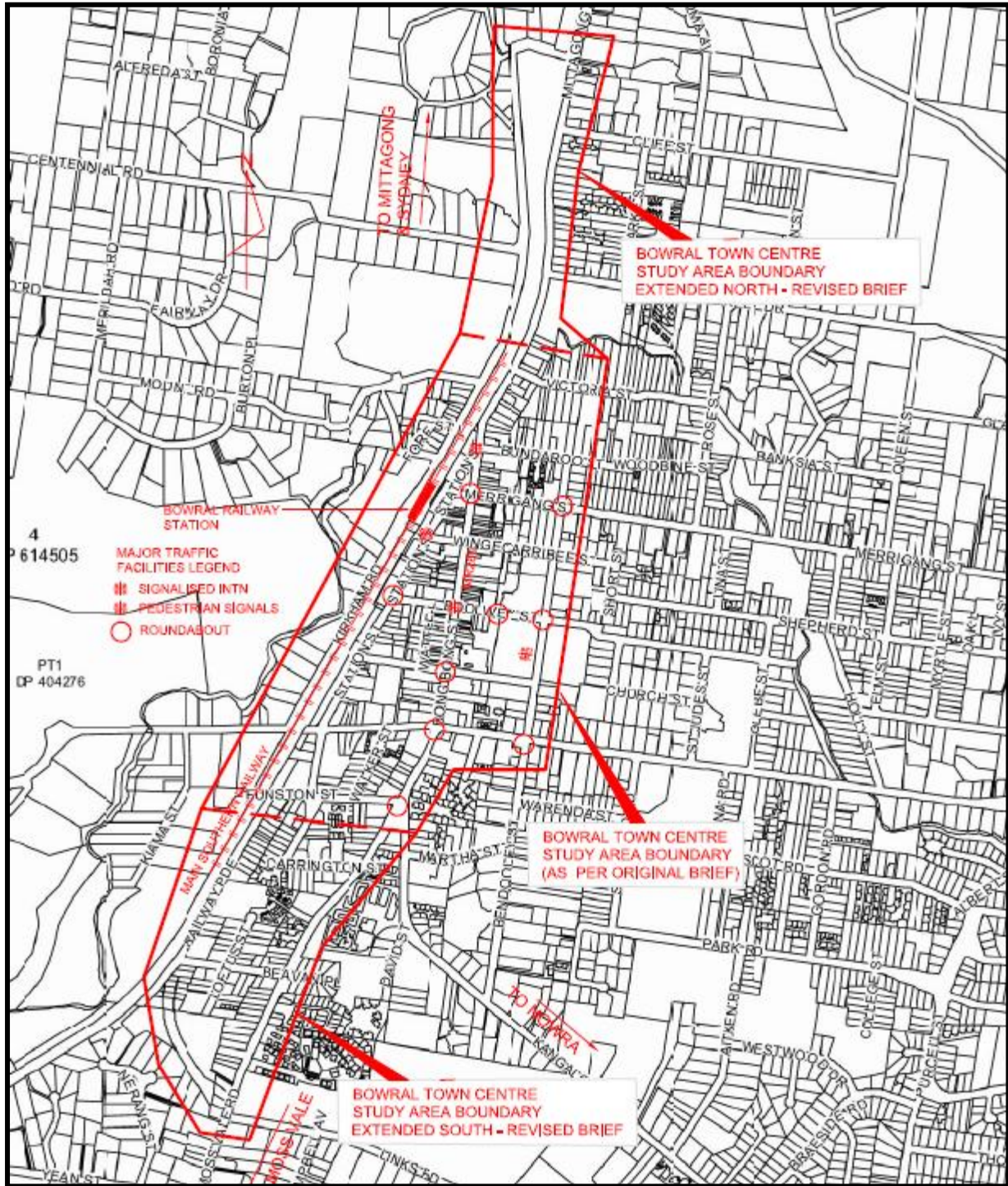
Disk 3 – balance of video files of surveys.

## 2.0 Data Collection

### 2.1 Study area

The study area for the model and associated data collection is Bowral Town Centre as shown on Figure 1 (which is an excerpt from the amended brief).

Figure 1 – Study area



## 2.1 Survey objectives

The surveys sought to provide sufficient data to meet the particular requirements of the brief:

- In relation to the operational features and performance of the nominated intersections of interest.
- To be able to develop and calibrate demand matrices for the model, specifically turning movement counts at major intersections and at important car park access/egress points.
- To provide data with which to validate the model including queuing survey data and travel time surveys.
- Additional data with which to establish operational aspects of the traffic system in Bowral on the day of survey, including signal phasings, pedestrian activity and parking activity in selected locations.

## 2.3 Survey specification

The survey specification is in Appendix A – this includes the initial survey specification plus amendments of 19 April 2010, which added four intersections and eight car park access/egress points. The data was collected independently by an experienced specialist survey company, Skyhigh Traffic Data Australia Pty Ltd.

## 2.4 Survey conduct

Almost all field data collection was undertaken and completed on Friday 30 April, with video collection between 2.30pm and 6.00pm and all other data collected between 3pm and 5pm. Video data was reduced and reported on between 3pm and 5pm.

The exception was the car park egress to Bundaroo Street (from the public car park in Merrigang Street adjacent to the fire station). This was taken manually on Friday 14 May 2010.

During the survey period, High Range Analytics had an employee within the Bowral Town Centre to monitor potential traffic issues or survey problems.



### 3.0 Traffic Volume Data

#### 3.1 Volume data collected

The survey captured turning movement information at 31 intersections and 14 car park access/egress points. This information is disaggregated by:

- Individual turning movement (intersections have through movements included)
- By vehicle class – light vehicle, heavy vehicle and bus
- By 15-minute period

The raw data is provided in a set of Microsoft Excel workbooks accompanying this report.

In addition the RTA made available SCATS VS data at the three signal controlled intersections in the study area:

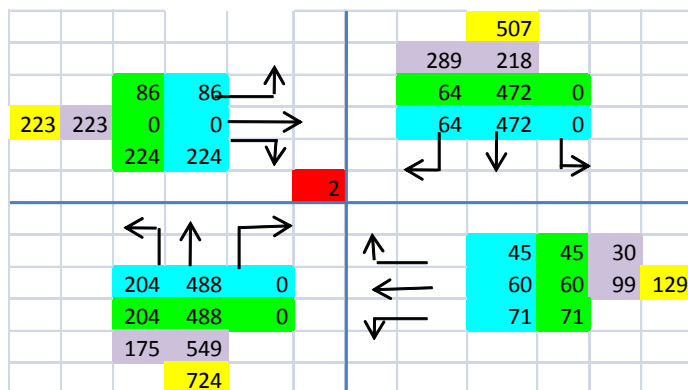
- Station Street and Bong Bong Street
- Station Street and Wingecarribee Street
- Bong Bong Street and Boolwey Street

This SCATS data covered a seven day period in March 2010, 24 hours a day by 15-minute period by individual detector. This VS data provides a rich source from which to gauge day to day variability of traffic service flows and also a means to assist in the detection of problems with parts of the field data, such as a traffic incident affecting traffic on the day of survey.

#### 3.2 Processing volume data

This data was subsequently entered into a set of worksheets that provide a stylised graphical representation of Bowral Town Centre’s road network. This permits the analyst to assess the internal consistency of the counts, and identify potential sources of mis-closure in the upstream and downstream traffic flows. Generally, substantial mis-closures are due to intervening land use or intersections for which the traffic volumes were not recorded.

These stick figures are provided in an accompanying workbook *Stick\_figure\_reports.xls*, as they are too big to be included in this report. They are provided for each hour for all vehicles. The entries in these stick figures are colour coded, with the following illustration:



- The red cell is the intersection number used by this study
- The blue cells are manual turning movement count estimates – raw data from the survey company

- The green cells are the representative estimates of turning movement volumes – a subset of these harmonised numbers are used in the estimation and calibration of the demand matrices
- The purple cells are SCATS VS detector counts, where detector level data is relevant
- The yellow cell is the SCATS VS approach counts (sum of the detector-level data).

It should be noted that the green cells are adjusted volume estimates to provide representative traffic volumes – this means that where an upstream intersection’s departure flow does not agree with the downstream intersection’s arrival flow, and there are no intervening land uses, then if the counts are not adjusted they will act to confound the matrix estimation process. Hence, the analyst makes an adjustment to the estimates, based on as much volumetric information as is available.

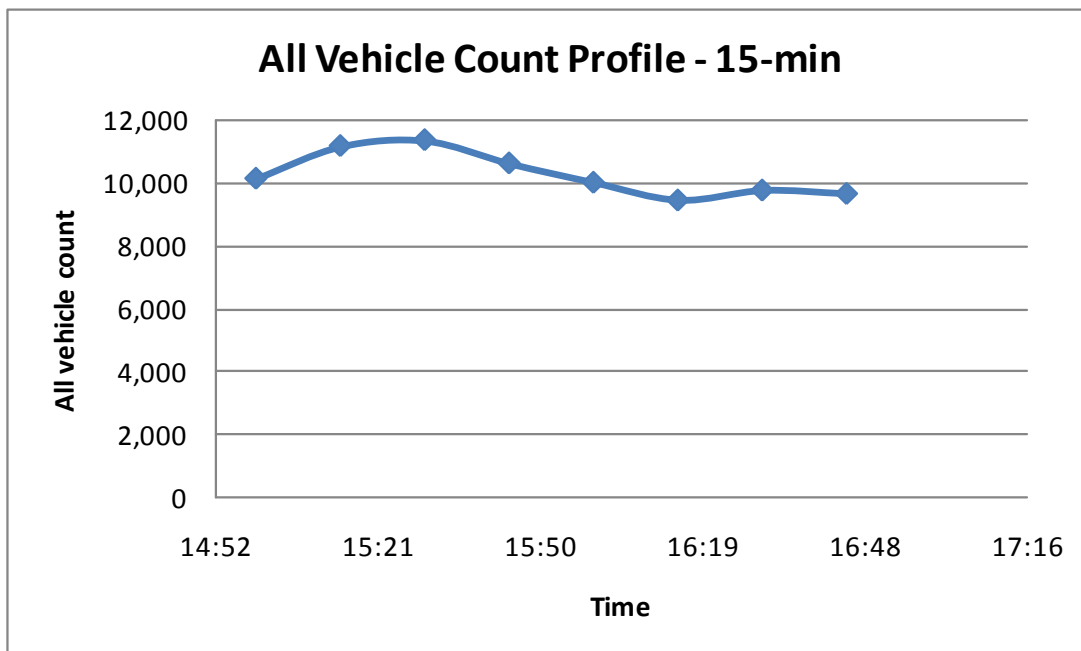
A finalised stickfigure for 3pm to 4pm is in *StickfigureForEstimation.xlsx*, showing the traffic volumes used for estimation.

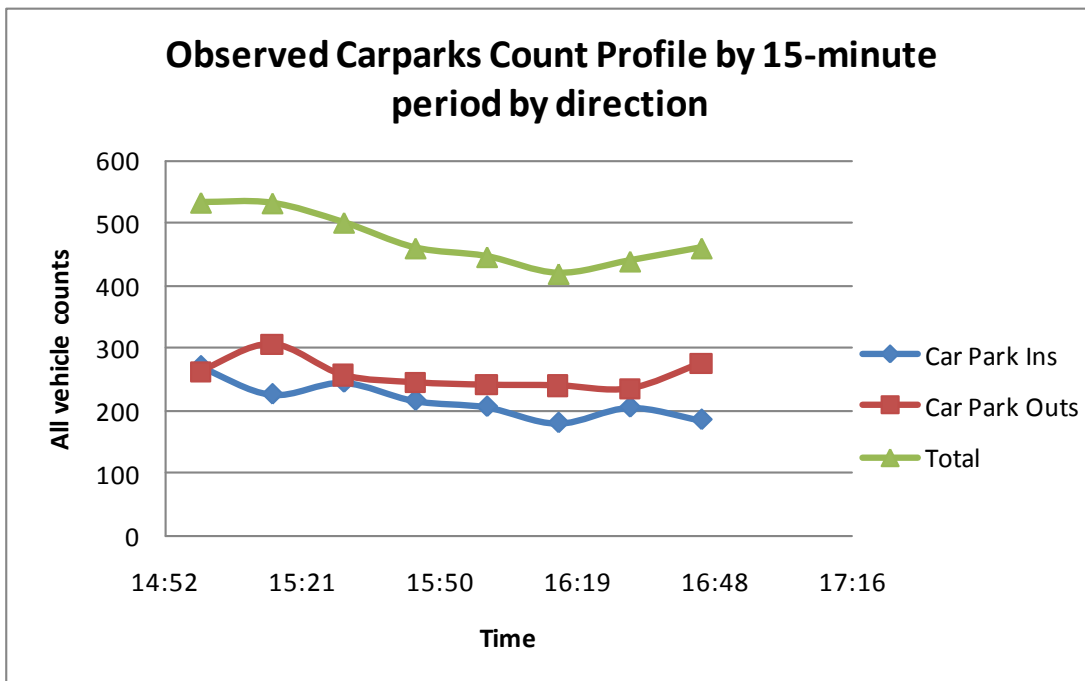
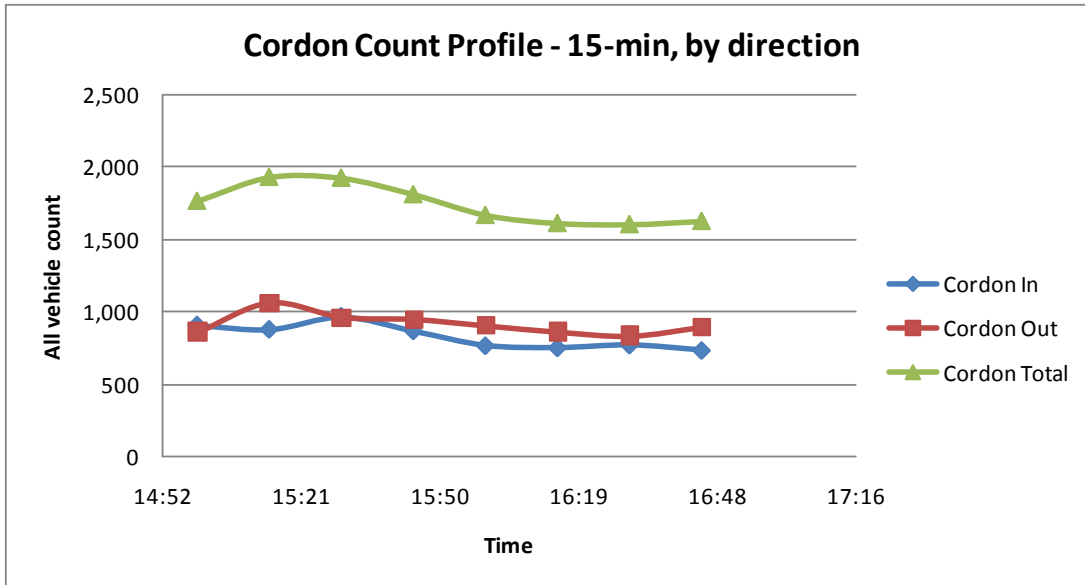
### 3.3 Traffic volume data summary

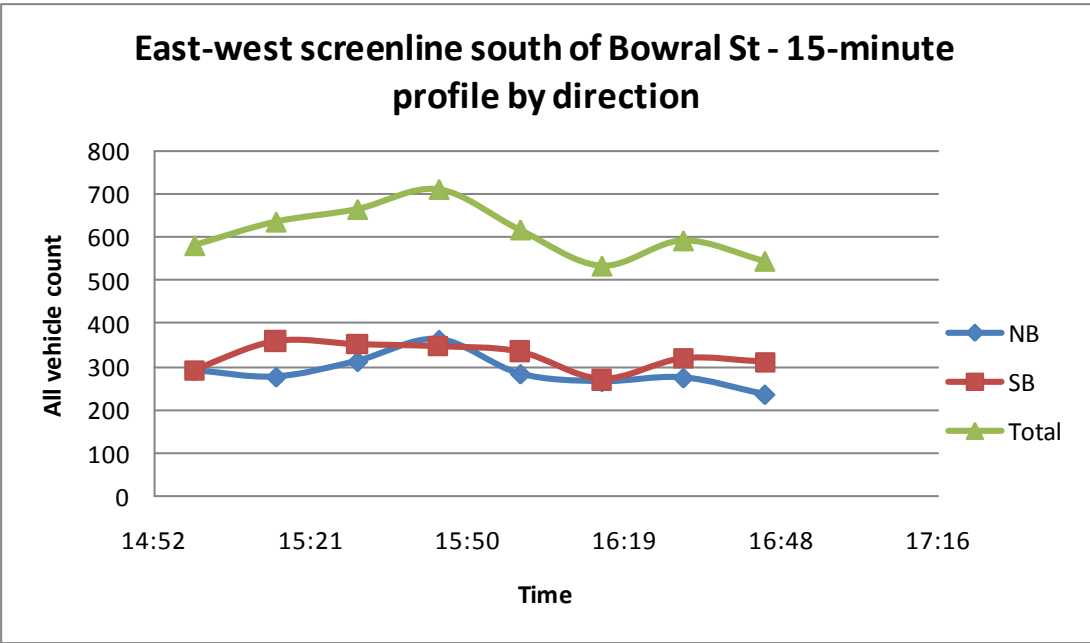
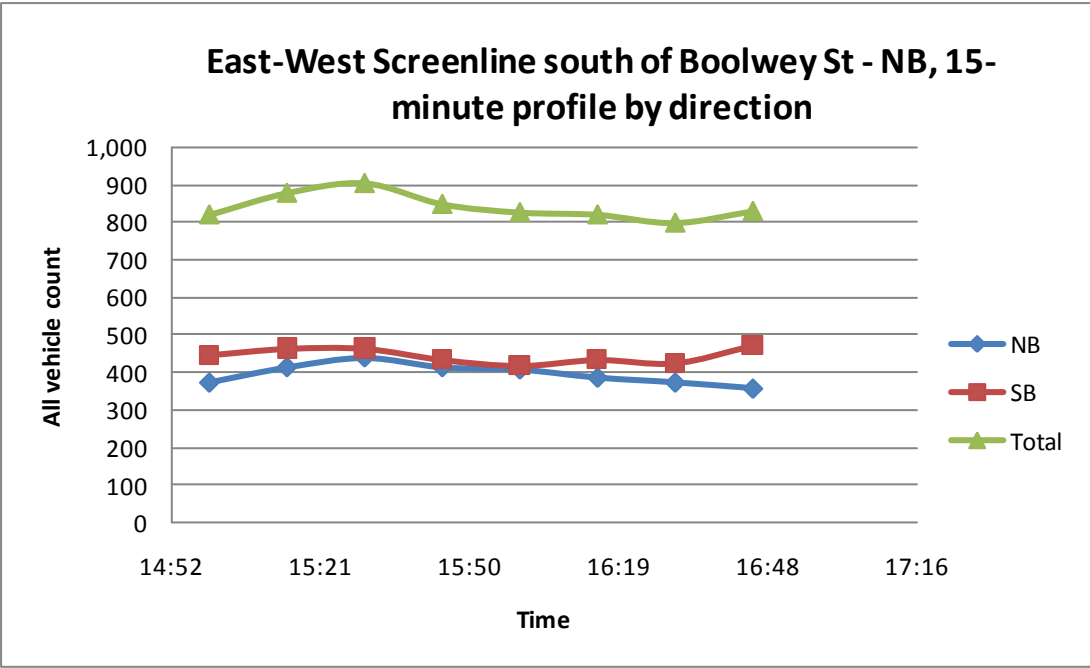
The traffic volume data was coded to permit examination of the following aggregated flow profiles:

- All counts
- Study area cordon
- Counted car park ins and outs
- East west screenlines: south of Boolwey Street and south of Bowral Street
- North south screenline: east of Bong Bong Street
- Intersection counts

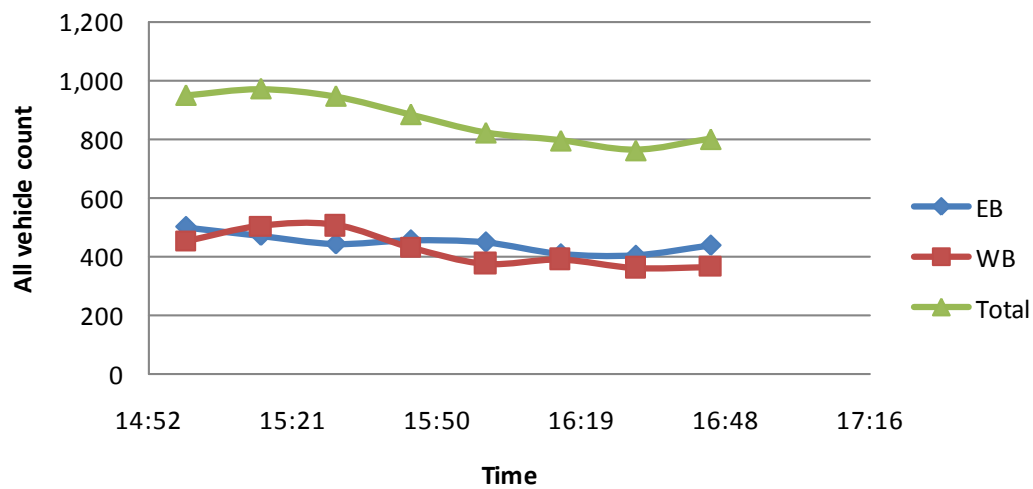
The following charts present the all vehicle traffic vehicle profiles for the above.



