WICKHAM MASTER PLAN

TRAFFIC AND TRANSPORT ASSESSMENT

FOR

CITY OF NEWCASTLE

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CONTENTS

Tables

Figures

Appendices

EXECUTIVE SUMMARY

Background and Purpose

Newcastle Light Rail is soon to commence construction whilst the Wickham Interchange is currently under construction. With light rail connecting from Wickham Interchange to the city centre, and given the nature of existing land uses in the Wickham precinct to the north of the interchange, this area is primed for urban renewal. Newcastle City Council is developing a master plan for the Wickham area and has identified its proposal for the area to transition into a mixed use development precinct with residential towers and commercial and retail space with building heights ranging from 14 stories to 3 stories.

This report provides a traffic and transport assessment of the master plan to recommend a preferred road network and street management system, pedestrian and cycling facilities and on and off street parking requirements. These investigations have also considered the traffic impacts of the development levels proposed on the surrounding network with the assistance of a traffic model. The model has been used to identify potential intersection upgrade requirements along with any local street traffic management schemes to discourage through traffic usage of local streets in the master plan area.

Modelling and Evaluation

A VISUM/VISSIM microsimulation traffic model was created to assess the traffic impacts and needs associated with the master plan. The model was calibrated and validated in accordance with the *Roads and Maritime Traffic Modelling Guidelines 2013.* Traffic surveys identified peak hours in the study area of 0800-0900 and 1645-1745. The model boundary is shown in the adjacent figure.

In 2016, approximately 95% of traffic in the modelled area is "through" traffic travelling between external zones. In 2036 with background traffic growth and 50% development of the maximum potential master plan development under proposed Floor Space Ratios (FSRs), approximately 90% of traffic is through traffic with total study area traffic approximately 1.5 times the level of 2016 traffic. This significant increase in traffic volumes places pressure on the major road corridors surrounding and through the study area such as Hannell Street and King Street, with consequential impacts on secondary "connecting" roads such as Albert Street.

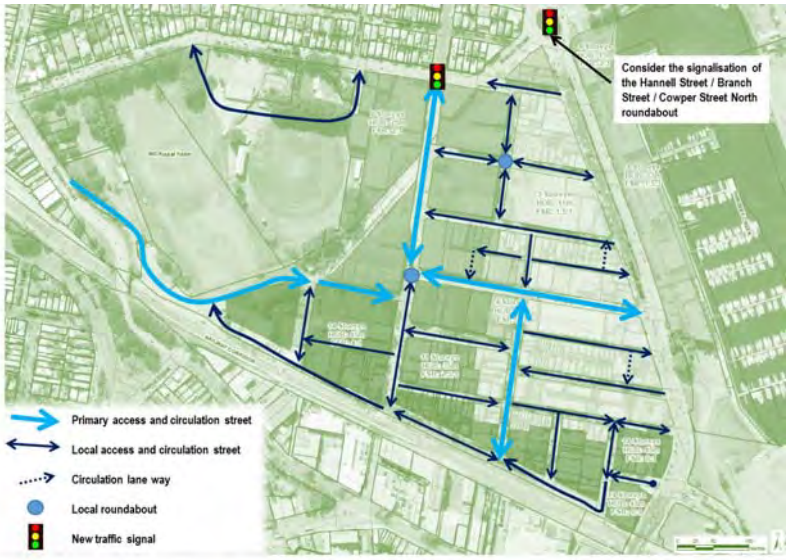
The traffic modelling has revealed that that the "weak point" in the future year networks is the Hannell Street / Branch Street / Cowper Street North roundabout which is over capacity in the PM peak, regardless of what development occurs in the master plan area. The consequence of this for the master plan development is the long northbound queues in Hannell Street which queue back past Throsby Street and long queues in Albert Street. This in turn reduces the ability master plan area traffic to leave via Albert Street or via Throsby Street and also induces some through traffic into the area via the new one-way link south of Wickham Park.

Upgrading the Hannell Street / Branch Street / Cowper Street North roundabout would remove this issue and would be expected to relieve most of these constraints on the master plan area.

Consideration has been given to the option of changing Union Street to one-way northbound only between Station Street and Throsby Street. Whilst this change would not lead to excessively high volumes on supporting streets such as Railway Street and Bishopsgate Street, it does result in very long circulation routes to access the southern half of the master plan area from the north. Given the limited north-south links in this area, this option is not favoured.