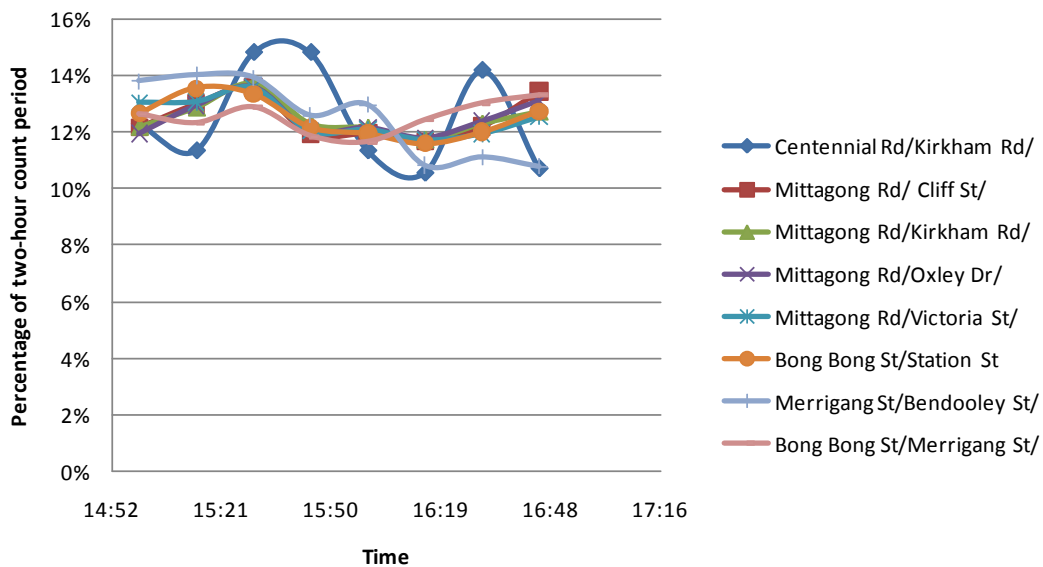


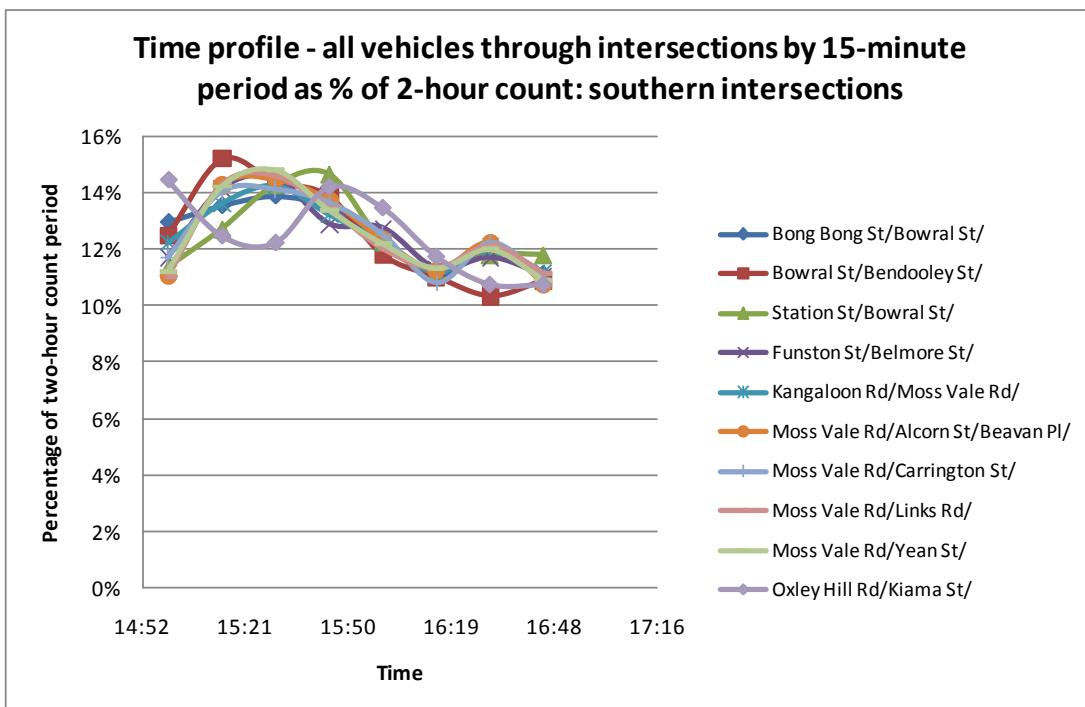
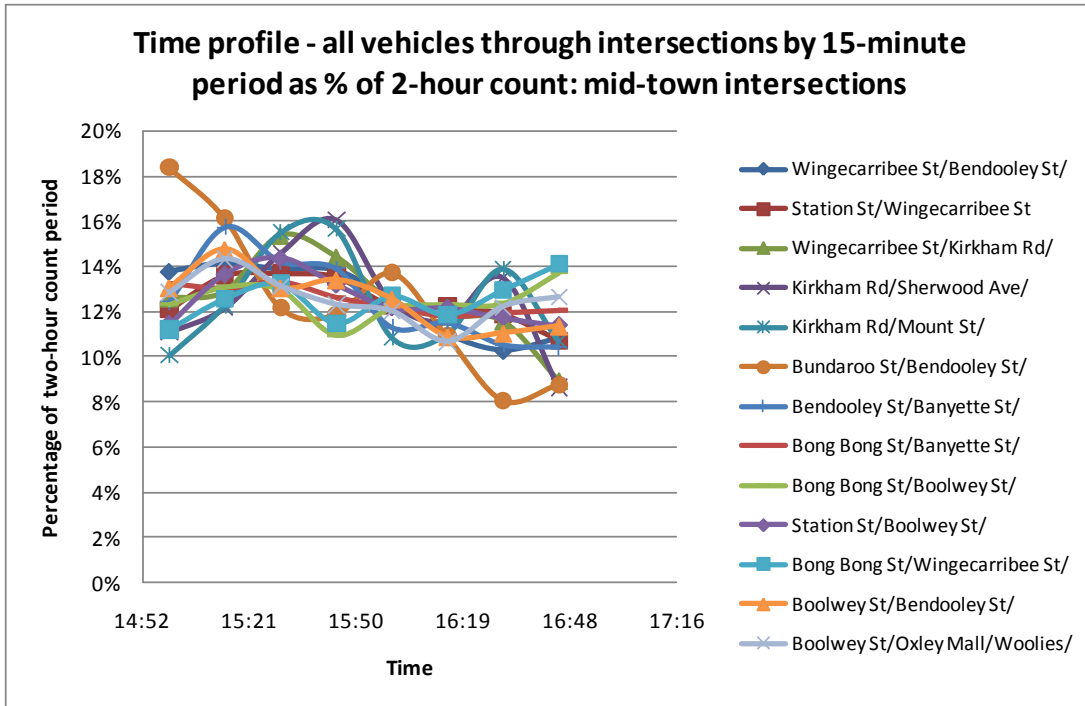


### North-south screenline east of Bong Bong Street - 15-minute profile by direction



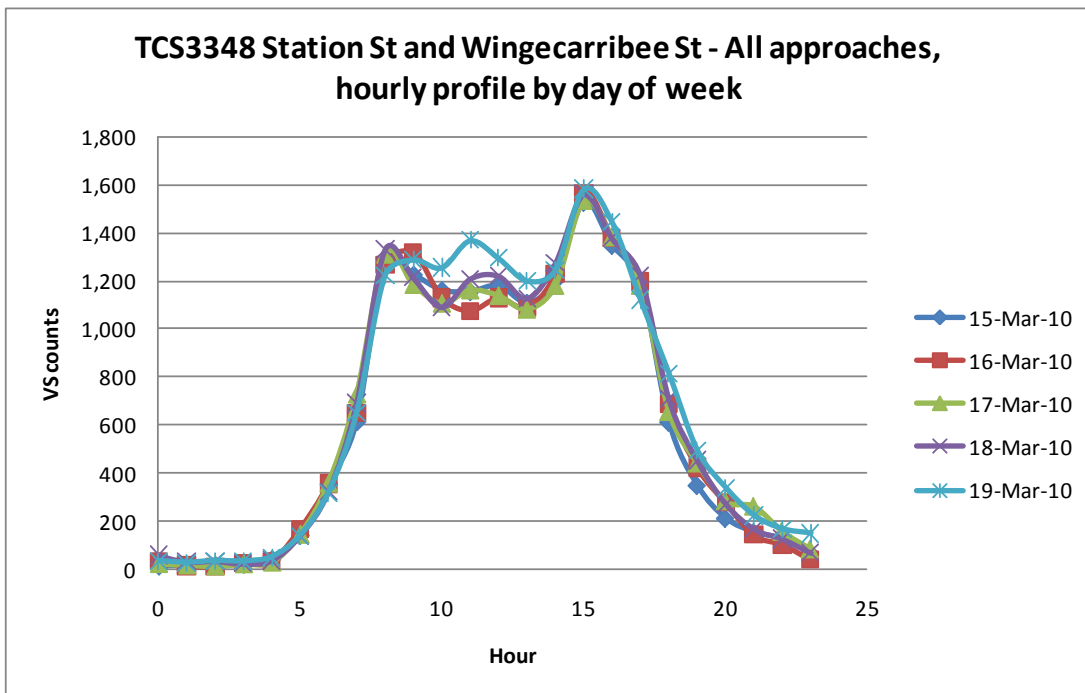
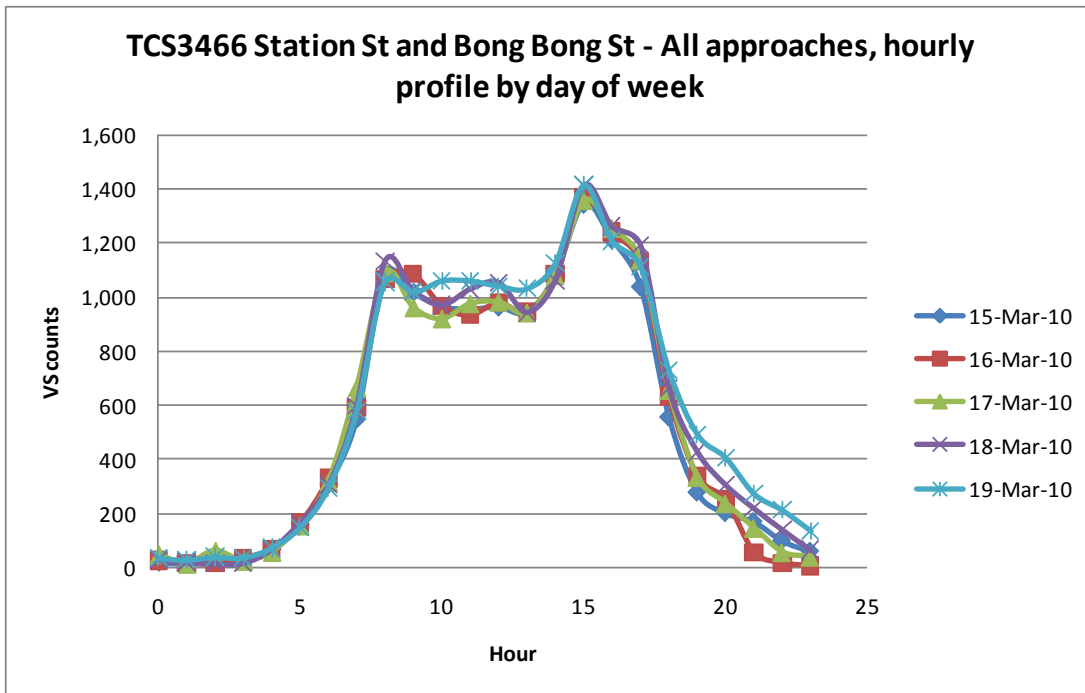
### Time profile - all vehicles through intersections by 15-minute period as % of 2-hour count: northern intersections

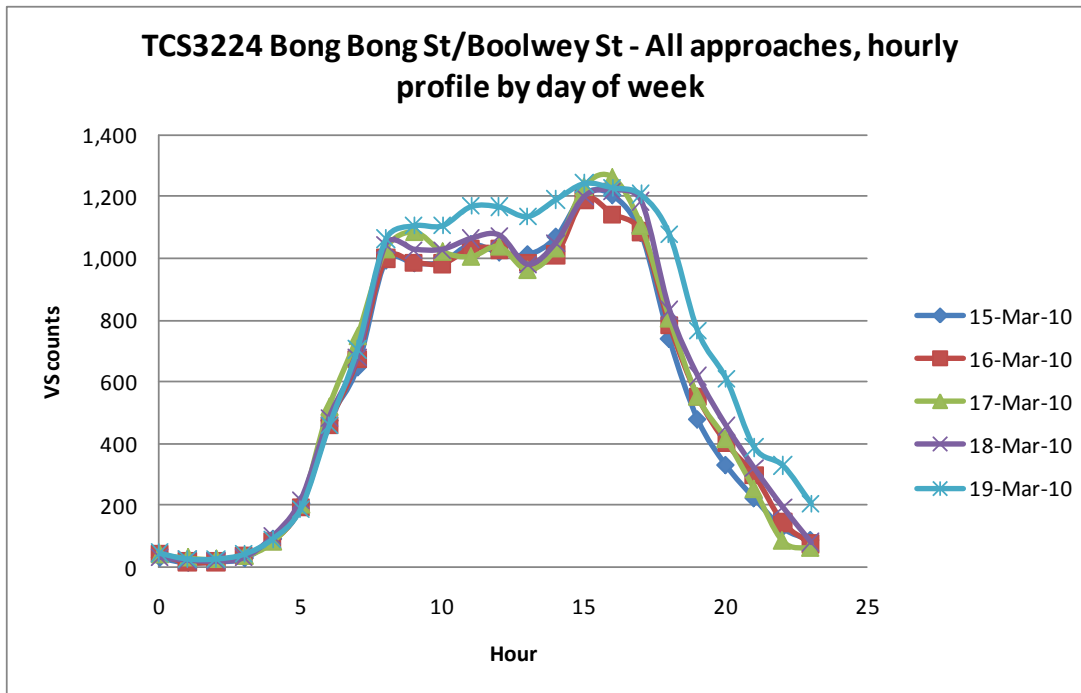




Of particular interest to this study is the selection of the one hour period to model. The above profiles indicate that the first hour of survey (3pm to 4pm) has consistently higher traffic volumes than other periods, with the exception of the east-west screenline south of Bowral Street, which exhibits a peak hour form 3.15pm to 4.15pm.

The SCATS data provides an indication of hourly variations in demand by day of week. The following three charts show the all-detector profiles for each intersection for the five weekdays between Monday 15 March 2010 and Friday 19 March 2010.





The above three charts consistently identify the hour commencing 3pm as the peak hour for most weekdays. Of interest is that Friday is usually a busier day through the middle of the day, between 9am and 2pm, at least for this week of data.

### 3.4 Vehicle classification

Data was collect by three vehicle classes:

- Light
- Heavy, and
- Bus

The following table summarises the number of vehicles by class recorded at each intersection during the survey period, and provides the proportion of heavy vehicles and the proportion of heavy vehicles plus buses.



Intersection	Light	Heavy	Bus	Total	% heavy	%heavy & Bus
Bendooley St/Banyette St/	1,914	10	33	1,957	0.5%	2.2%
Bong Bong St/Banyette St/	2,710	25	10	2,745	0.9%	1.3%
Bong Bong St/Boolwey St/	2,533	29	25	2,587	1.1%	2.1%
Bong Bong St/Bowral St/	3,147	31	24	3,202	1.0%	1.7%
Bong Bong St/Merrigang St/	2,790	34	12	2,836	1.2%	1.6%
Bong Bong St/Station St	4,084	79	36	4,199	1.9%	2.7%
Bong Bong St/Wingecarribee St/	1,807	20	4	1,831	1.1%	1.3%
Boolwey St/Bendooley St/	2,522	7	47	2,576	0.3%	2.1%
Boolwey St/Oxley Mall/Woolies/	2,045	5	25	2,075	0.2%	1.4%
Bowral St/Bendooley St/	2,618	21	32	2,671	0.8%	2.0%
Bundaroo St/Bendooley St/	681	4	22	707	0.6%	3.7%
Centennial Rd/Kirkham Rd/	612	19	4	635	3.0%	3.6%
Funston St/Belmore St/	1,949	59	18	2,026	2.9%	3.8%
Kangaloon Rd/Moss Vale Rd/	4,117	88	35	4,240	2.1%	2.9%
Kirkham Rd/Mount St/	600	20	6	626	3.2%	4.2%
Kirkham Rd/Sherwood Ave/	710	25	6	741	3.4%	4.2%
Merrigang St/Bendooley St/	2,345	13	26	2,384	0.5%	1.6%
Mittagong Rd/ Cliff St/	3,954	82	46	4,082	2.0%	3.1%
Mittagong Rd/Kirkham Rd/	4,104	96	43	4,243	2.3%	3.3%
Mittagong Rd/Oxley Dr/	3,963	88	43	4,094	2.1%	3.2%
Mittagong Rd/Victoria St/	3,978	84	47	4,109	2.0%	3.2%
Moss Vale Rd/Alcorn St/Beavan Pl/	3,082	58	27	3,167	1.8%	2.7%
Moss Vale Rd/Carrington St/	3,085	54	26	3,165	1.7%	2.5%
Moss Vale Rd/Links Rd/	2,986	56	28	3,070	1.8%	2.7%
Moss Vale Rd/Yean St/	2,920	55	29	3,004	1.8%	2.8%
Oxley Hill Rd/Kiama St/	380	20	1	401	5.0%	5.2%
Station St/Boolwey St/	3,053	92	65	3,210	2.9%	4.9%
Station St/Bowral St/	2,329	73	24	2,426	3.0%	4.0%
Station St/Wingecarribee St	3,264	87	29	3,380	2.6%	3.4%
Wingecarribee St/Bendooley St/	2,228	6	27	2,261	0.3%	1.5%
Wingecarribee St/Kirkham Rd/	1,319	41	6	1,366	3.0%	3.4%
<b>Total</b>	<b>77,829</b>	<b>1,381</b>	<b>806</b>	<b>80,016</b>	<b>1.7%</b>	<b>2.7%</b>

The data in the above table indicates that heavy vehicles were a small proportion of the traffic stream in the study area during the survey period, at less than 3% of the recorded traffic stream. Of the sites with higher volumes, intersections along Station St had around 3% heavy vehicles, whereas along Bong Bong Street it was closer to 1% heavy vehicles. This suggests that heavy vehicles tend to use the bypass (Station Street) and avoid Bong Bong Street.

### 3.5 Supplementary counts

Additional count information was taken from the video files of 30 April 2010 at:

- The access to The Intersection from Bowral Street
- Merrigang Street and Station Street

- Station Street and petrol station access driveway
- Bong Bong Street and petrol station access
- Bong Bong Street and Bundaroo Street
- Funston Street and Station Street

This data was for turning movements only between 3pm and 4pm and is generally for all vehicles.

Additional spot counts were taken at:

- Bowral and Holmhale Street – turns only
- Medical centre and Bowral Street – both driveways, opposite Holmhale Street, turns only
- Driveway near motorcycle shop and Bowral Street – turns only
- Station Street and Banyette Street – turns only
- Argyle Lane north and Banyette Street – turns only
- Argyle Lane south and Banyette Street – turns only
- Driveways to Anchors and ALDI from Banyette Street
- Wattle Lane and Banyette Street
- Banyette Street and petrol station egress

These counts were taken on 10 and 11 June 2010 between 3pm and 4pm and are generally for all vehicles. The purpose of the additional counts was to provide extra information on internal traffic generation within the study area and to provide more control over vehicle movements within the traffic model.

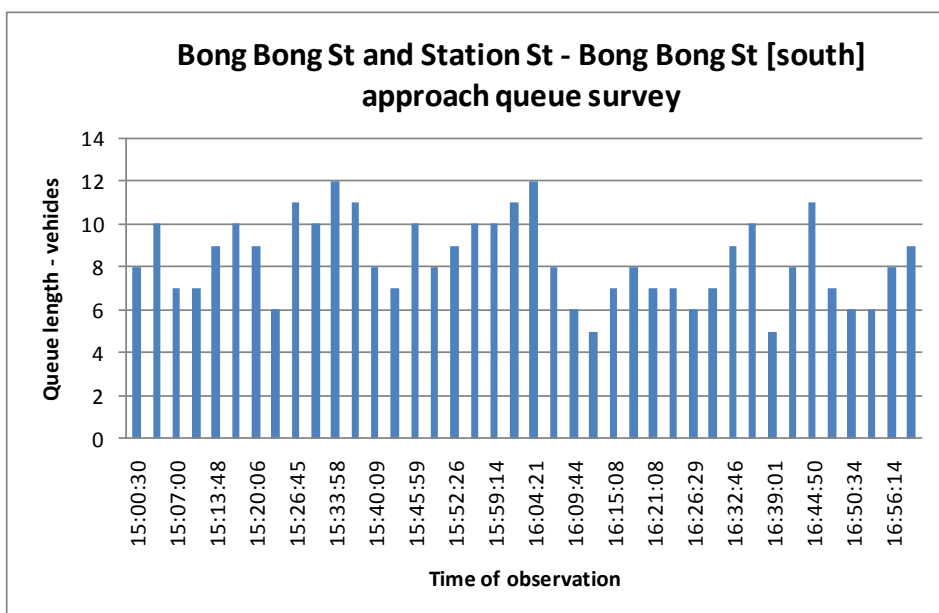
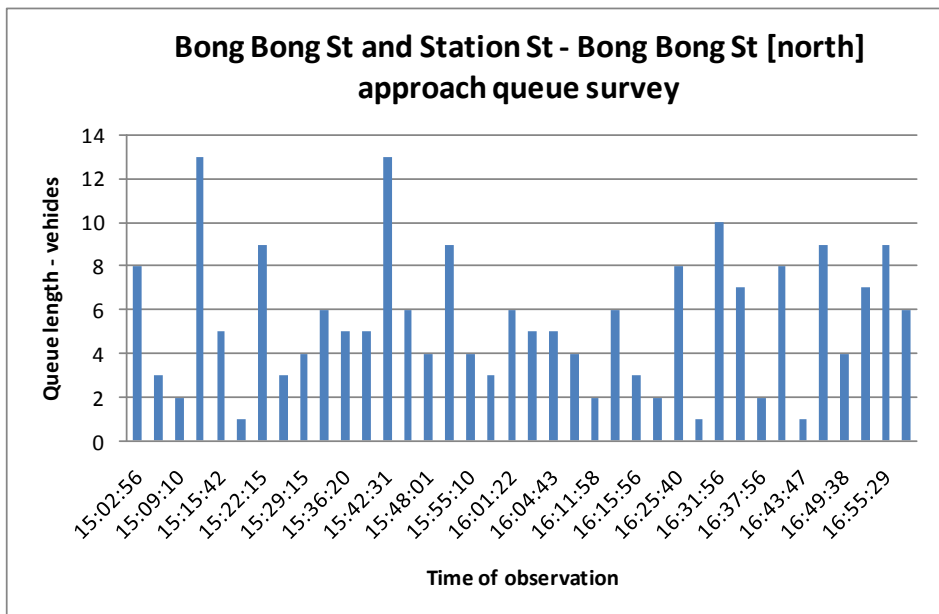
This information is summarised in attached workbook – *SupplementaryFieldData.xlsx*. It is also included in the updated stick figure – *StickfigureForEstimation.xlsx*.

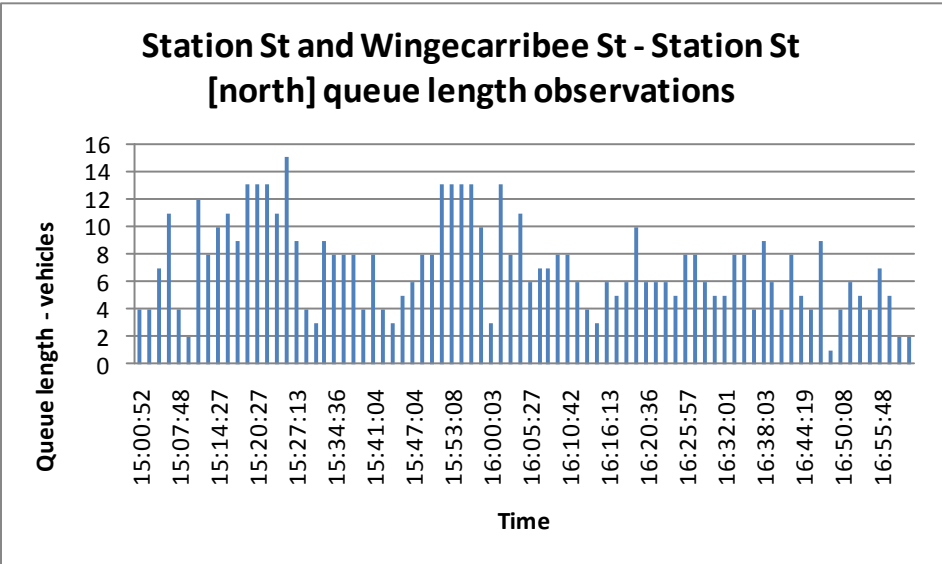
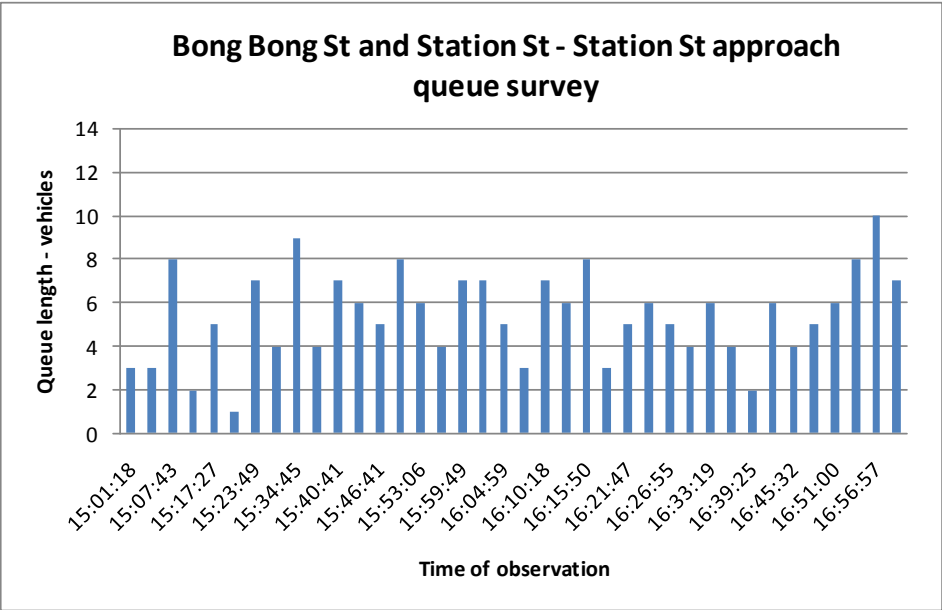
## 4.0 Queue Surveys

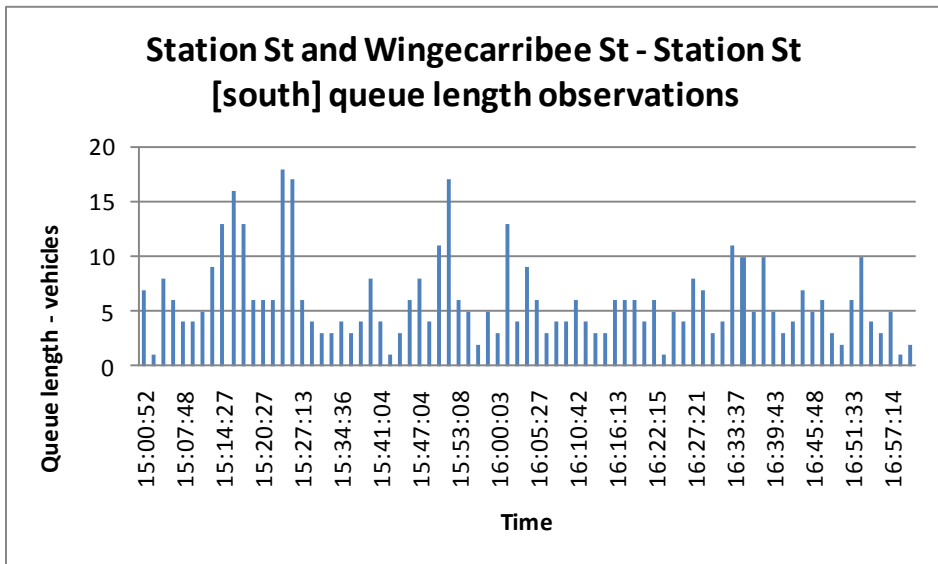
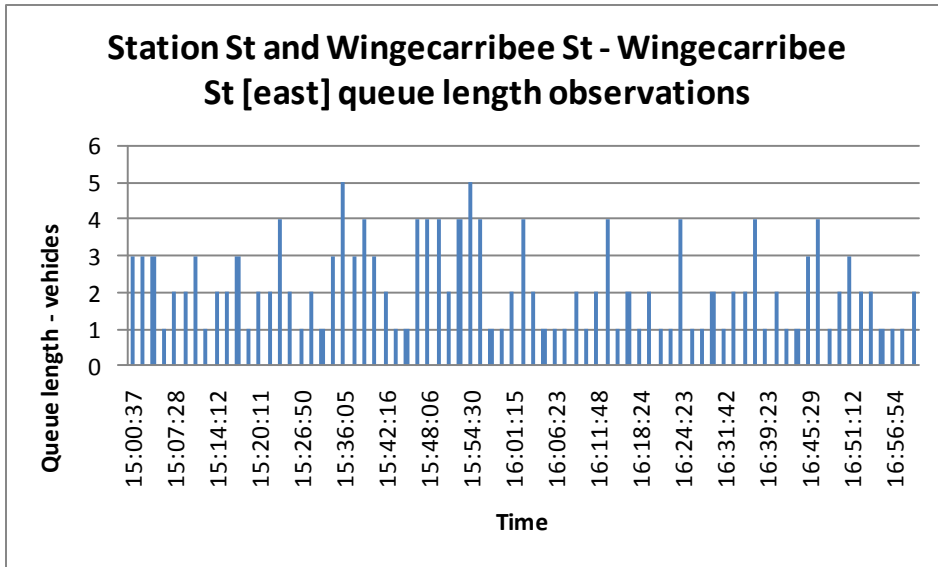
Observations of vehicle queue lengths were taken at selected intersections. The observation method depended upon the intersection’s mode of control, with signal controlled intersections having back of queue lengths recorded at end of red, with observations rotating around the intersection. Whereas priority intersections had their approach queue lengths recorded every minute – again rotating around the intersection.

The purpose of the queue length surveys was to obtain numerical estimates of indicative queuing for subsequent comparison with the model’s queues at the particular intersection. Data was collected at 17 intersections, and a chart was prepared for each approach to each of these intersections showing observed queue lengths through the survey period.

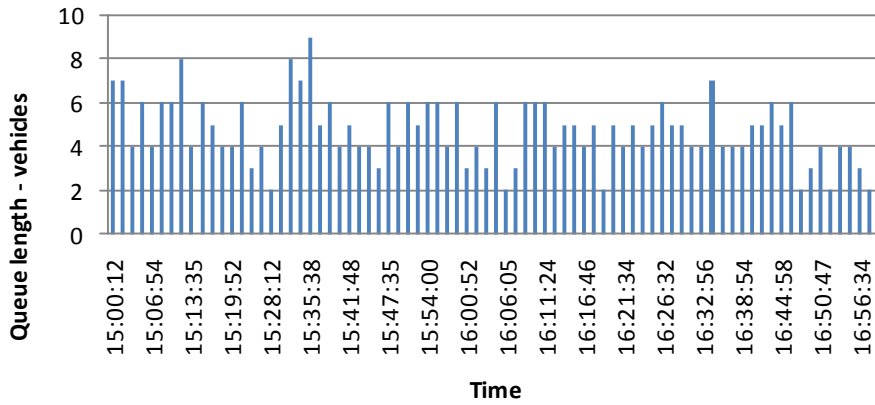
Where no queues were observed on an approach over the survey period then no chart is included below.



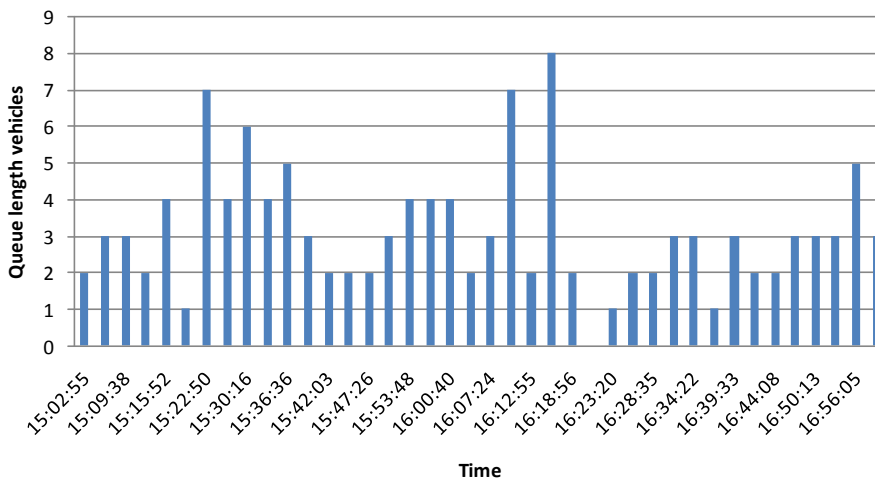


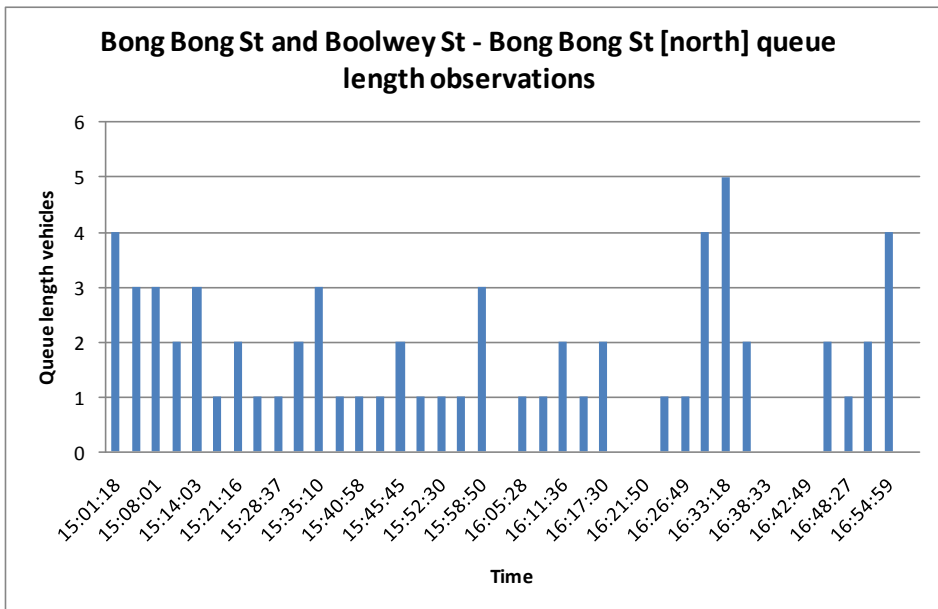
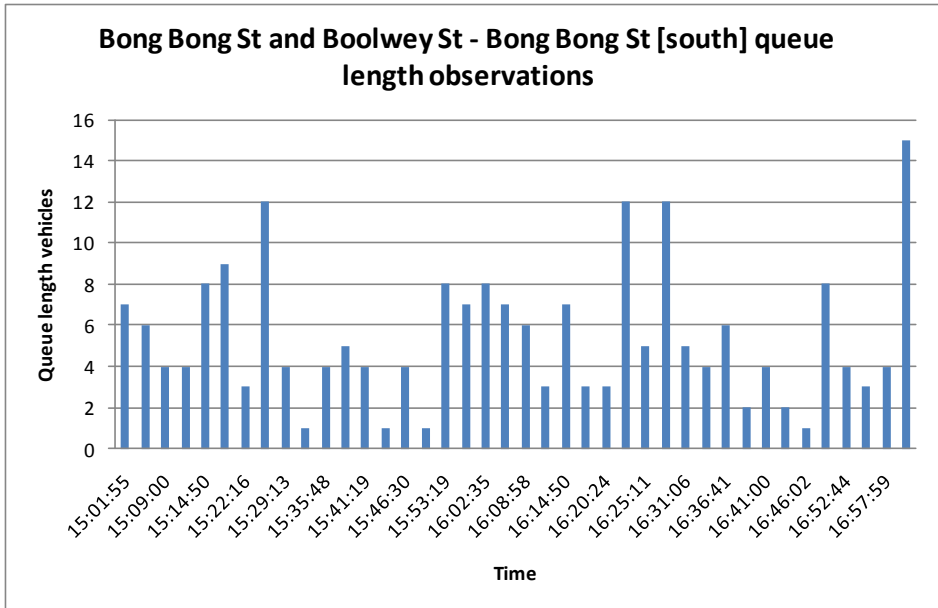


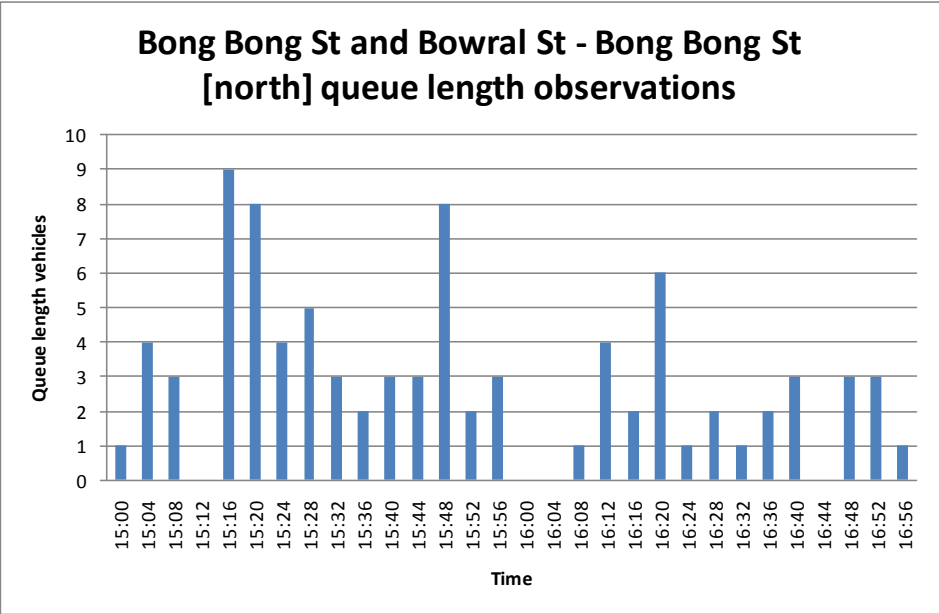
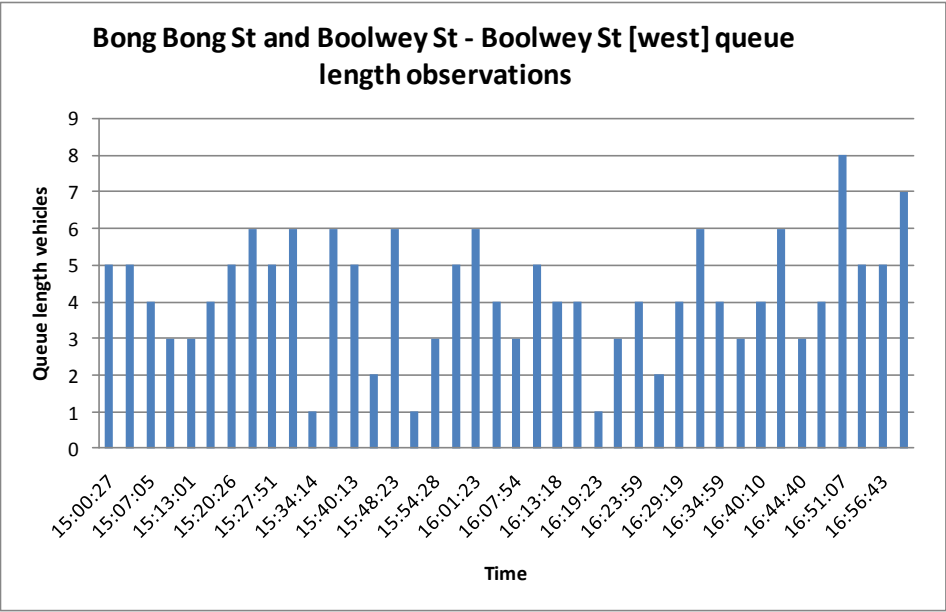
**Station St and Wingecarribee St - Wingecarribee St [west] queue length observations**



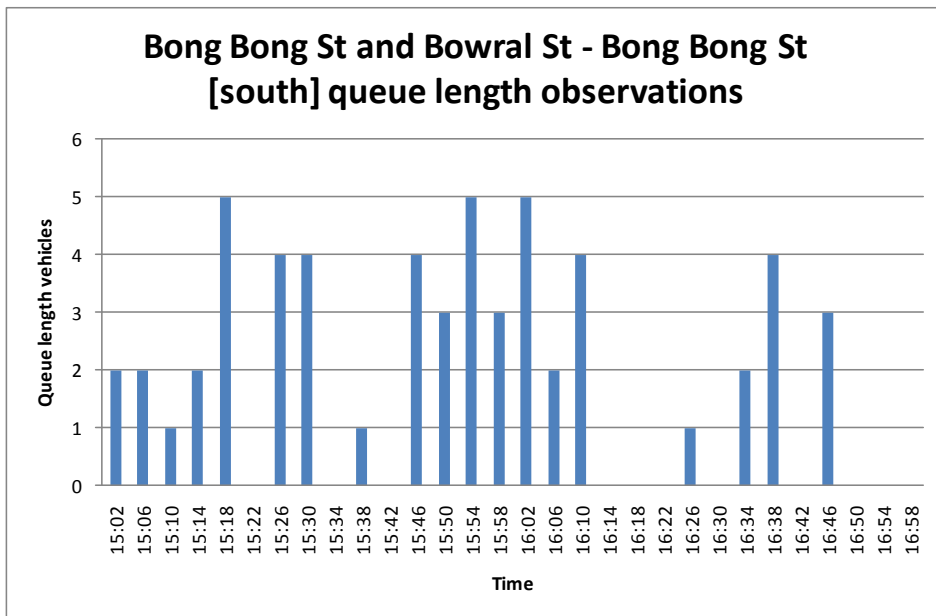
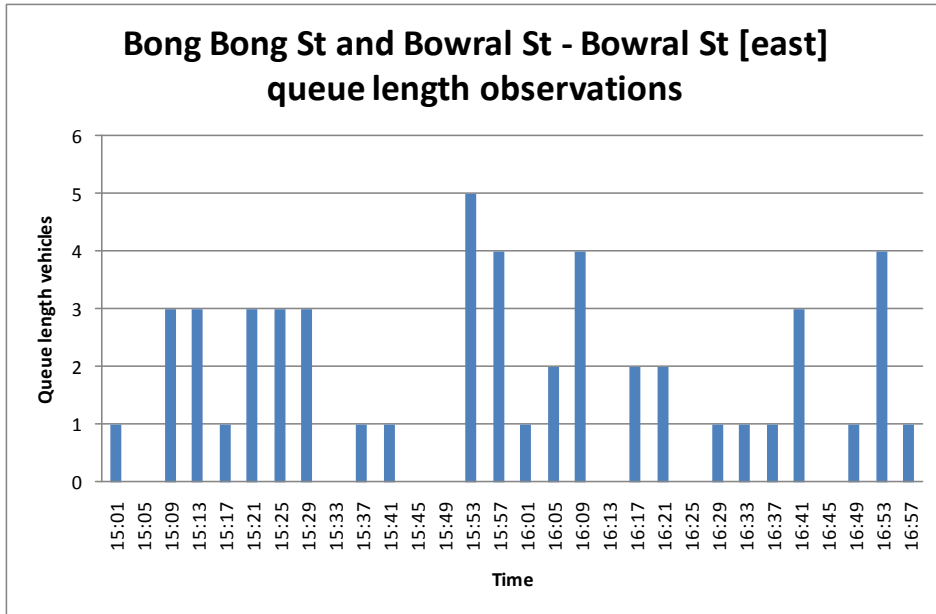
**Bong Bong St and Boolwey St - Boolwey St [east] queue length observations**

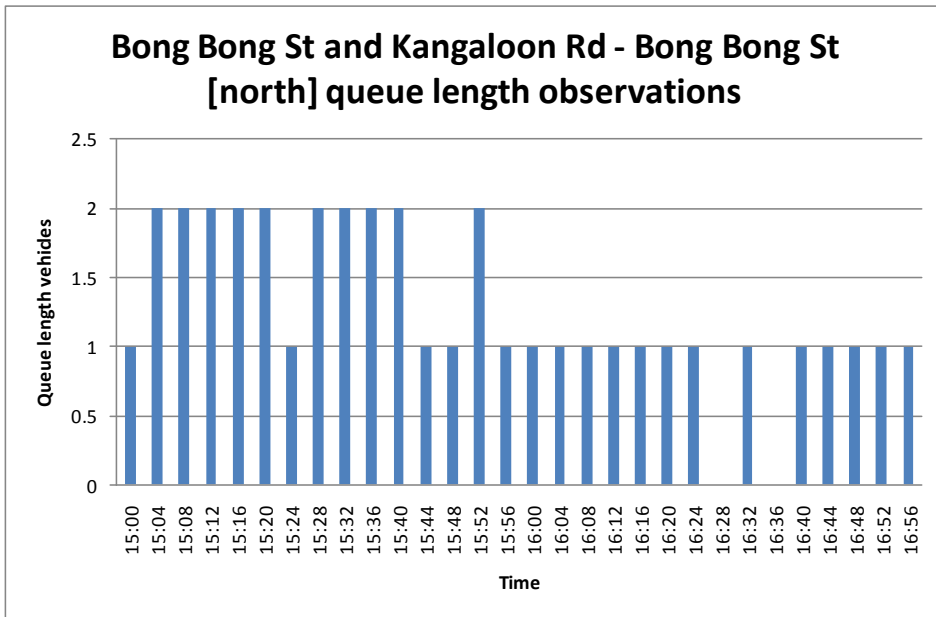
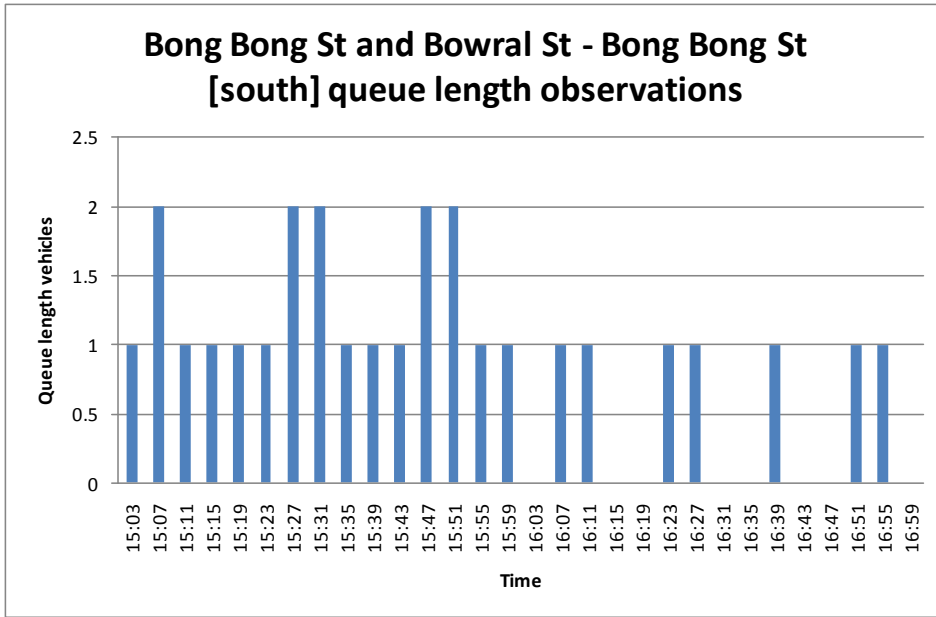