Key Recommendations

The local street network within the master plan area is proposed to be maintained and to reinforce the one-way street system to reduce the likelihood of "rat running" whilst maximising the kerbside space for on street parking which will be under increasing pressure as the light industrial development turns over to higher density mixed use and residential development. The proposed new one-way link through Wickham park provides an important function in taking pressure of Albert Street for access into the master plan area and also helps activate the southern end of the park. Railway Street (north of Throsby), Throsby Street and Union Street all have important collector functions as "main streets", given their centrality and directness to key nodes.



Signalising the Railway Street / Albert Street intersection appears to improve management of approach volumes on Albert Street – Branch Street and provides a mechanism for master plan area traffic to exit on Albert Street. Furthermore, the introduction of a fourth leg at the Honeysuckle / Hannell intersection using Dangar Street provides significant benefits, reducing reliance on only the two exit points (Throsby and Railway/Albert) even if only minimal green time was provided for this approach). The consequence of this however is the reduced green time for Hannell Street traffic and particularly for southbound traffic (given the need to preserve northbound capacity due to the proximity of the light rail crossing).

Whilst cycle lanes on Throsby Street would have a benefit for network legibility, it is understood that road width limitations, parking needs and traffic volumes on this street make on street cycling lanes undesirable. Instead, the proposed off street facility in Church Street would function as the primary internal east-west cycle link and its width should be maximised in recognition of this. Cycle lanes on Union Street improves accessibility through the master plan area for cycling and particularly for access to the Wickham Interchange. Also, block lengths between Railway Street, Union Street and Hannell Street are reasonably long and opportunities to provide pedestrian links between or through developments in these blocks should be considered. In general, however, the scale of development and the expected volume of pedestrians is not expected to warrant major pedestrian crossing facilities within the master plan area particularly given the grid street network and the dispersion of both pedestrians and conflicting traffic movements across this network. A raised pedestrian crossing across Station Street and a pedestrian crossing of Throsby Street will however cater for what is expected to be an attractive active transport corridor down Union Street.

Parking is an existing issue within the master plan area. With light industrial development taking up most of the available site space, a lot of employee and visitor parking occurs on street, and on street areas that are not 2P designated are largely full for large parts of the day. There appears to be justification for 1-2 large commercial off street car parks over time. Whilst these sites may not be commercially viable in the early years, there is some benefit to council to reducing current long stay parking on street and encouraging it to be relocated to an off street car park to free up on street space for emerging commercial/retail activities under the master plan; and designate more of this space as 2P. Furthermore, the proximity of the Wickham Interchange and the potential for parking to be reduced (and become more expensive) in the city centre suggests that Park and Ride demand for light rail trips associated with Wickham Interchange may also draw in parking demand into the area.

Overall, the levels of development proposed under the master plan are not expected to introduce significantly greater traffic capacity and congestion issues into the area than those that would occur anyway due to background traffic growth. Hannell Street and its intersection with Branch Street and Cowper Street North in particular will need further investigation for capacity improvements independent of development within the master plan area. Furthermore, the internal street system, walking and cycling facilities and parking facilities can be configured to appropriately cater for master plan's demands as the area evolves from it light industrial and low density residential base into a higher density mixed use precinct orientated towards Wickham Interchange.