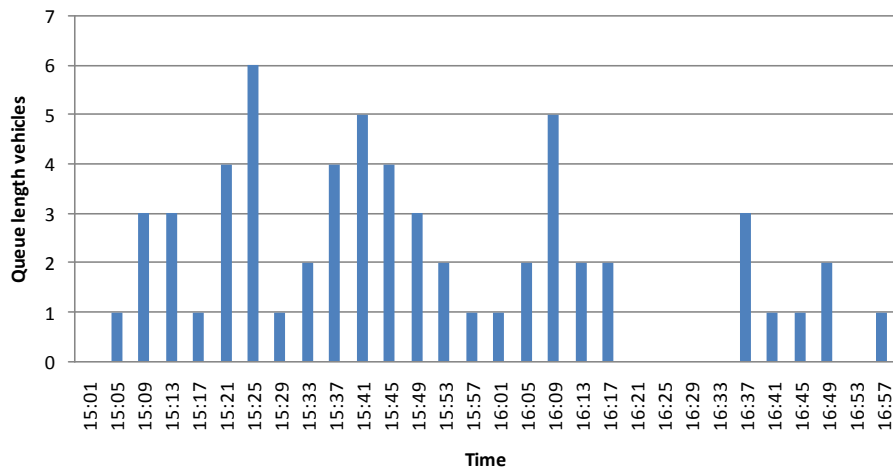




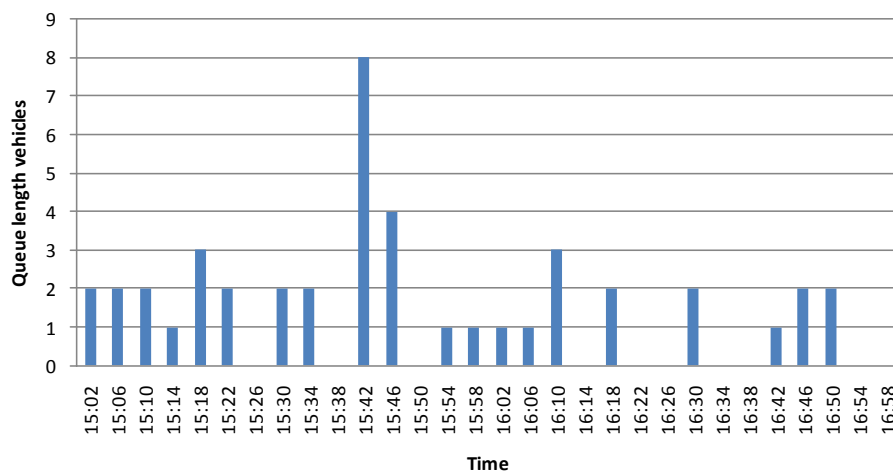




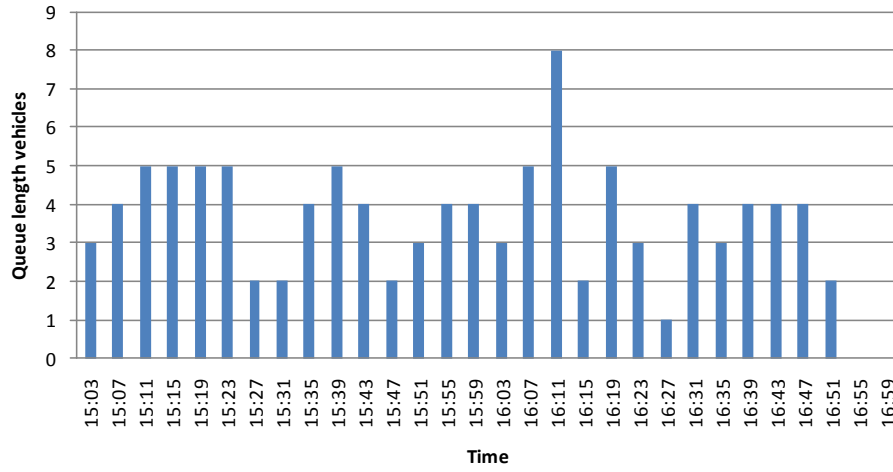
**Bong Bong St and Kangaloon Rd - Kangaloon Rd  
[east] queue length observations**



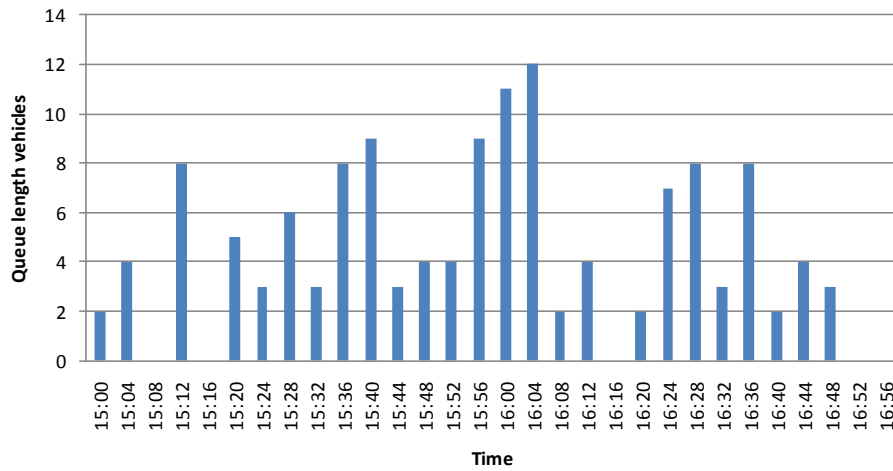
**Bong Bong St and Kangaloon Rd - Funston Rd  
[west] queue length observations**



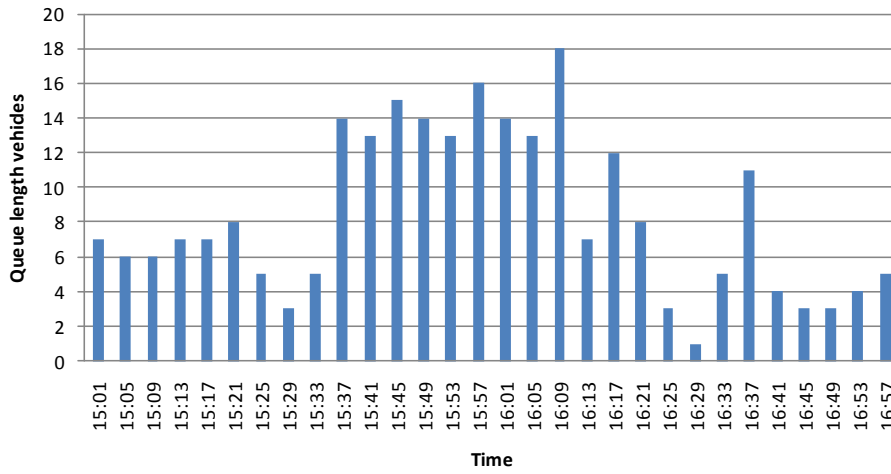
**Bong Bong St and Kangaloon Rd - Moss Vale Rd  
[south] queue length observations**



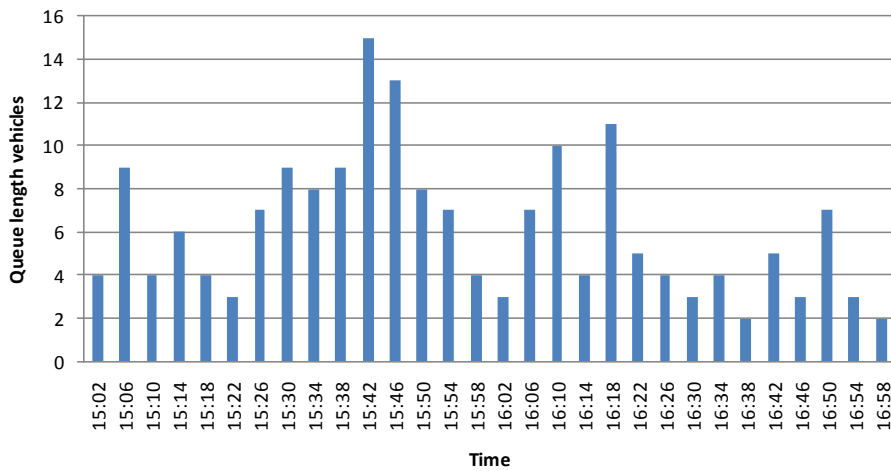
**Bong Bong St and Merrigang St - Bong Bong St  
[north] queue length observations**



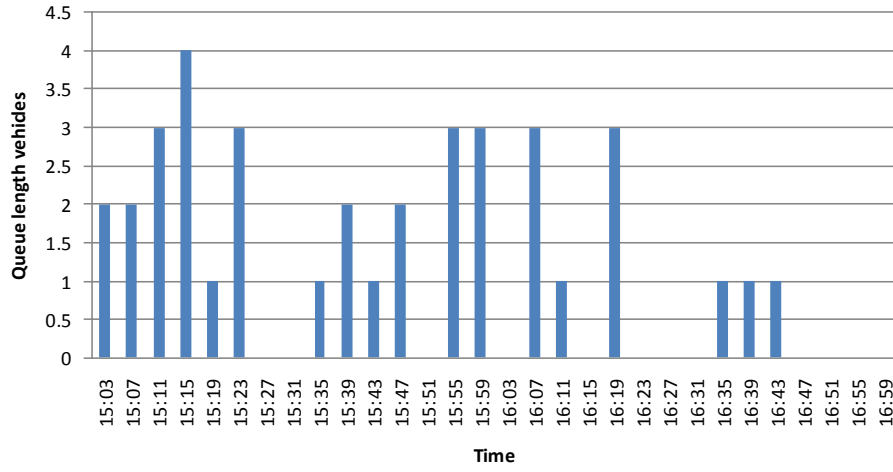
**Bong Bong St and Merrigang St - Merrigang St [east] queue length observations**



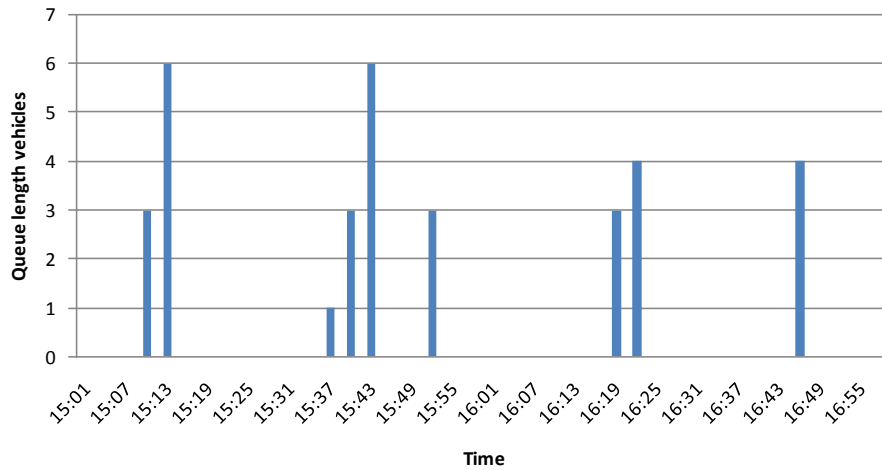
**Bong Bong St and Merrigang St - Bong Bong St [south] queue length observations**



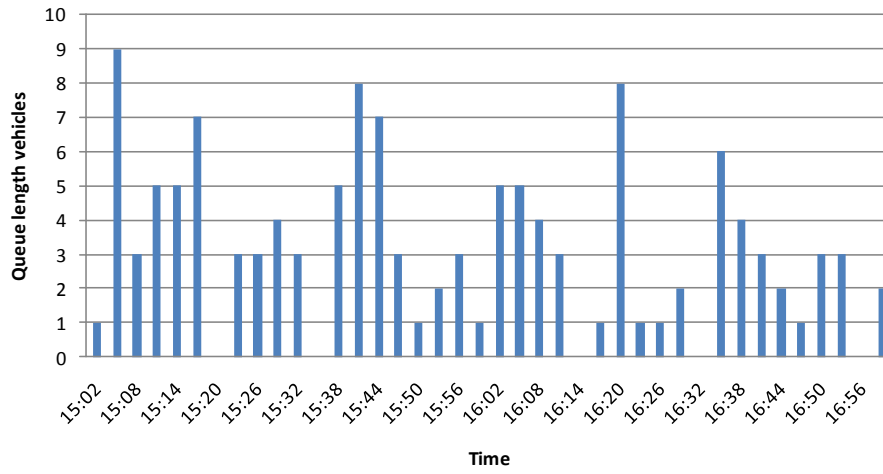
### Bong Bong St and Merrigang St - Merrigang St [west] queue length observations



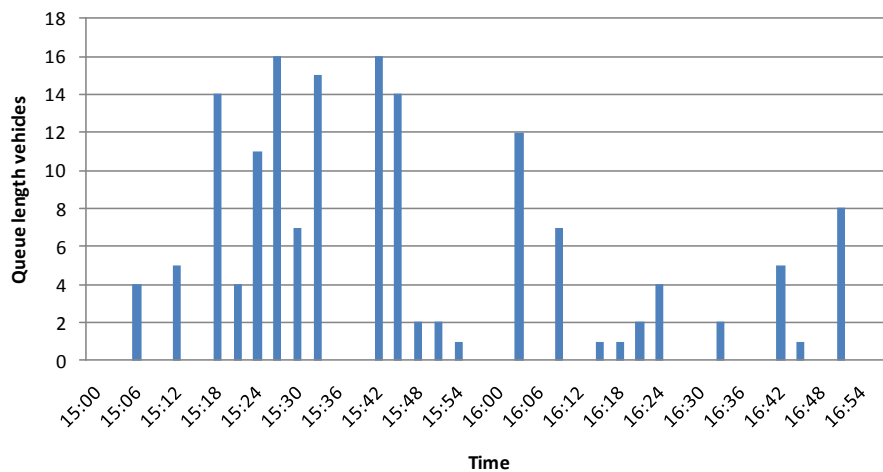
### Station St and Boolwey St - Station St [north] queue length observations



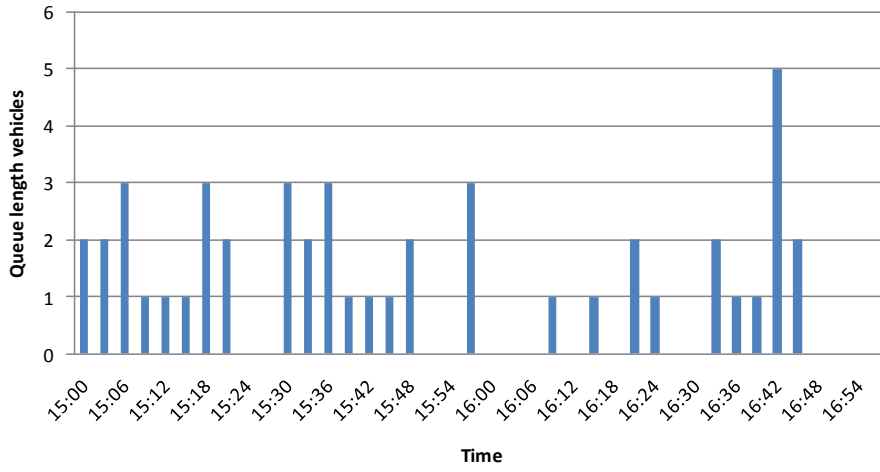
**Station St and Boolwey St - Boolwey St [east]  
queue length observations**



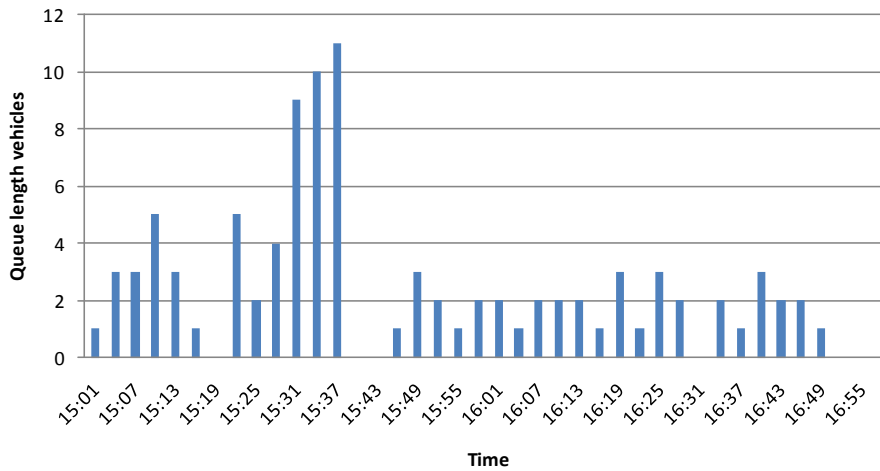
**Station St and Boolwey St - Station St [south]  
queue length observations**



### Wingecarribee St and Kirkham Rd - Kirkham Rd [north] queue length observations

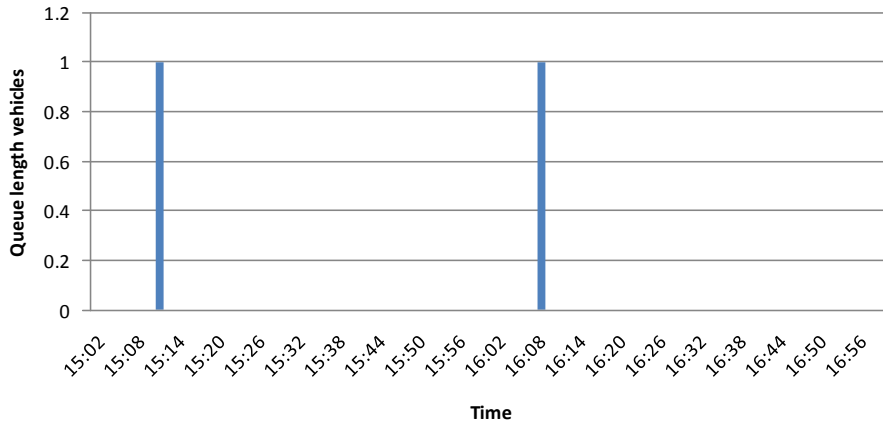


### Wingecarribee St and Kirkham Rd - Kirkham Rd [south] queue length observations

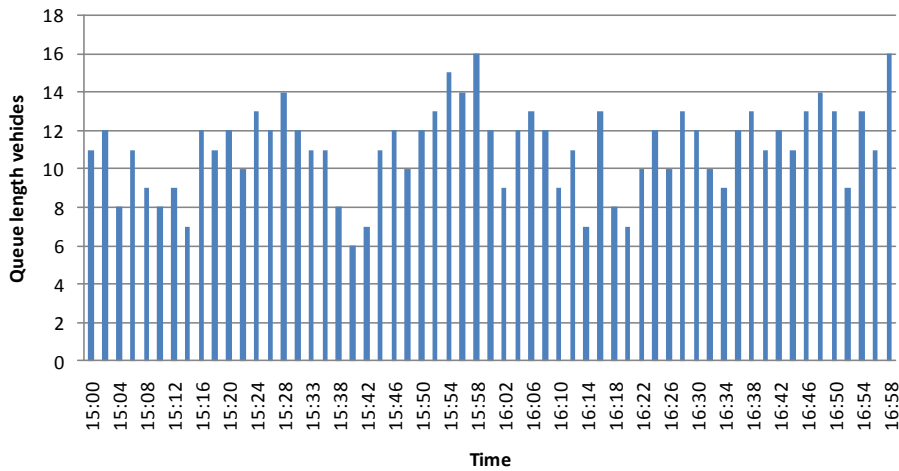




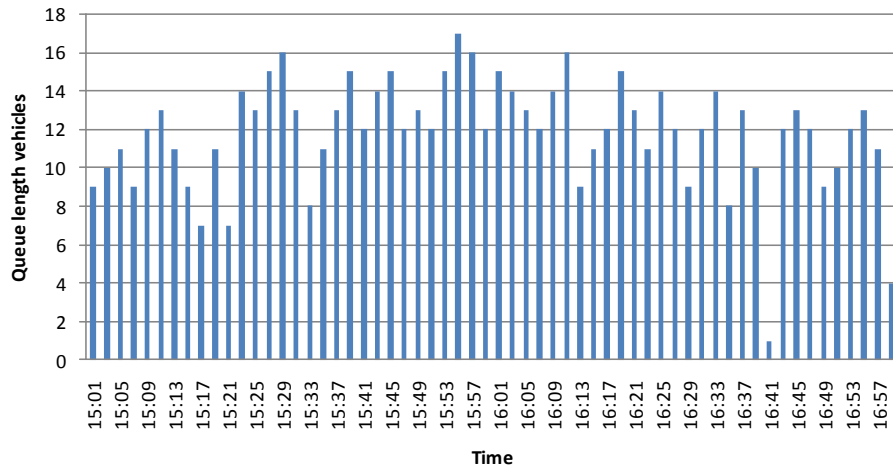
### Wingecarribee St and Kirkham Rd - Wingecarribee St [east] queue length observations



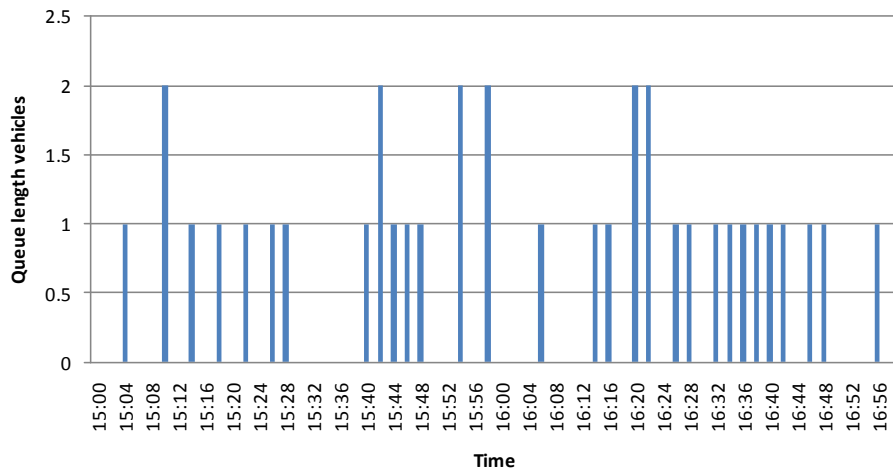
### Bong Bong St and Wingecarribee St - Bong Bong St [north] queue length observations



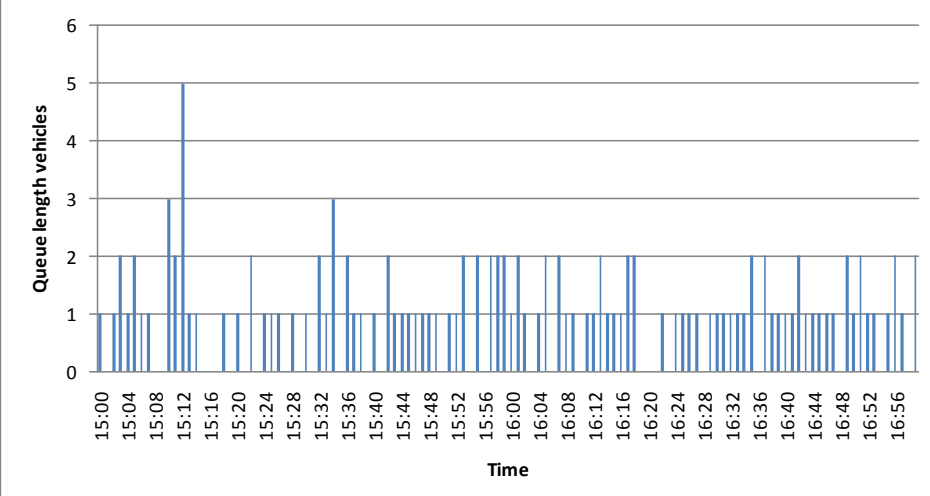
### Bong Bong St and Wingecarribee St - Bong Bong St [south] queue length observations



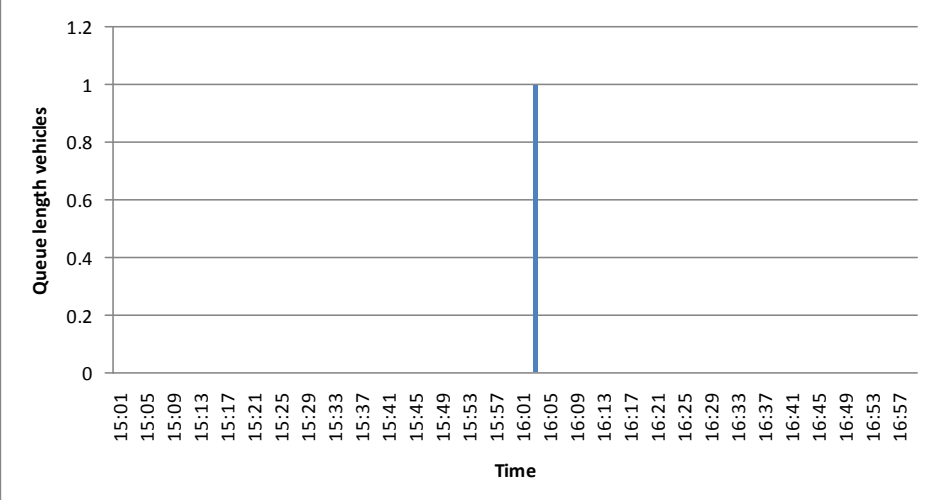
### Mittagong Rd and Kirkham Rd - Mittagong Rd [north] queue length observations