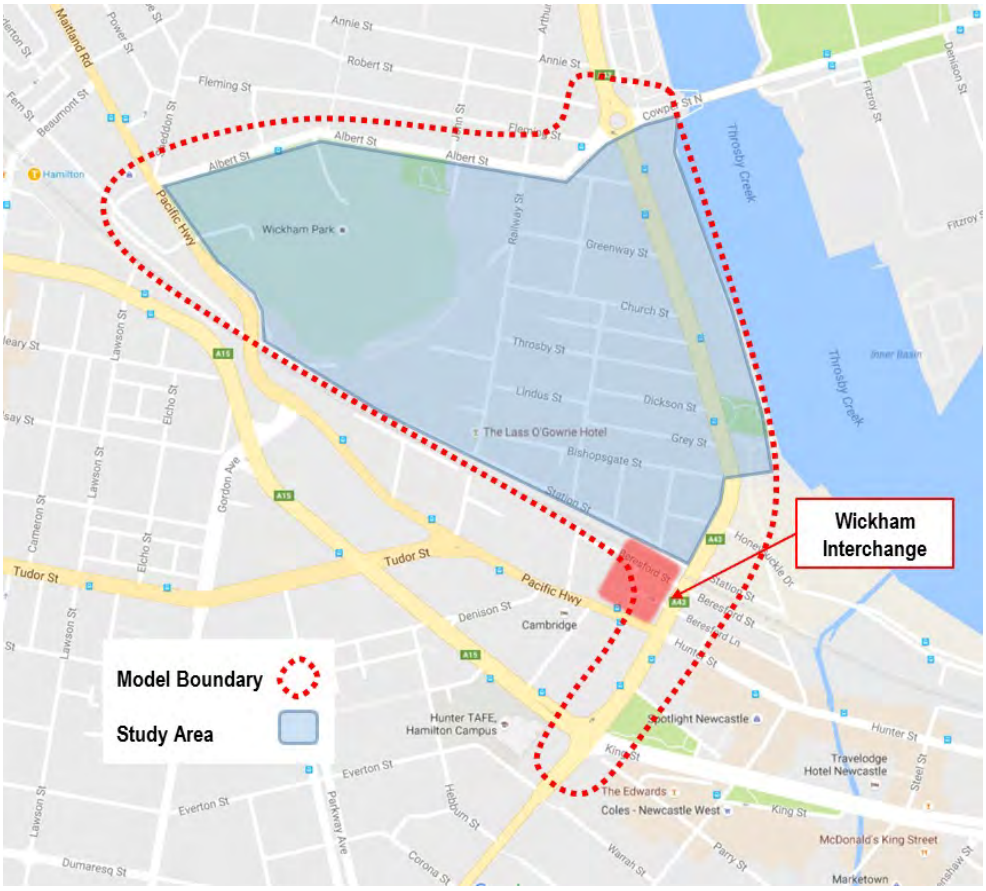
1. INTRODUCTION

1.1 BACKGROUND

The terminus of the heavy rail line at Wickham and the impending construction of the Newcastle Light Rail line from Wickham Interchange to the east, as well as development interest in the Newcastle CBD area, have initiated reconsideration of the land use structure for the Wickham area and in particular the area north of the rail line. Newcastle City Council is preparing a master plan for the area considering a range of uses and modifications to the local street system and intersections. In addition, with the construction of the heavy rail/ light rail/bus interchange, and increasing residential development proposed in the Wickham area north of the rail line, there is a greater emphasis needed on the planning of pedestrian and cyclist links through the area, as well as consideration of on street parking, speed management and street-scaping needs.

Bitzios Consulting has been engaged by The City of Newcastle (Council) to prepare a micro-simulation model of the Wickham redevelopment area in order to assess the traffic infrastructure needs associated with the proposed levels of development. Advice was also being sought by council on preferred pedestrian and cyclist routes/facilities, on street parking needs and local street and intersection configurations.

The study area and model boundary is shown in Figure 1.1.



Source: Google Maps

Figure 1.1: Study Area and Model Boundary

1.2 SCOPE AND STUDY PROCESS

The study has been run in three stages as shown in Figure 1.2.

Phase 1 focussed on confirming the input assumptions, collecting and collating data and undertaking model development tasks. Phase 2 then developed and tested strategy options and established the preferred networks. Phase 3 involved summarising and documenting the key findings of the project.