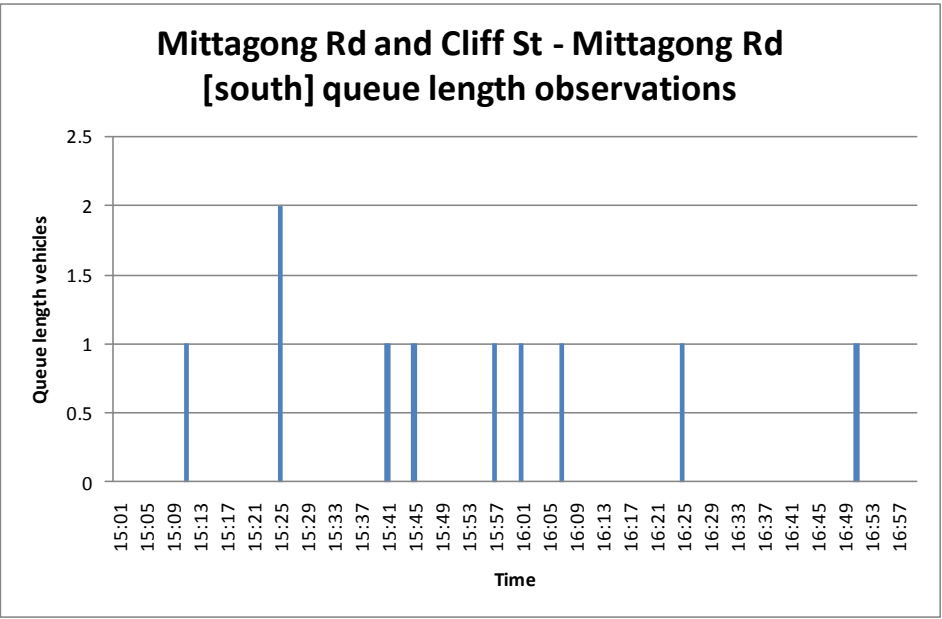
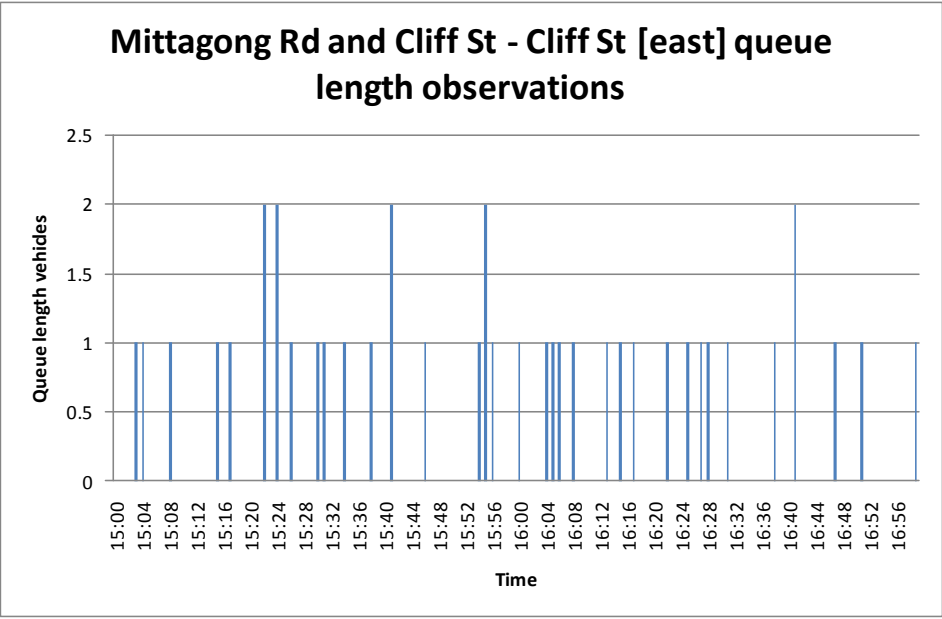


### Mittagong Rd and Kirkham Rd - Kirkham Rd [west] queue length observations

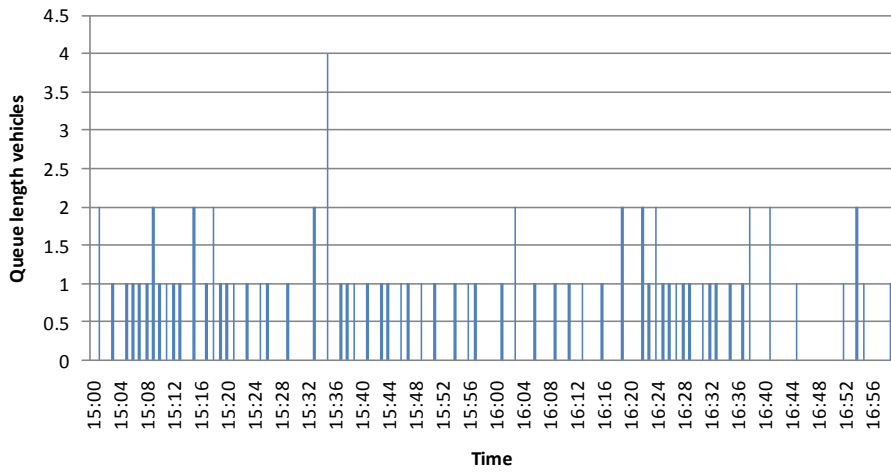


### Mittagong Rd and Kirkham Rd - Mittagong Rd [south] queue length observations

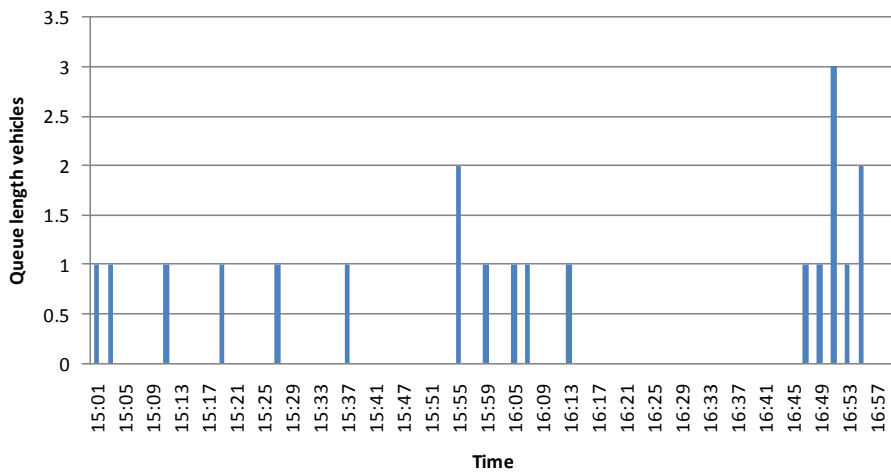


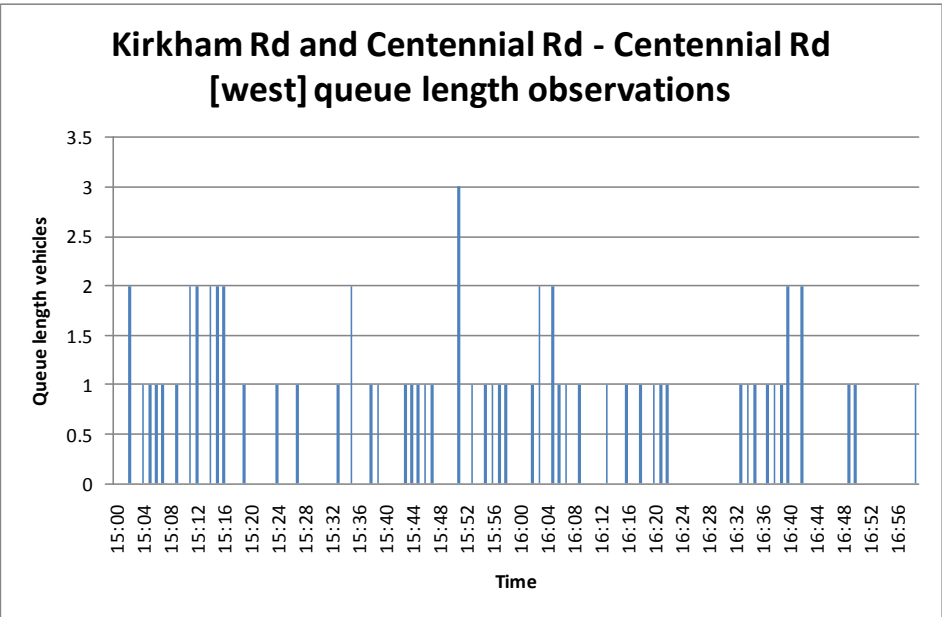
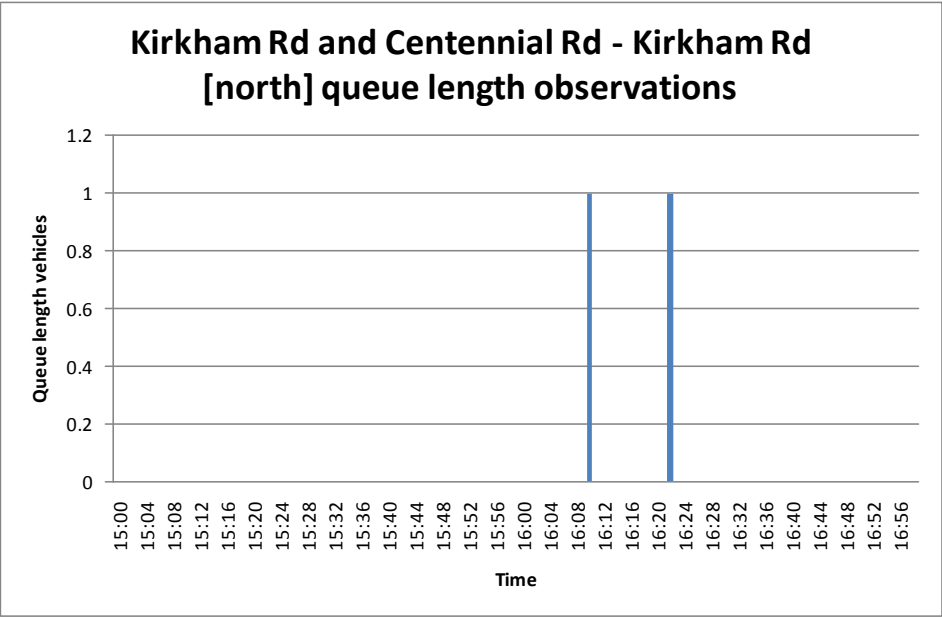


### Mittagong Rd and Oxely Dr - Oxley Dr [east] queue length observations

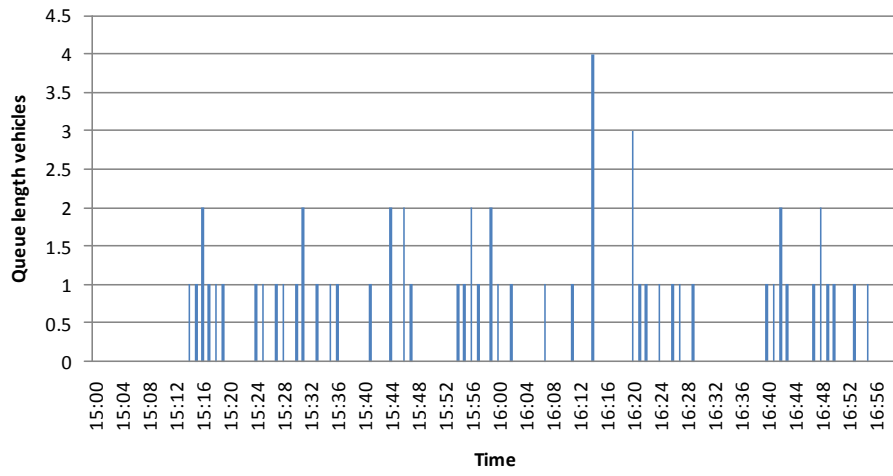


### Mittagong Rd and Oxely Dr - Mittagong Rd [south] queue length observations

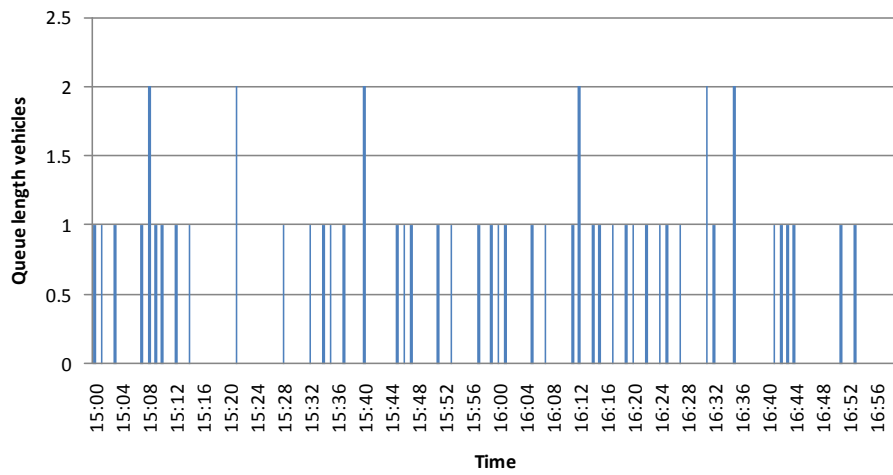


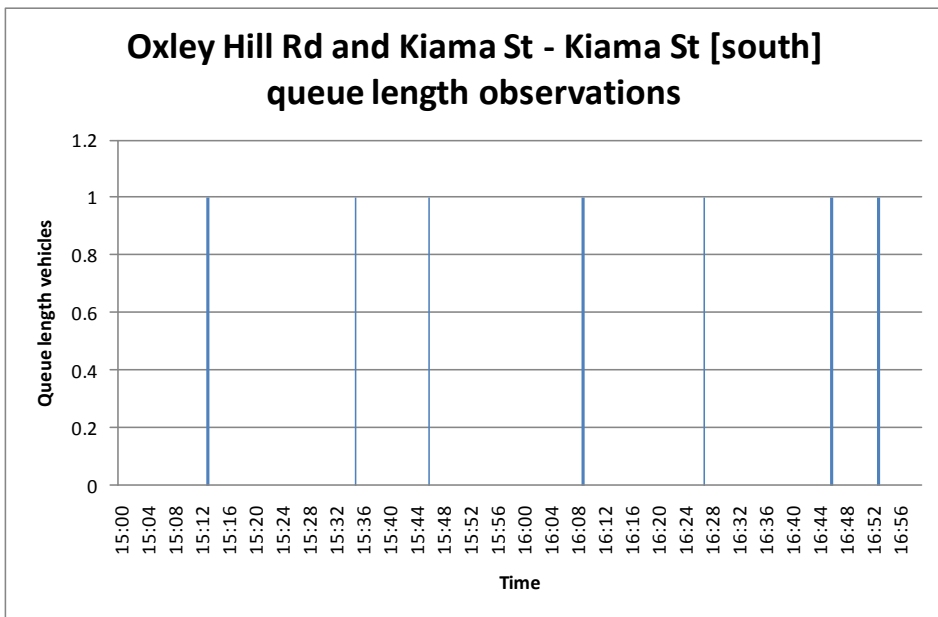
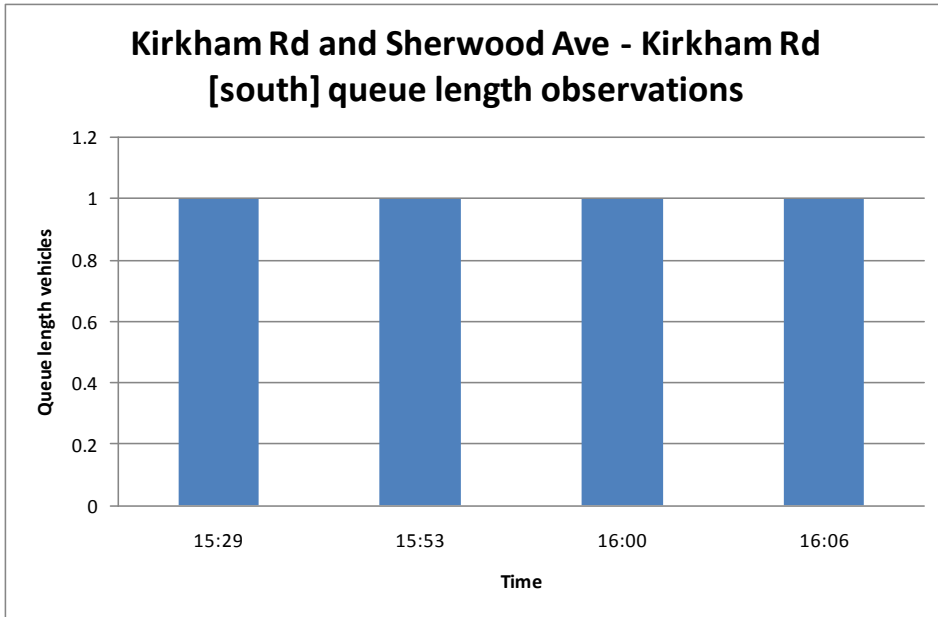


### Kirkham Rd and Mount St - Mount Rd [west] queue length observations



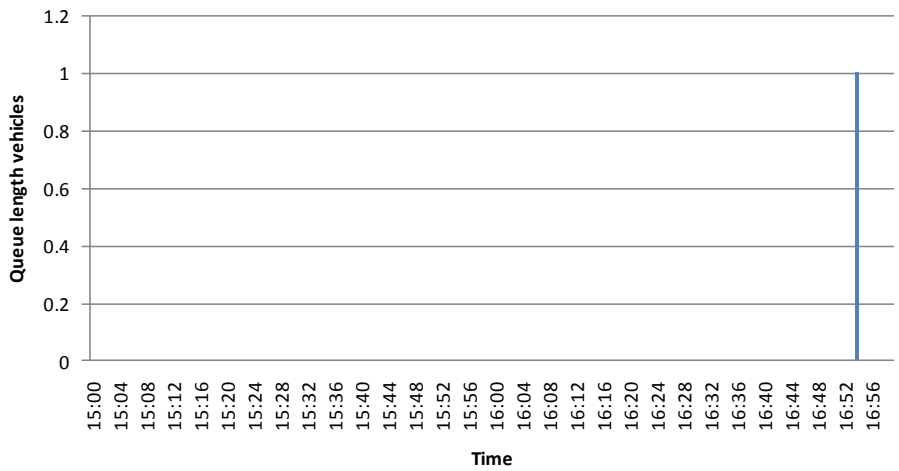
### Kirkham Rd and Sherwood Ave - Sherwood Ave [west] queue length observations



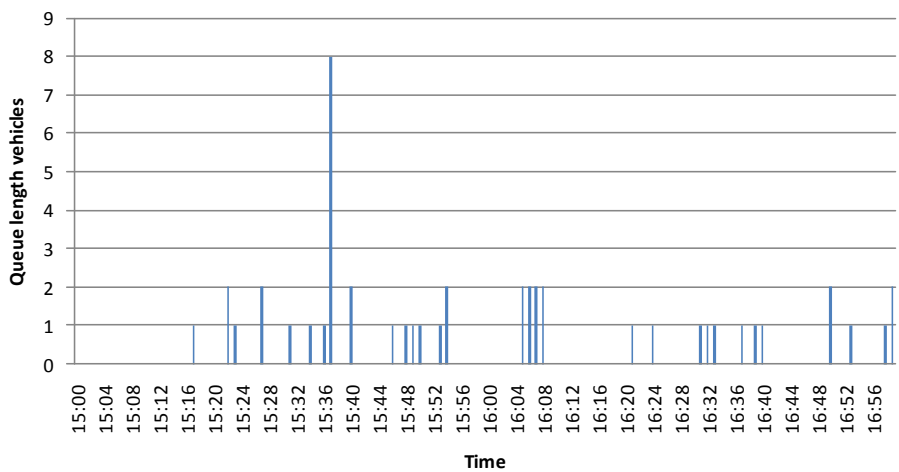




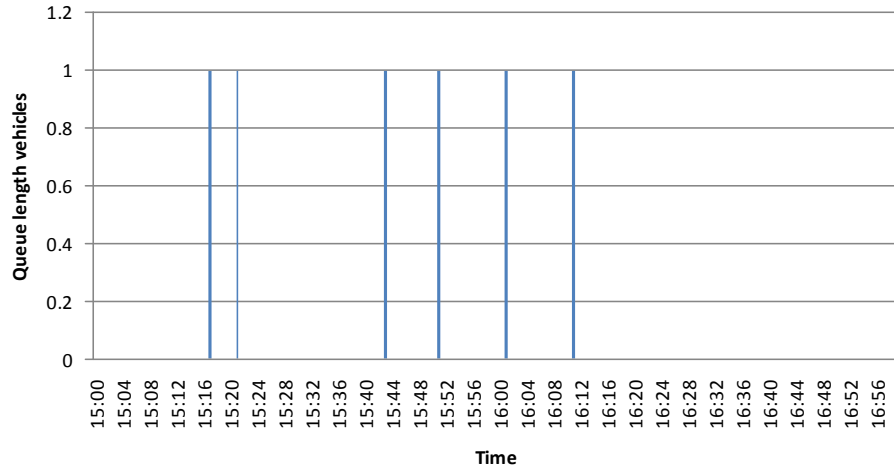
**Moss Vale Rd and Links Rd - Moss Vale Rd  
[north] queue length observations**



**Moss Vale Rd and Links Rd - Links Rd [east]  
queue length observations**



### Moss Vale Rd and Links Rd - Moss Vale Rd [south] queue length observations

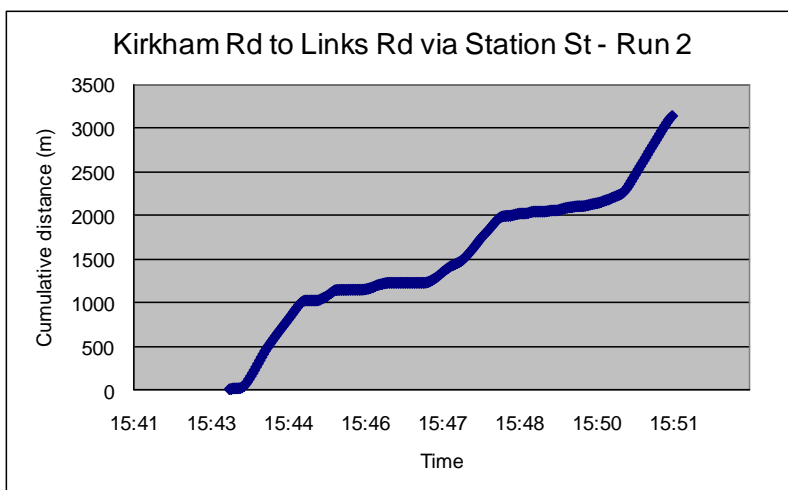
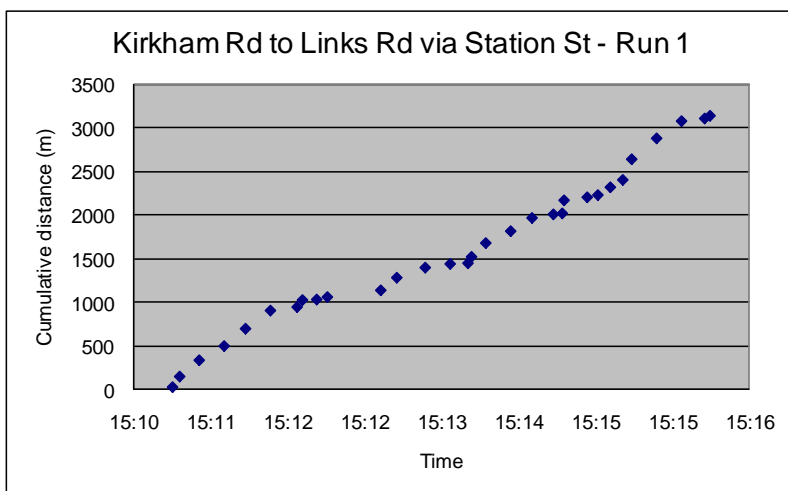