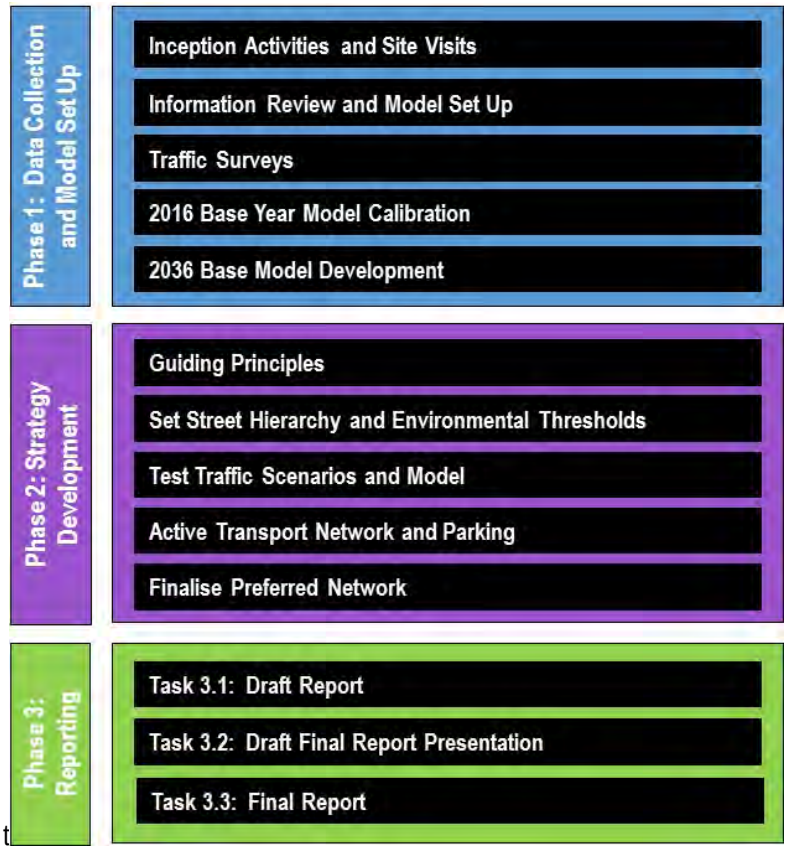


Figure 1.2: Study Process

Traffic modelling has been undertaken with the VISUM / VISSIM software through a purpose-built model for the study area identified in Figure 1.1. Morning and evening peak hour traffic models were created for 2016 and then calibrated and validated to RMS guidelines. Year 2036 base models were then created which reflected all of the expected traffic and transport network changes in the area (primarily associated with Newcastle Light Rail), with background "through" traffic growth and with no change to current development in the master plan area. Then the master plan traffic, based on assumed development levels, as well as an initial traffic network were coded into the models and tested.

From there, a number of incremental changes to the network were tested to identify their benefits and impacts and to inform the development of the preferred 2036 traffic network. The pedestrian links, cycling links, street hierarchy and intersection management measures were then developed, consistent with the preferred road network. Similarly, on street parking recommendations have been based on the preferred network, conflicts with other modes and potential conflicts with Wickham Interchange "hide and ride" influences.

1.3 LIMITATIONS

The extent of traffic upgrade works associated with the Newcastle Light Rail project were not absolutely defined at the time of writing this report. A number of intersection upgrade assumptions have been made that have been alluded to in the Newcastle Light Rail REF (April, 2016) and the Newcastle Light Rail Submissions Report (July, 2016), as well as subsequent discussions between Transport for New South Wales and Council. These upgrades have been included in the 2036 Base Case as well as the option testing models associated with the master plan.

2. PREVIOUS PLANNING STUDIES

2.1 NEWCASTLE URBAN TRANSFORMATION AND TRANSPORT PROGRAM

The Newcastle Urban Transformation and Transport Program (NUTTP) involves two key transport projects, namely:

- "A light rail service between the Wickham interchange and Newcastle beach by way of the city centre" *(Newcastle Light Rail REF, April 2016)*; and
- "A transport interchange at Wickham" (*Newcastle Light Rail REF, April 2016*).

2.2 NEWCASTLE LIGHT RAIL

The Newcastle Light Rail (NLR) project is soon to commence construction. The alignment and station locations are shown in Figure 2.1.

Source: http://ourtransport.revitalisingnewcastle.com.au/delivering-newcastle-light-rail

Figure 2.1: Newcastle Light Rail Alignment and Stations

The REF (April 2016) and the Submissions Report (July 2016) contained little detail relating to the specific effects or changes required to the Wickham Master Plan area. The Submissions Report did however identify the following changes to the concept:

- excluding the bus queue jump in Stewart Avenue for buses to turn right into Honeysuckle Drive as no local buses will use the bus indent bay in Stewart Avenue;
- the Station Street laneway north of the interchange will not be a shared road/pathway and will not have road access from Stewart Avenue;
- a pedestrian bridge was included to provide north-south access over the rail corridor for pedestrians in close proximity to Railway Street, to the west of the interchange; and
- the intersection of Hannell Street and Throsby Street will be upgraded to improve the right turn from Hannell Street into Throsby Street, including a longer queuing lane. Throsby Street will also incorporate a left turn lane and a right turn lane onto Hannell Street, necessitating minor adjustments to the lane widths and some reduction in parking in Throsby Street in the immediate vicinity of the intersection. This would improve access to the interchange from the north.

2.3 WICKHAM INTERCHANGE UPGRADE

The Wickham Interchange configuration is shown conceptually in Figure 2.2. Bus and "formal" Kiss and Ride (KnR) access to the interchange will be available via a new signalised intersection off Hunter Street, west of Stewart Avenue. There is no Park and Ride (PnR) at the interchange and there is limited-to-no all-day parking within a reasonable walking distance north of the interchange in the master plan area.

Pedestrian and cycling connections are however available to/from the north.

Source: http://www.transport.nsw.gov.au/sites/default/files/b2b/projects/TFN_WICKHAM_%20NEWSLETTER_JULY15_V004_web_0.pdf

Figure 2.2: Wickham Interchange

2.4 WICKHAM PRECINCT TRANSPORT STUDY

The Wickham Precinct Transport Study prepared for TfNSW (Jacobs, January 2016) investigated access to the proposed interchange and evaluated the impacts on the Wickham precinct. Key conclusions from the study relevant to the Wickham Master Plan area included:

- the projected traffic demand on Hannell Street, Railway Street, Station Street, Throsby Street and Albert Street, as a result of the new interchange, is within the limits specified by the RMS Guidelines for local collector and sub-arterial roads;
- due to the limited quantity and variable condition of the existing footpaths throughout Wickham, it is recommended that a footpath audit be undertaken and footpaths upgraded within the precinct where they are considered to be substandard;

- the identified access route to the interchange is via Bishopsgate Street and Charles Street. Alternative routes include the use of Union Street, rather than Bishopsgate Street and Church Street, as an access to Station Street, thus minimising the vehicular impact on the light traffic thoroughfares;
- that additional 'Kiss and Ride' parking spaces, or '5 min' parking restrictions are provided during peak periods on the eastern frontage of Union Street between Station Street and Bishopsgate Street;
- extend existing Light Traffic Thoroughfare (5 tonne and 8.5 metre limit) areas by including signage at Bishopsgate Street (from Hannell Street), Grey Street and Dickson Street to help manage heavy vehicle movements within the precinct and increasing residential amenity;
- in order to improve pedestrian connectivity and safety when accessing the interchange from within Wickham, the following changes were recommended for further investigation:
  - a footpath along the northern frontage of Station Street; and
  - a raised shared-use plateau at the corner of Railway Street and Station Street. This would act as a traffic calming measure and enhance pedestrian safety for pedestrians accessing or exiting the station to the northwest.
- cycle signage or on-street markings should be provided to clearly indicate dedicated cycling routes for both cyclists and drivers. This would enhance safety by advising drivers that there may be cyclists on the road as well as directing cyclists to the most appropriate and safest routes to take.

2.5 WICKHAM MASTER PLAN

Council is currently preparing the Wickham Master Plan. The proposed development densities and heights, whilst still under consideration by Council are shown in Figure 2.3.

Figure 2.3: Proposed Development Density

3. EXISTING NETWORKS

3.1 TRAFFIC

3.1.1 Road Network Description

As shown in Figure 3.1, the major road network surrounding the Wickham Master Plan area is comprised of Maitland Road (Hunter Street) controlled by Newcastle City Council and Hannell Street-Stewart Avenue, controlled by RMS. Albert Street in the north of the precinct area is council-controlled and provides both a local collector function from areas in and north of the master plan area and a partial "bypass" function for some traffic through movement traffic. Within the master plan area, Railway Street and Throsby Street provide primary local routes, with Throsby Street connecting to Hannell Street via a signalised intersection. Most other streets in the master plan area primarily serve a local access function with one way conditions, narrow formations and "tight" intersections, discouraging through traffic movements except for some circulation needs for access and parking.

Figure 3.1: Road Network in the Wickham Master Plan Area

3.1.2 Key Surrounding Intersections

Traffic issues affecting the master plan area are mostly associated with the intersections on major roads surrounding the area and the delays experienced accessing to/from these intersections. Key intersections that influence the master plan area include:

- Stewart Avenue / Parry Street / King Street signalised intersection;
- Hunter Street / Stewart Avenue signalised intersection;
- Hannell Street / Honeysuckle Drive signalised intersection;
- Hannell Street / Cowper Street North / Branch Street roundabout; and
- Maitland Road / Albert Street / Ivy Street signalised intersection.

Table 3.1 below provides a description of the layout of the existing key intersections.