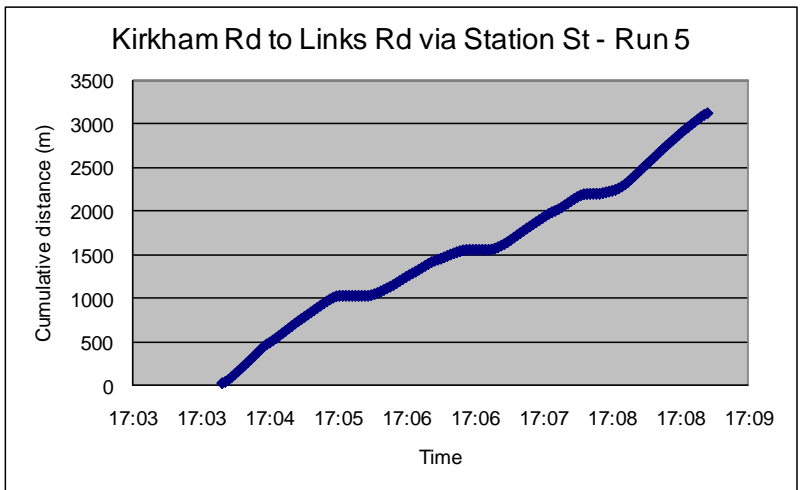
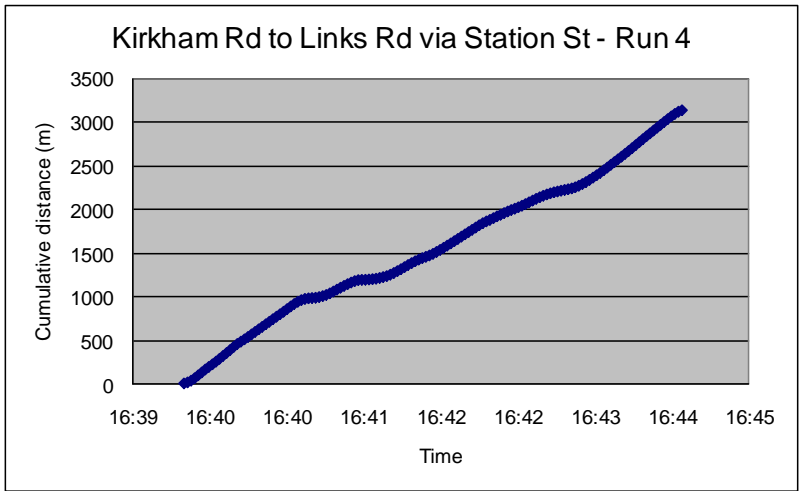
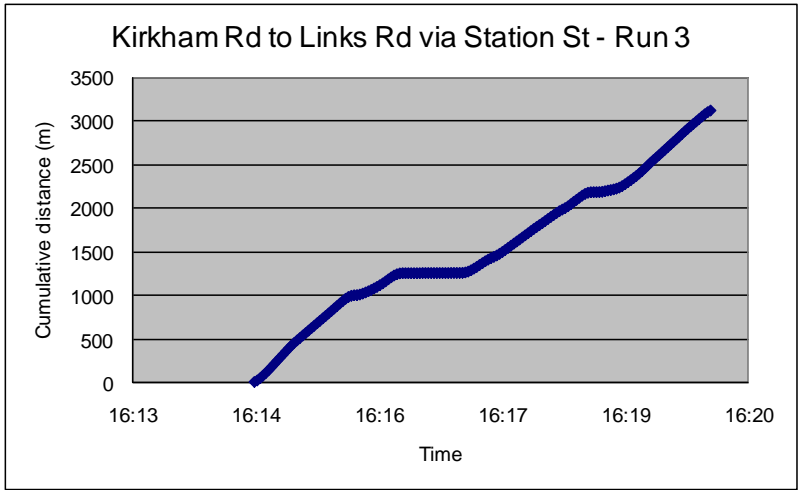
## 5.0 Travel Time Surveys

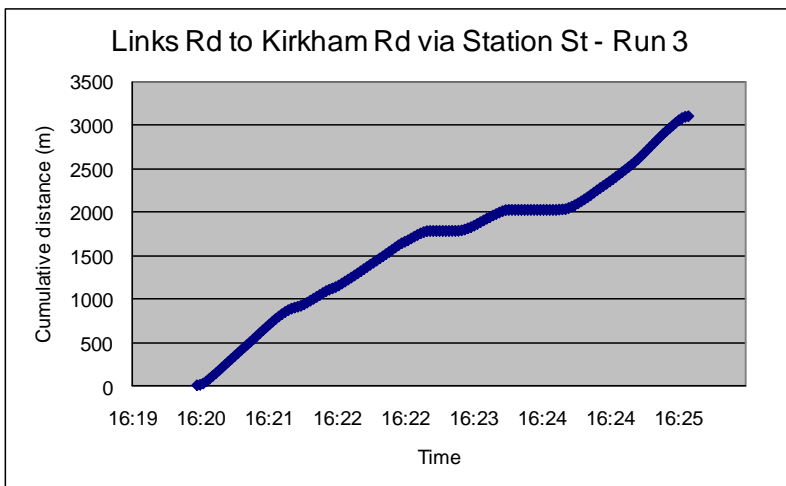
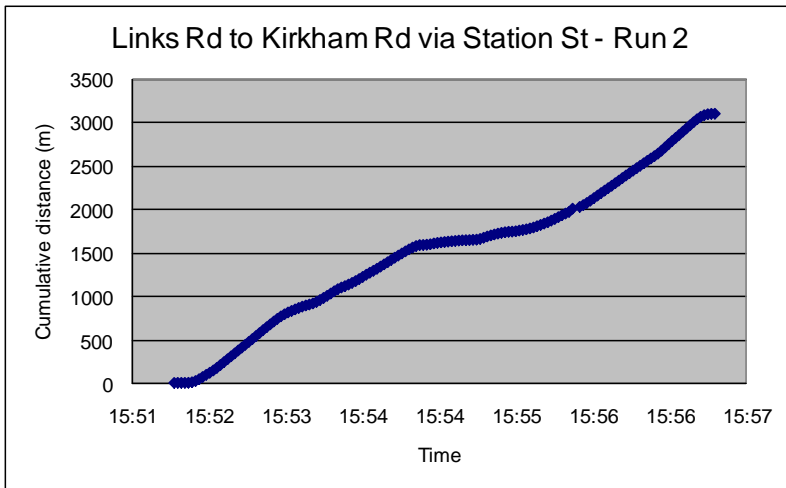
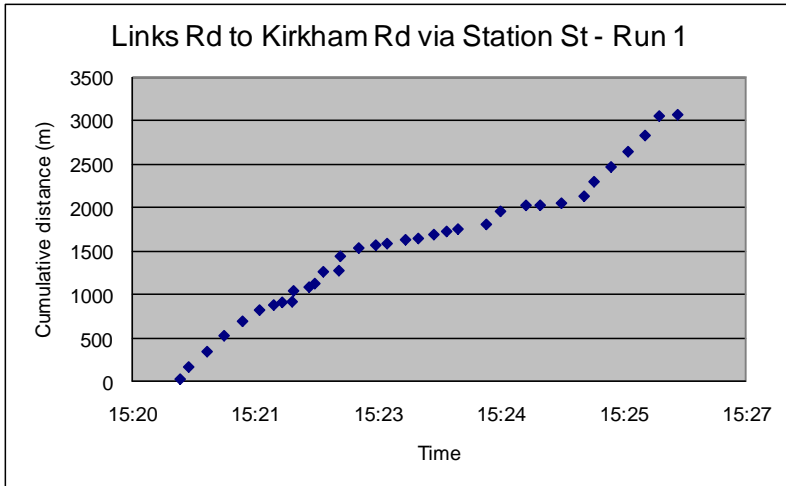
GPS-fitted probe cars were used to collect travel time information during the survey period. They collected travel time information along four broad alignments:

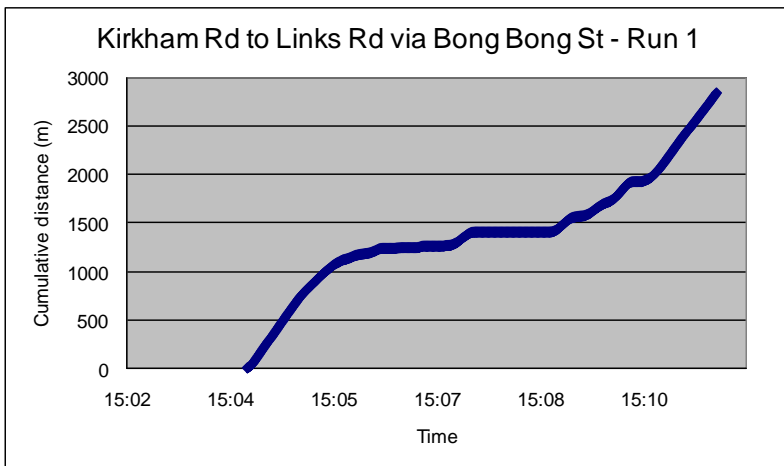
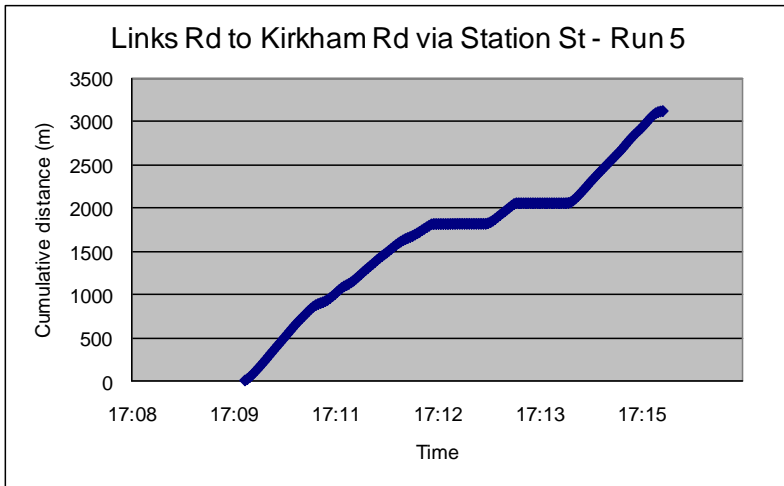
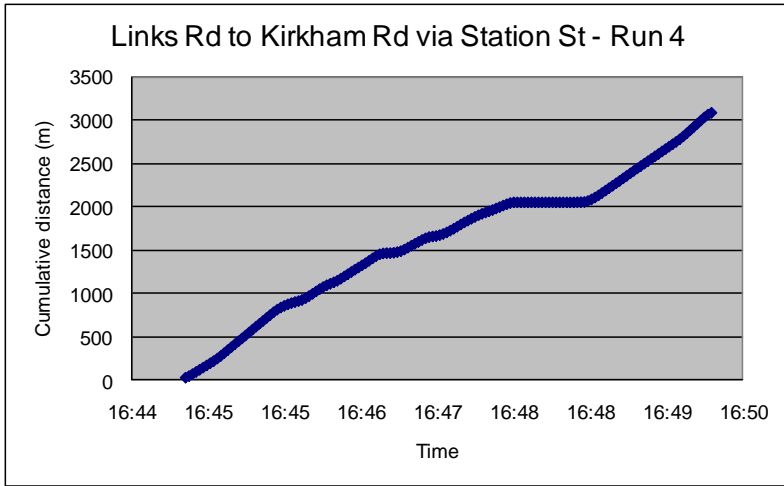
- Kirkham Road to Links Road via:
  - Station Street
  - Bong Bong Street
  - Bendooley Street; and,
- Boolwey Street, between Bendooley Street and Station Street

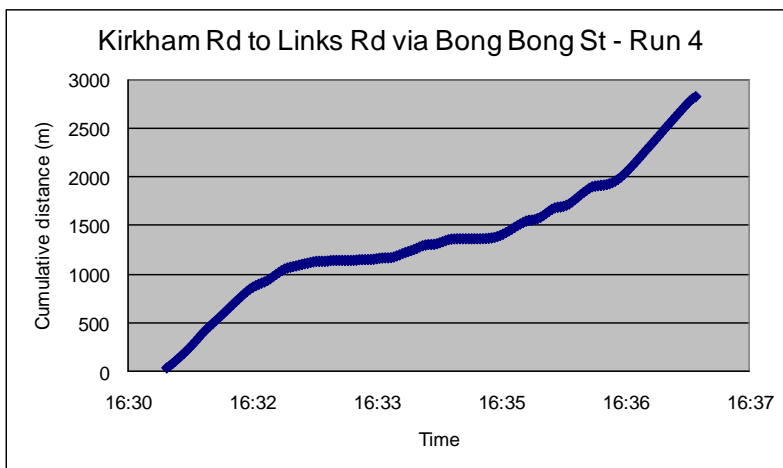
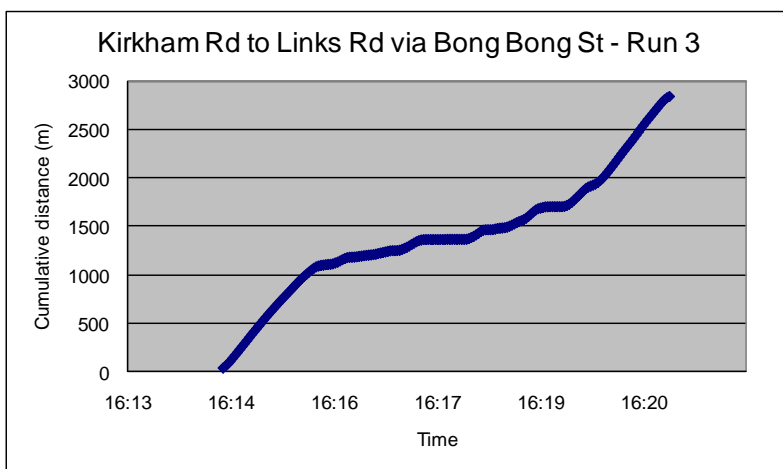
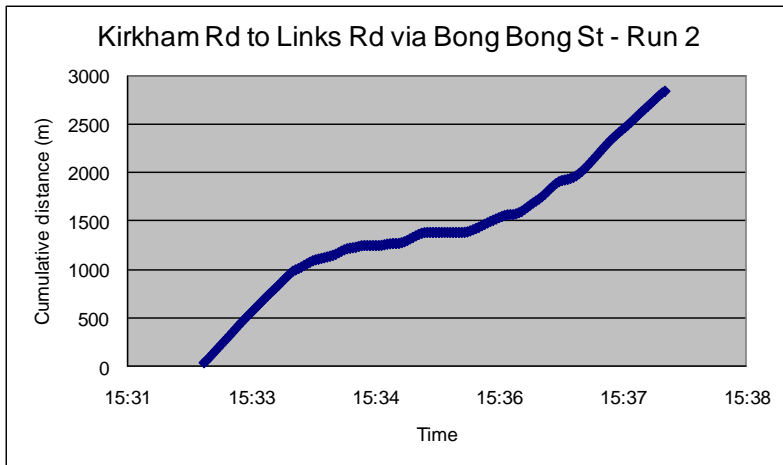
A number of runs were conducted in each direction along these routes, and charts are included below showing these.

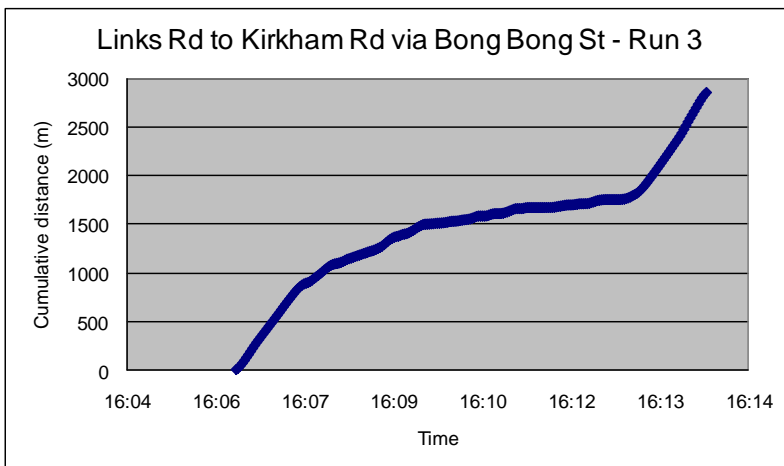
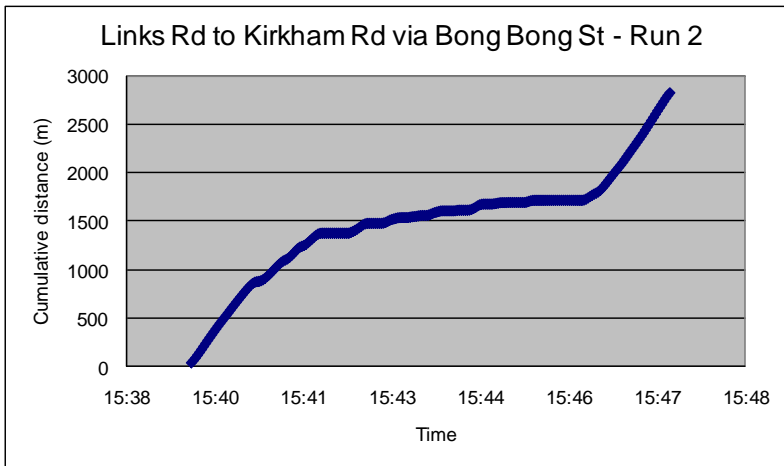
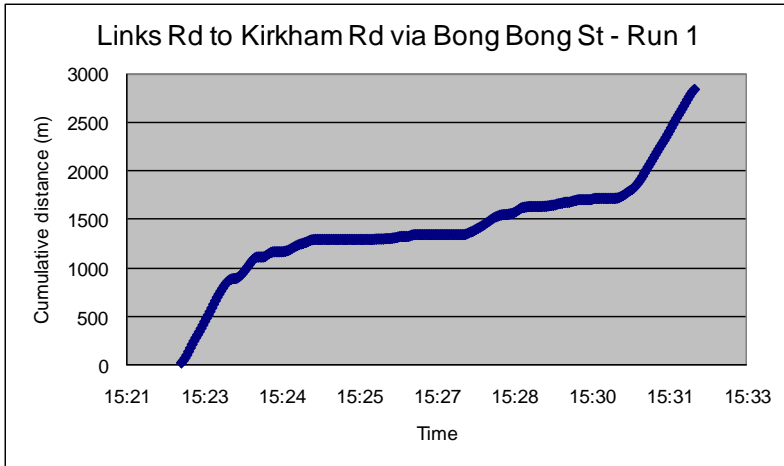




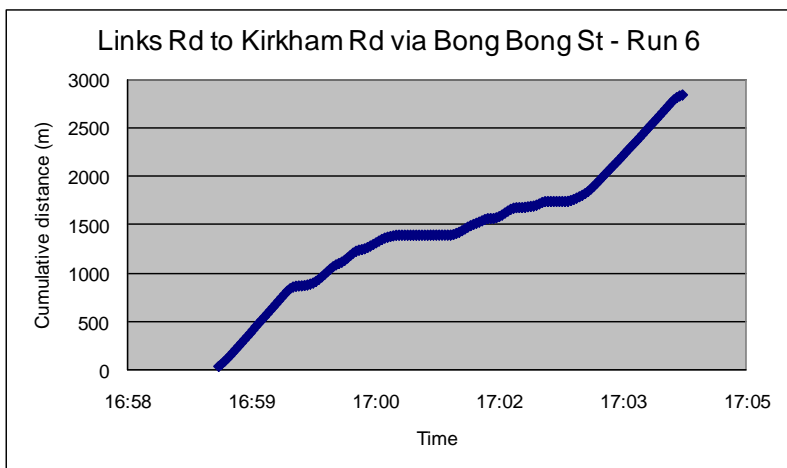
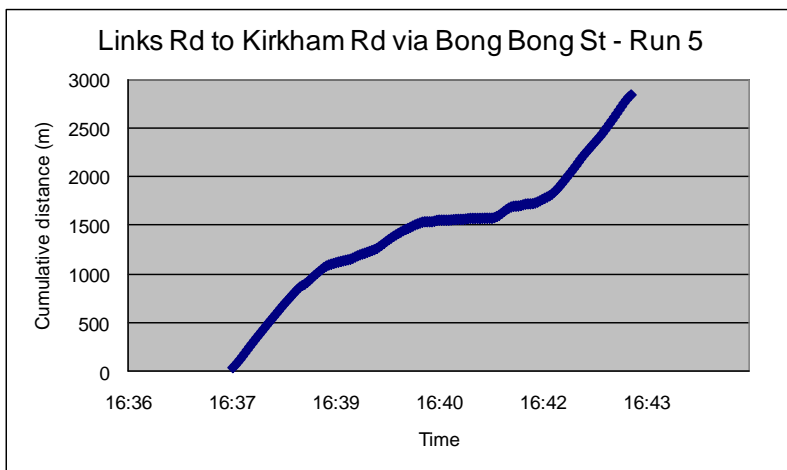
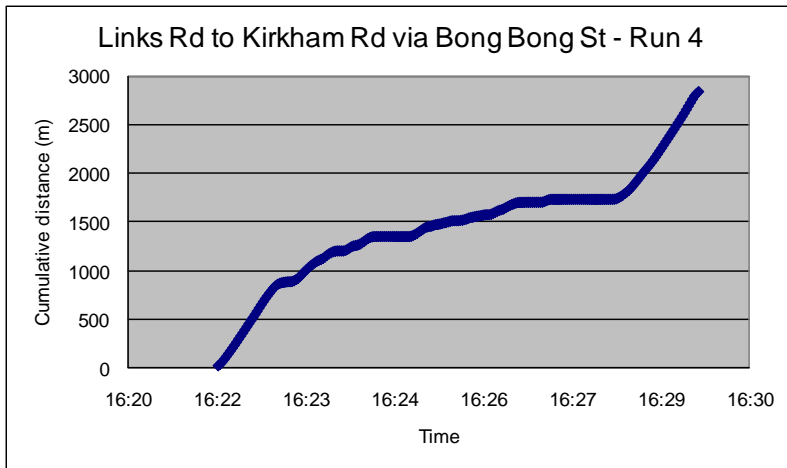


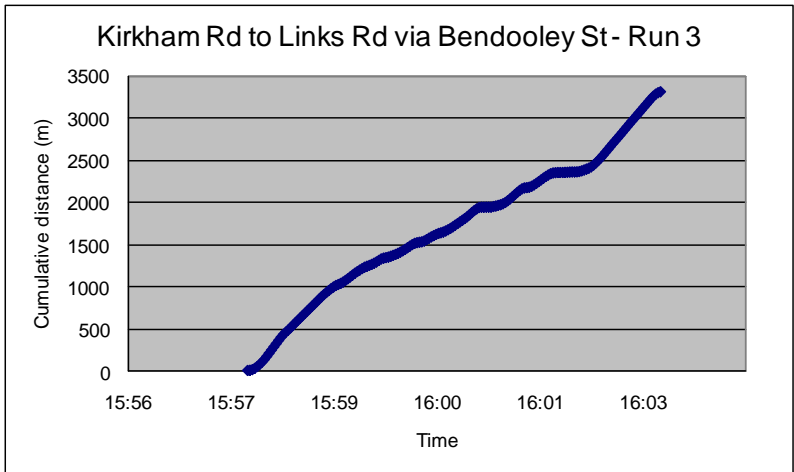
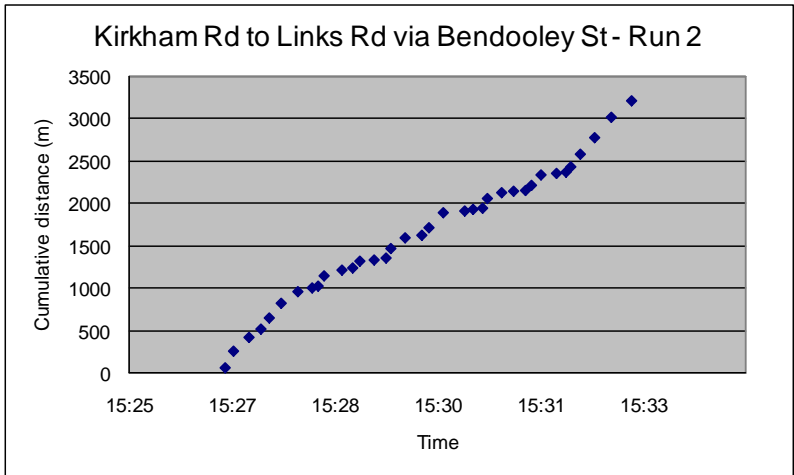
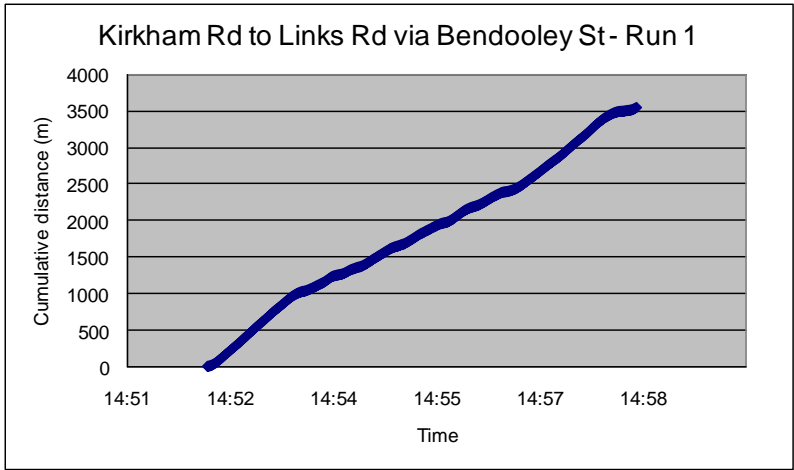


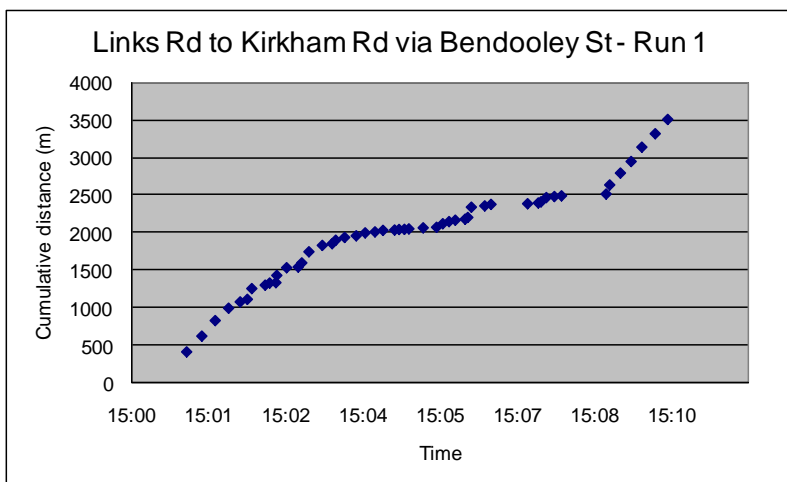
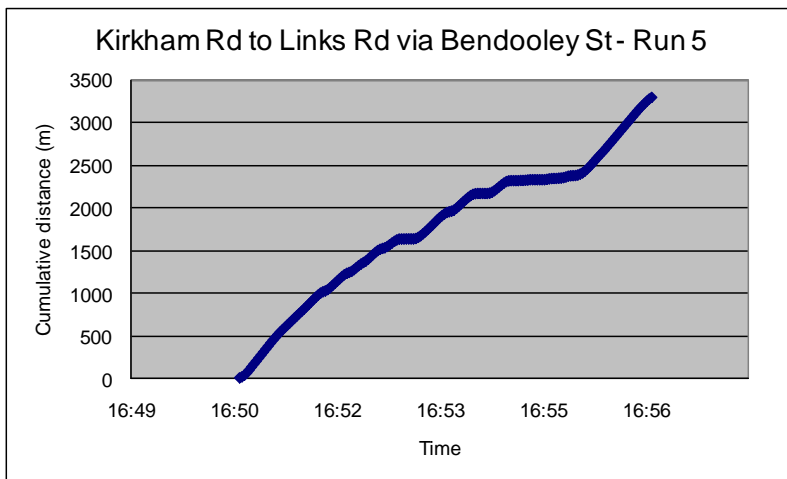
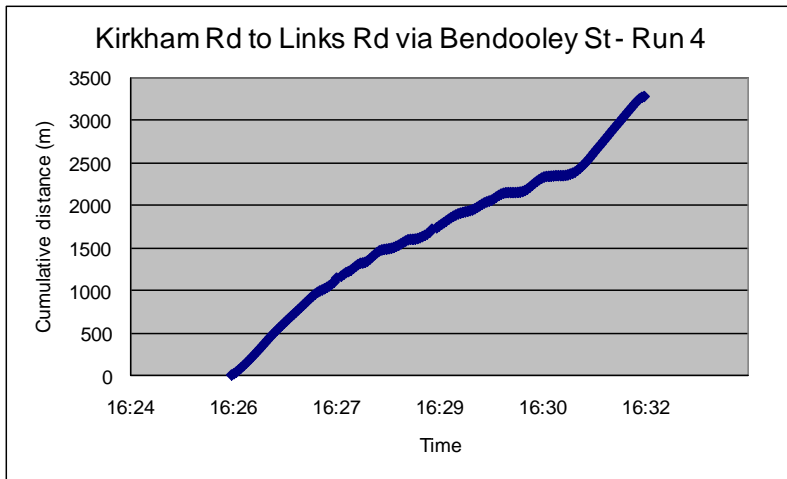


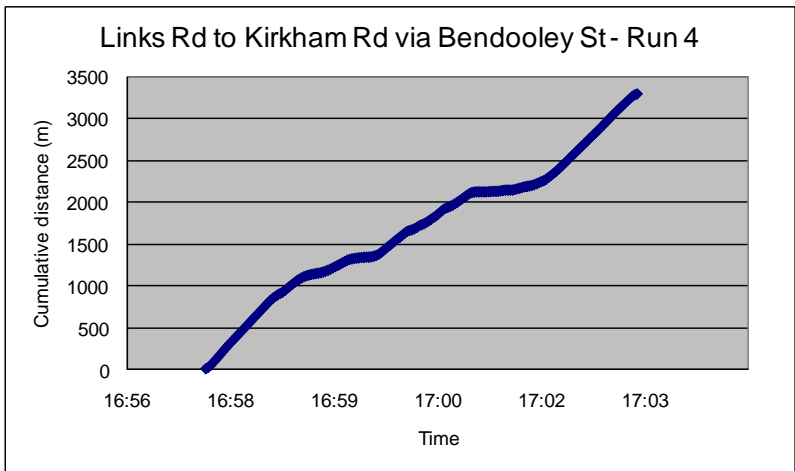
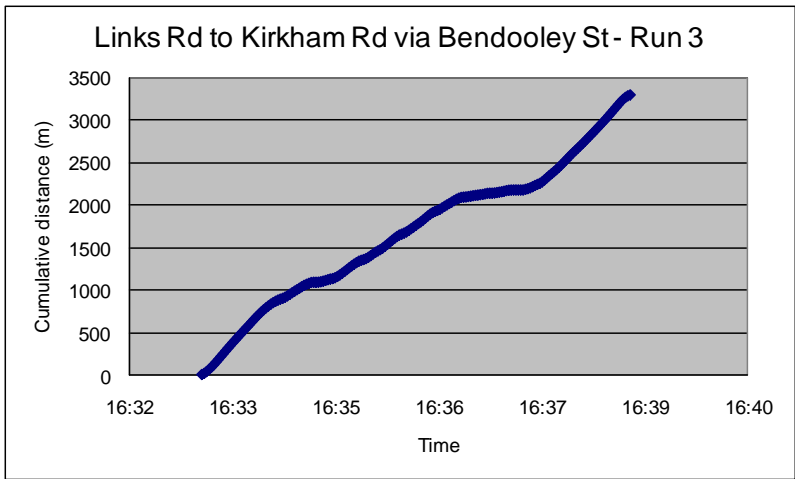
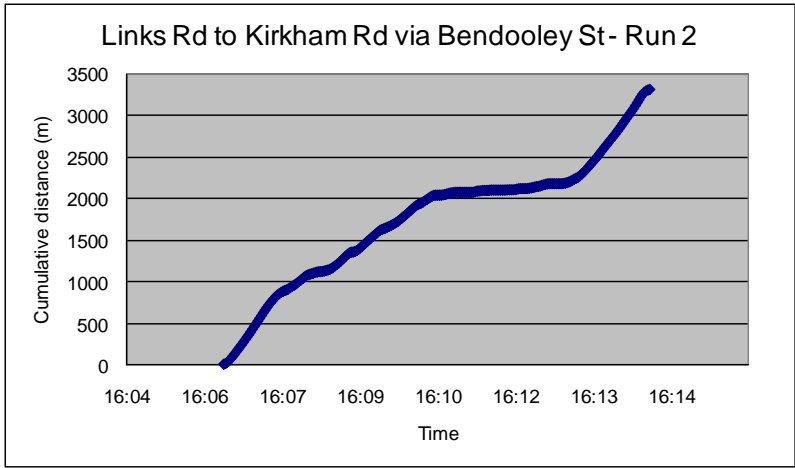


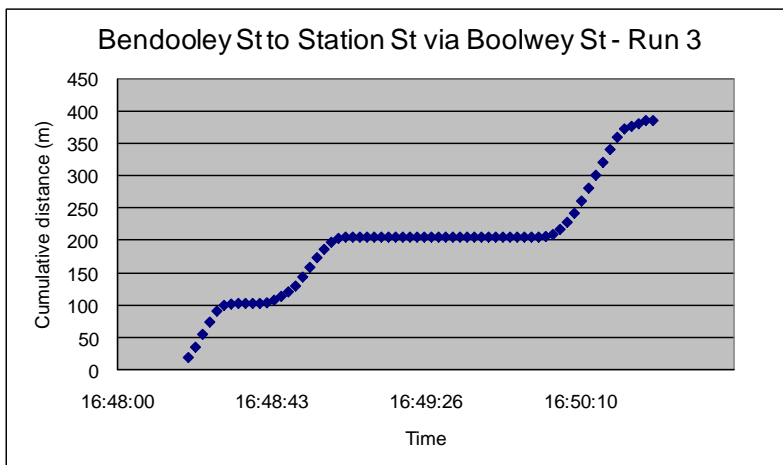
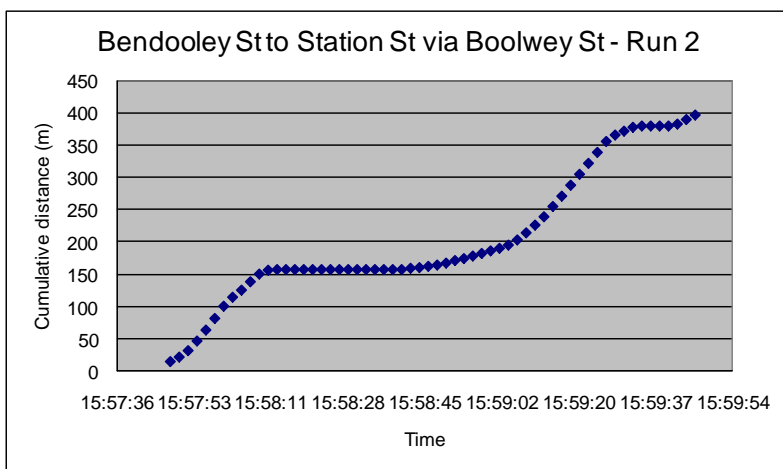
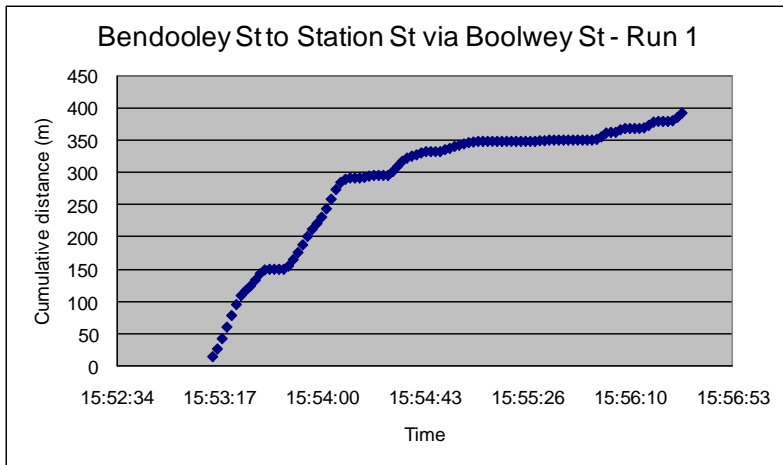


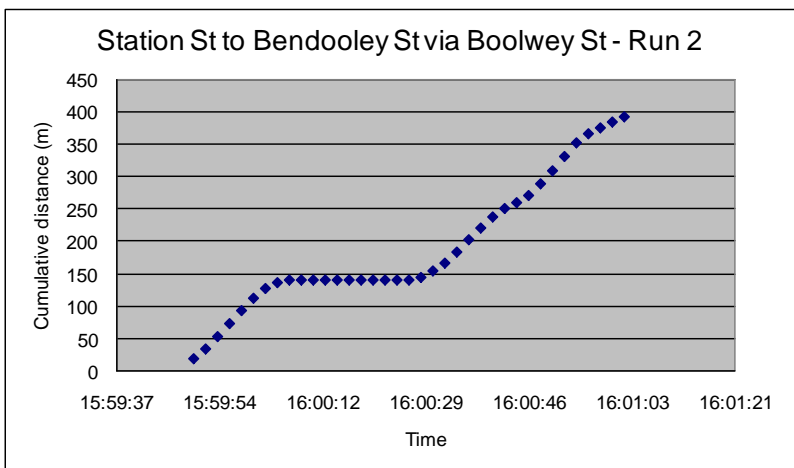
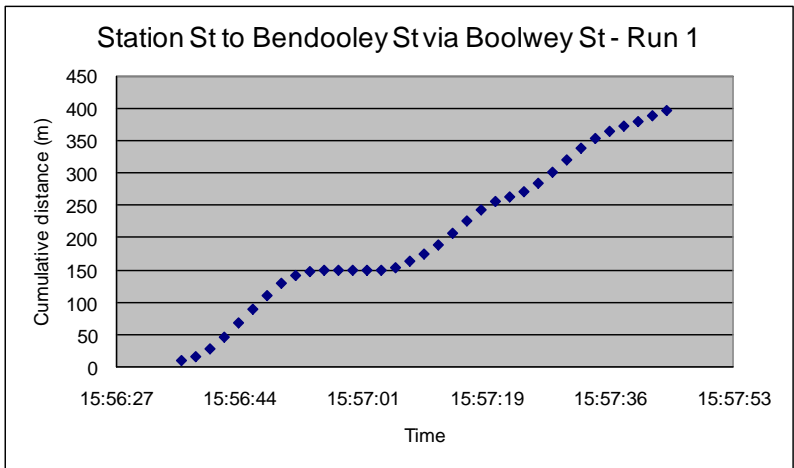
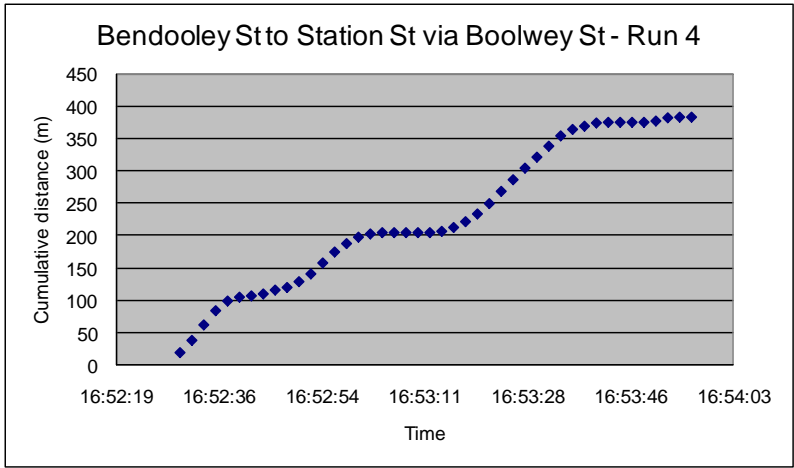


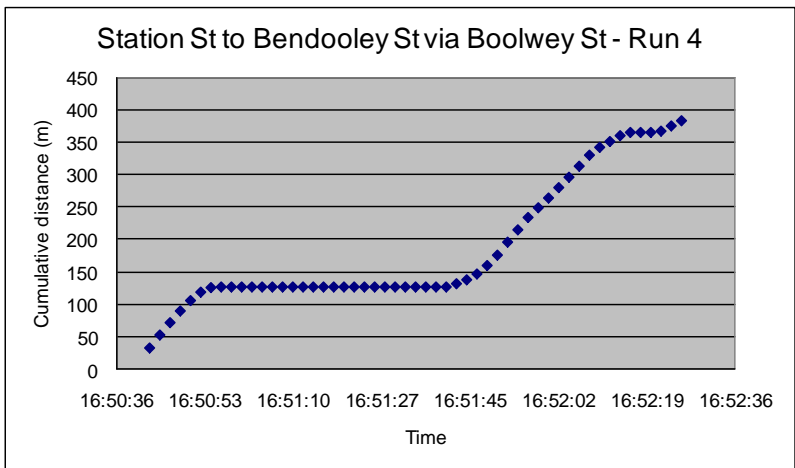
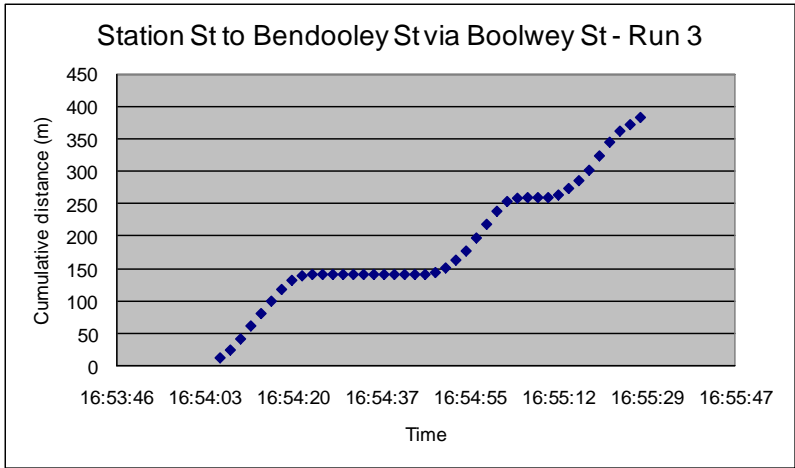












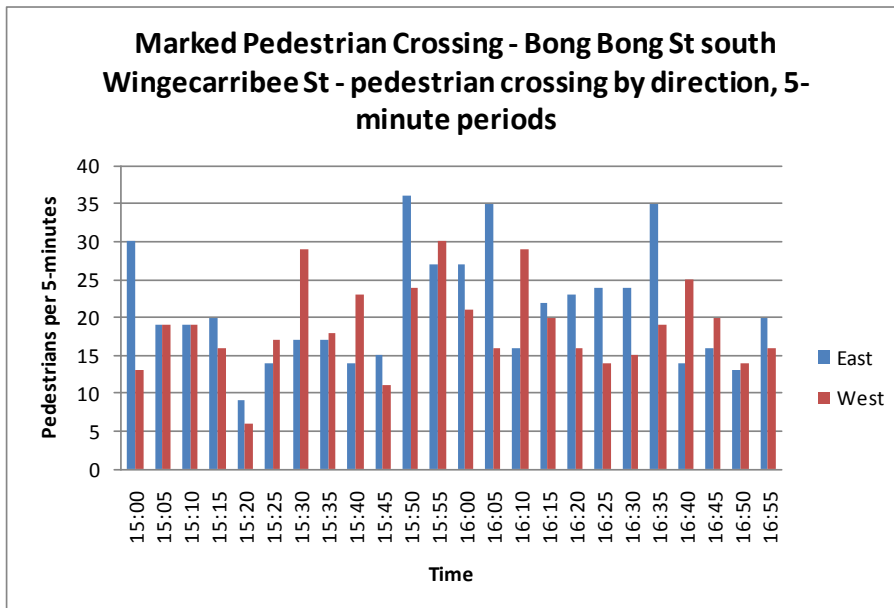
## 6.0 Pedestrian Counts

Video was taken of pedestrian behaviour at three pedestrian facilities:

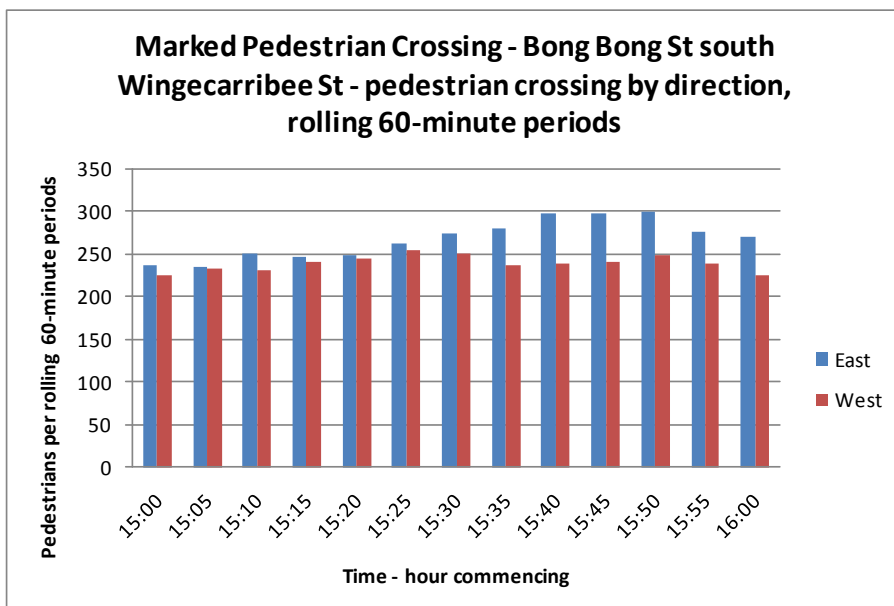
- Marked foot crossing – Bong Bong Street south of Wingecarribee Street
- Marked foot crossing – Bendooley Street south of Wingecarribee Street (outside Library)
- Signal controlled pedestrian crossing – Bendooley Street outside Bowral Public School

Charts have been prepared to summarise the findings of these observations.

The first chart reports the number of pedestrians using the facility in 5-minute periods, by direction.

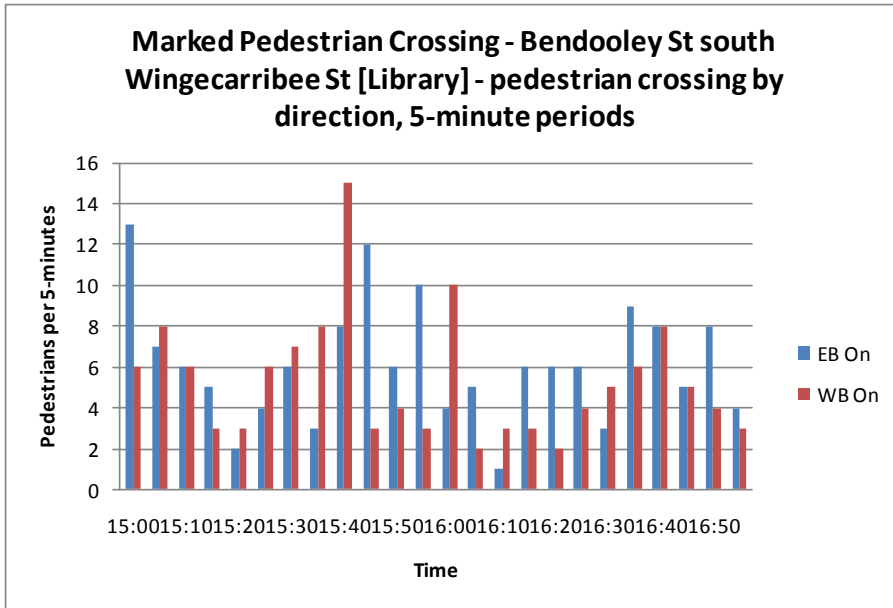


The following chart provides rolling 60-minute totals of pedestrian activity at this location.

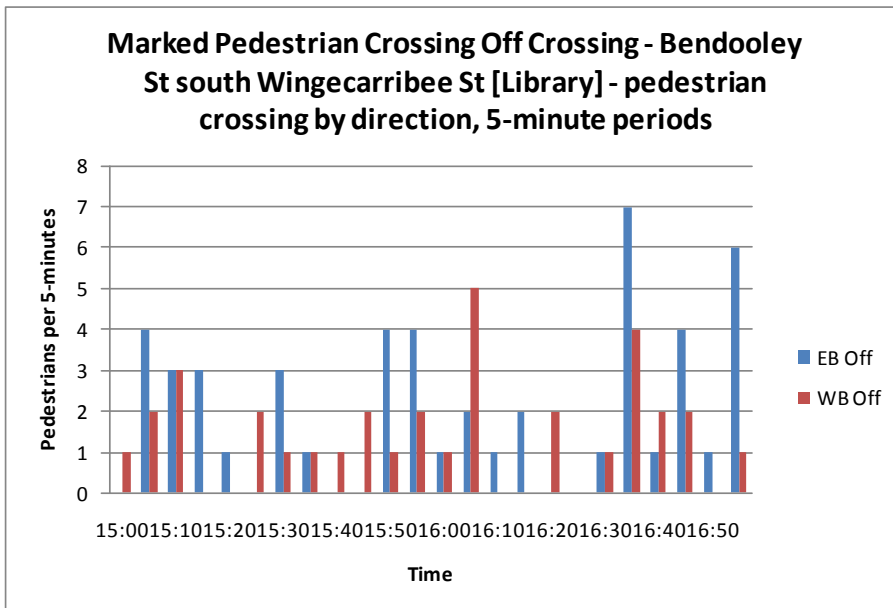


The following chart shows the number of people using the marked foot crossing of Bendooley Street outside the library.



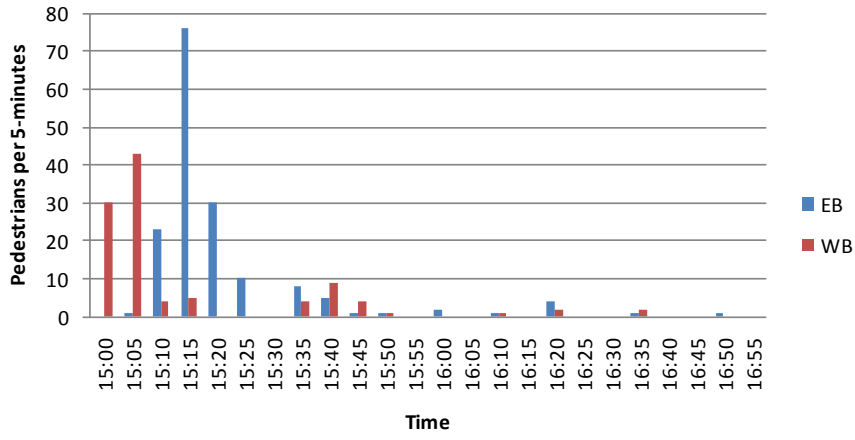


A similar analysis is provided for the same location, but this time it reports the volumes of pedestrians who cross close to, but not on, the marked foot crossing.



The time profile of use of the signal controlled pedestrian crossing of Bendooley Street outside Bowral Public School is shown below – it is evidently affected by the school pick-up period, with only modest use after 3.45pm.

**Signal Controlled Pedestrian Crossing - Bendooley St  
outside Bowral Public School - pedestrian crossing by  
direction, 5-minute periods**



## 7.0 Signal timings, parking and pedestrian crossing delays

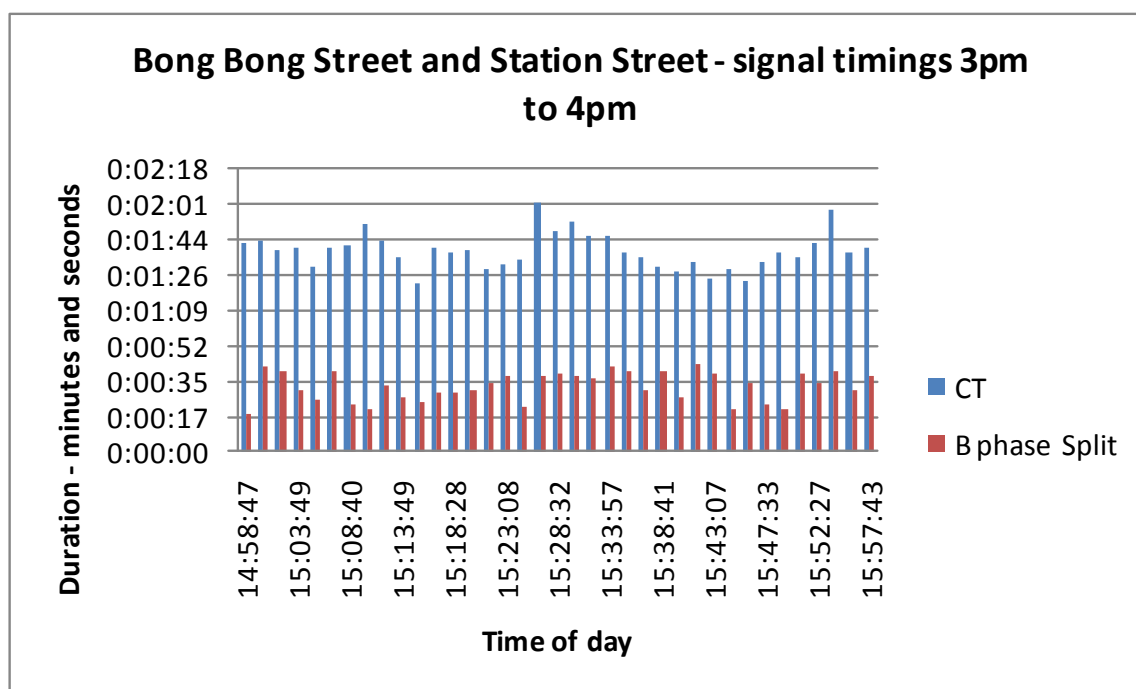
### 7.1 General

This chapter reports the results of data reduction of three inputs to the Paramics Model:

- Signal timings at:
  - Bong Bong Street and Station Street
  - Station Street and Wingecarribee Street
  - Bong Bong and Boolwey Street
  - Bendooley Street signal controlled pedestrian crossing
- Parking activity of a sample of Bong Bong Street
- Pedestrian crossing interactions between pedestrians and vehicles at Bong Bong Street and Bendooley Street

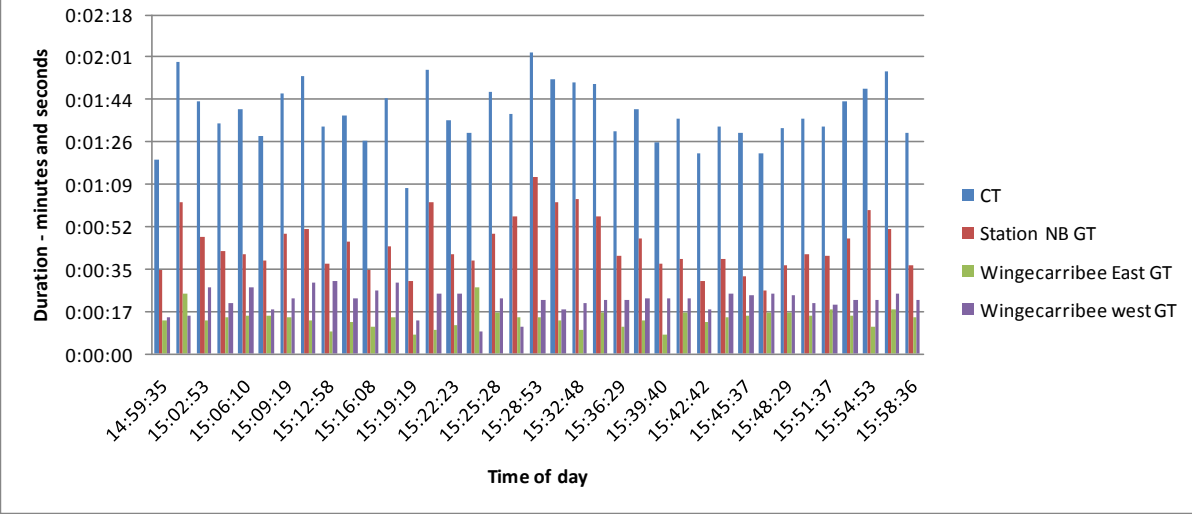
### 7.2 Signal Timings

At Bong Bong Street and Station Street the time when the Bong Bong Street southern approach signals change to green and then to red was recorded using the timestamp on the avi file. The following chart shows the cycle times and B phase green times over the analysis hour.



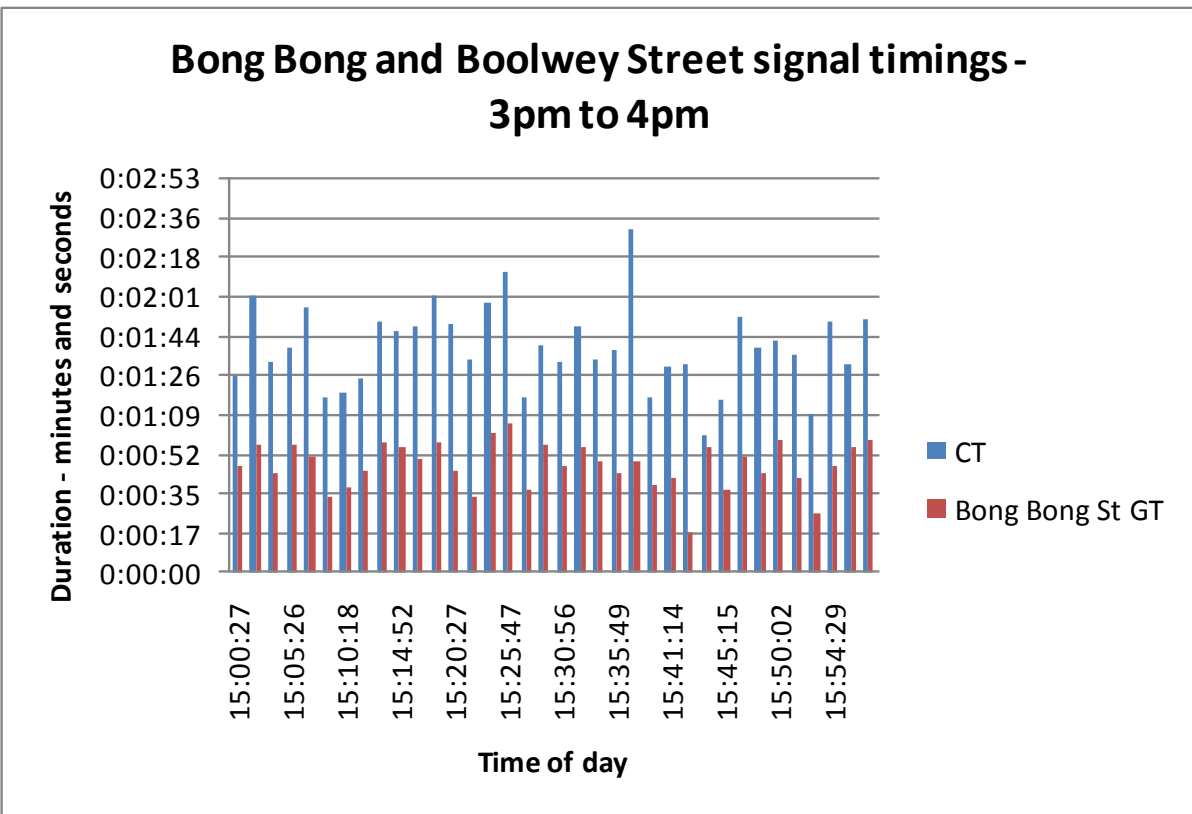
At Station Street and Wingecarribee Street phase start and end times were recorded from video for Wingecarribee Street west and east and Station Street south.

### Station Street and Wingecarribee Street Signal Timings 3pm to 4pm

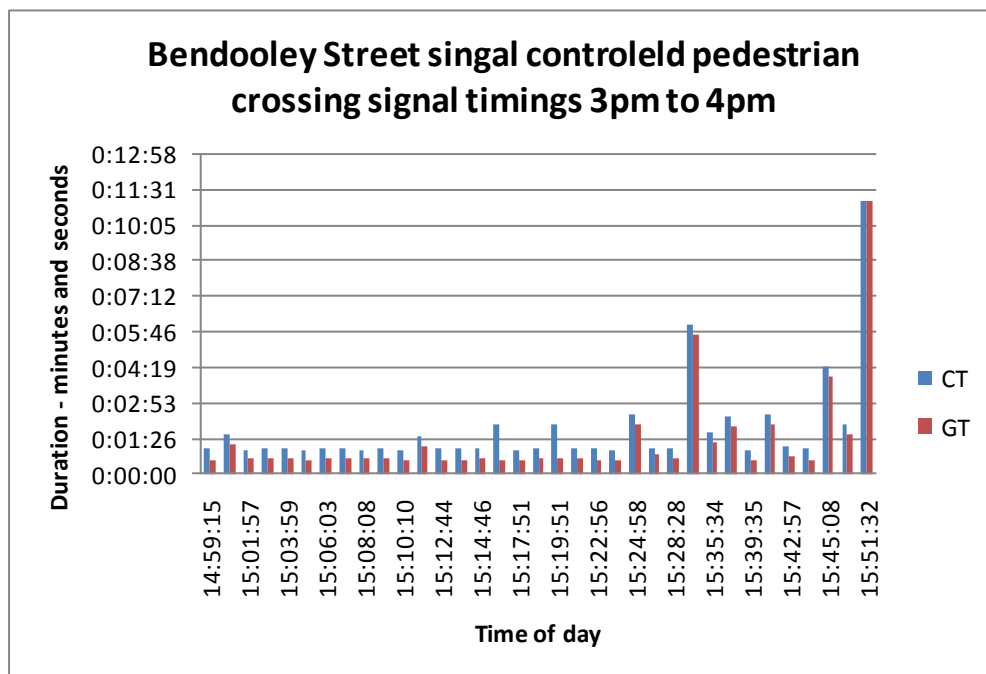


Bong Bong Street and Boolwey Street signal timings are summarised in the chart below.

### Bong Bong and Boolwey Street signal timings - 3pm to 4pm



Signal timings for Bendooley Street’s signal controlled pedestrian crossing are summarised in the following chart, showing vehicle green time and associated cycle time. As the facility is called by pedestrian demand, the long cycle times reflect a lack of pedestrian crossing activity.



### 7.3 Parking activity

Observations of parking activity were taken at:

- Bong Bong Street between Boolwey Street and approximately Empire Cinema
- Bong Bong Street near the marked pedestrian crossing south of Wingecarribee Street
- Bendooley Street between Wingecarribee Street and Boolwey Street

#### Bong Bong Street near Boolwey Street parking turnover from 3pm to 4pm

	In	Out	Total
East	20	16	36 from 7 spaces
West	17	19	36 from 7 spaces
Total	37	35	72 from 14 spaces

Indicative average turnover: 22 minutes.

#### Bong Bong Street near marked pedestrian crossing parking turnover from 3pm to 4pm.

	In	Out	Total
East	15	15	30 from 8 spaces

Indicative average turnover: 32 minutes.

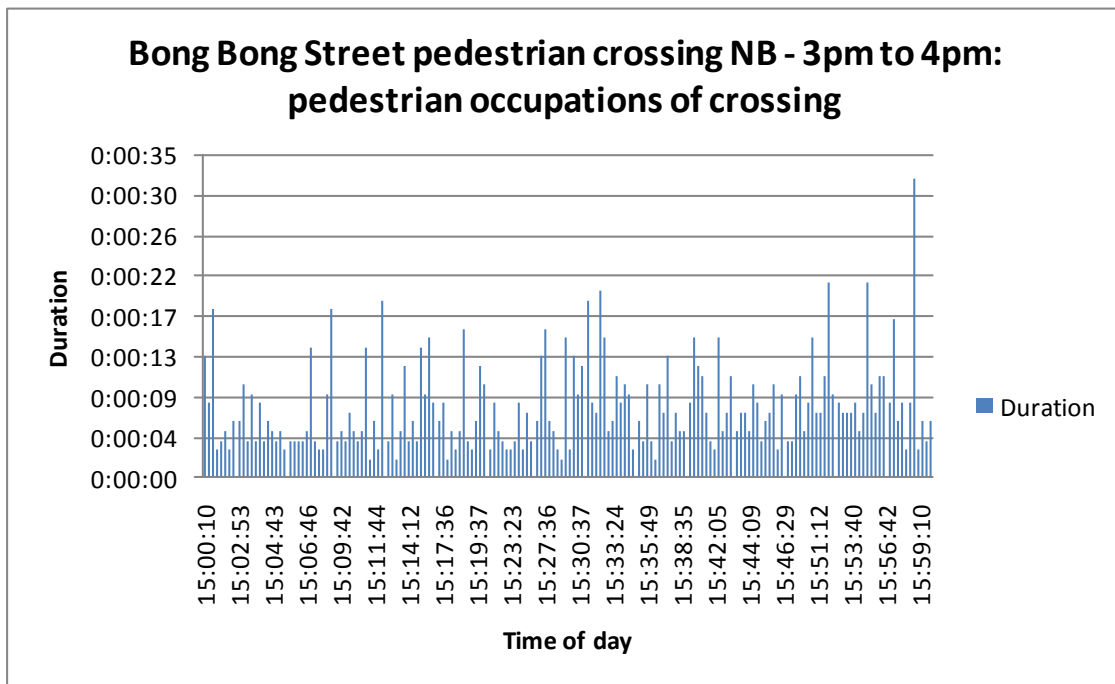
**Bendooley Street between Wingecarribee Street and Boolwey Street.**

	In	Out	Total
East	15	17	32 from 13 spaces
West	12	8	20 from 9 spaces
Total	27	25	52 from 22 spaces

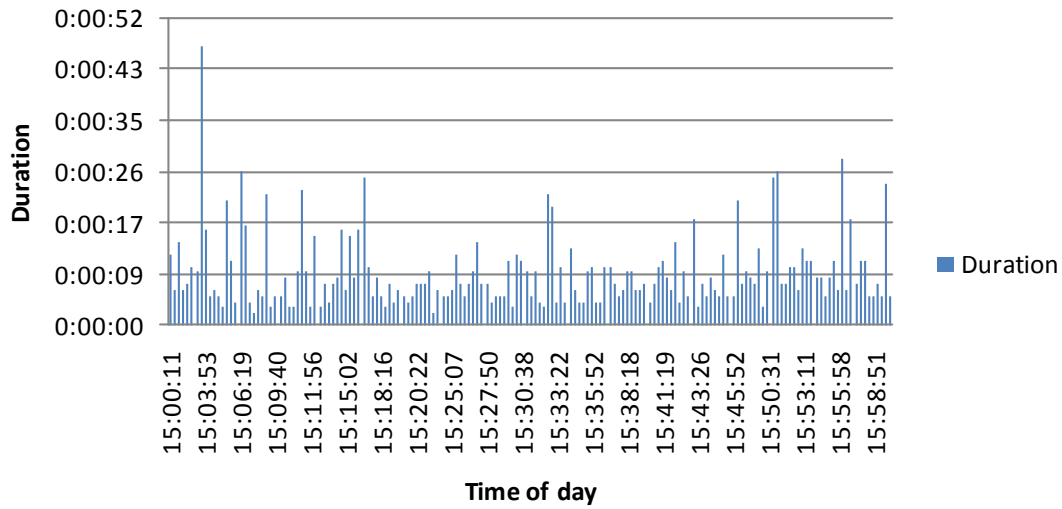
Indicative average turnover: 25 minutes.

**7.4 Pedestrian crossing activity**

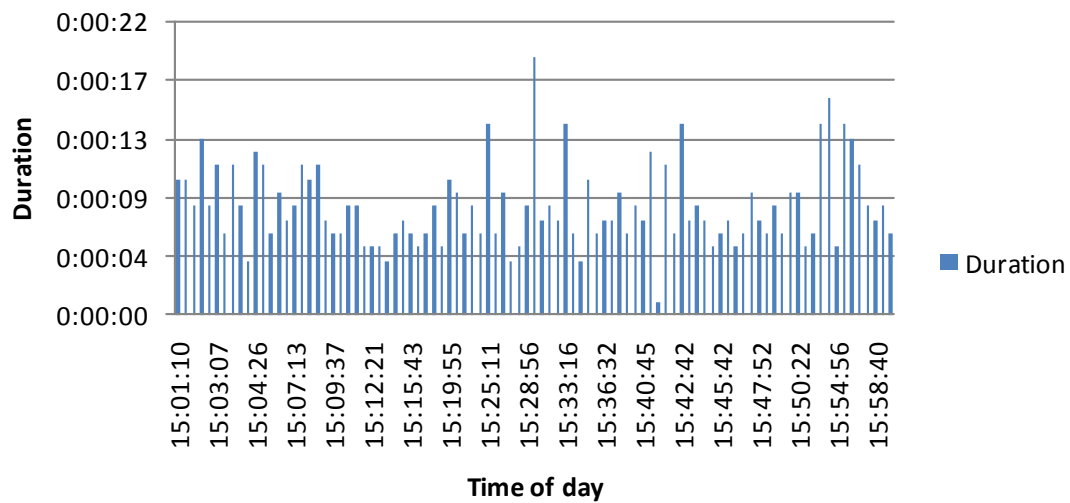
The following charts present the observed individual periods of occupation of the town centre’s marked pedestrian crossings. For Bong Bong Street the NB occupations are when pedestrians occupied the western half of the crossing and SB occupations are when they occupied the eastern half of the crossing. For Bendooley Street the occupations are when a pedestrian was on the crossing.



### Bong Bong Street pedestrian crossing SB - 3pm to 4pm: pedestrian occupations of crossing



### Bendooley Street pedestrian crossing - 3pm to 4pm: pedestrian occupation of crossing







# Appendix A – Field data collection specification