Table 3.1: Road Environment by Intersection

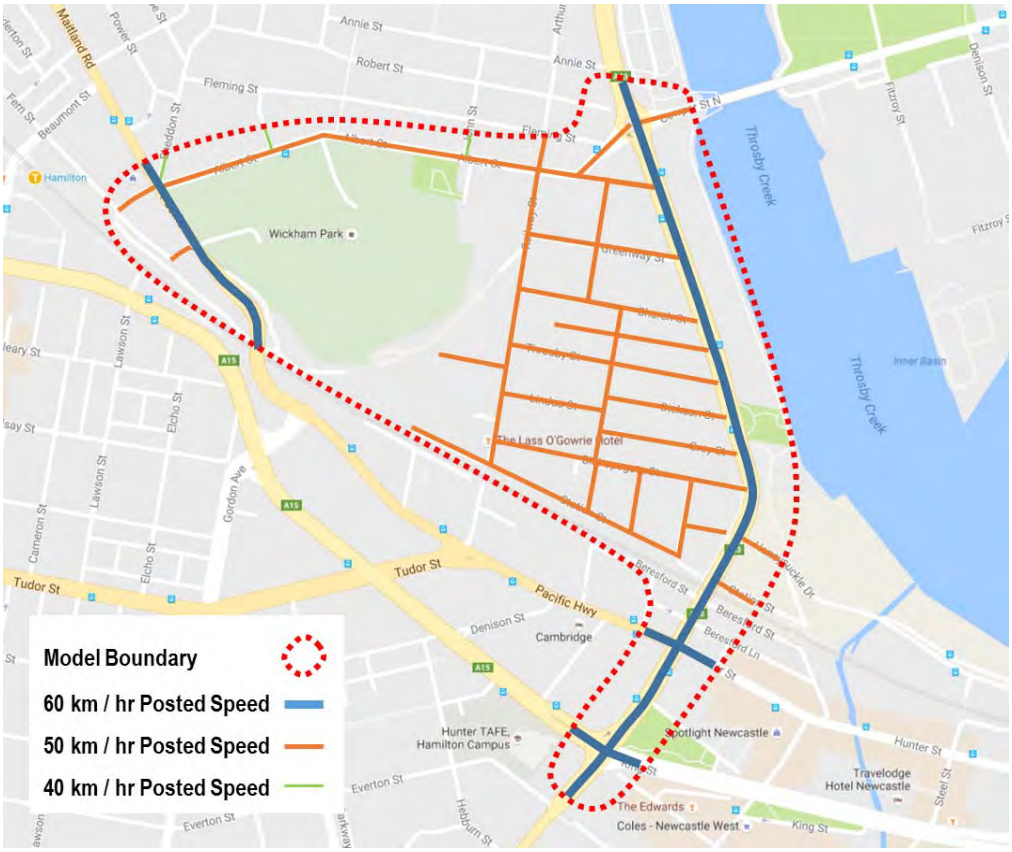
Description	Intersection Layout
Stewart Avenue / Parry Street / King Street signalised intersection	
The major intersection is located in the south-east boundary of the study area. There are dual right turns from the east, south and west approaches. Slip lanes are located on the east and west approaches of the intersection. There are pedestrian crossings provided on all approaches and bicycle lanes provided at the intersection.	
Hunter Street / Stewart Avenue signalised intersection	
This four way intersection is adjacent to the Stewart Avenue / Parry Street / King Street intersection. Right turns are banned from the south, north and west approaches with only right turns allowed from the east. Bicycle lanes are provided on the north and south approaches to the intersection and pedestrian crossings are provided on all approaches.	
Hannell Street / Honeysuckle Drive signalised intersection	
This intersection includes a dual right turn from Honeysuckle Drive to Hannell Street north. Bicycle lanes are provided at the intersection.	

Description	Intersection Layout
Hannell Street / Cowper Street North / Branch Street roundabout	
This is a key intersection at the north-east edge of the study area. Bicycle lanes are provided to create a north-south link through the intersection.	
Maitland Road / Albert Street / Ivy Street signalised intersection	
This intersection is located near the north-west boundary of the study area. Ivy Street does not provide an approach to the intersection and is a one-way departure at the intersection. There is no right turn allowed from Maitland Road north into Ivy Street.	

SOURCE: Photos sourced from Google Earth

3.1.3 Speed Environment

The speed of the road network in the study area is shown in Figure 3.2. The major roads surrounding the master plan area are typically posted at 60 kph with the "internal" roads posted at 50kph. Many of the local internal streets are short and narrow and actual speeds likely to be much slower than the posted speed limit; with the exception of streets with wider carriageways such as Railway Street and Throsby Street.



Source: Google Maps Australia

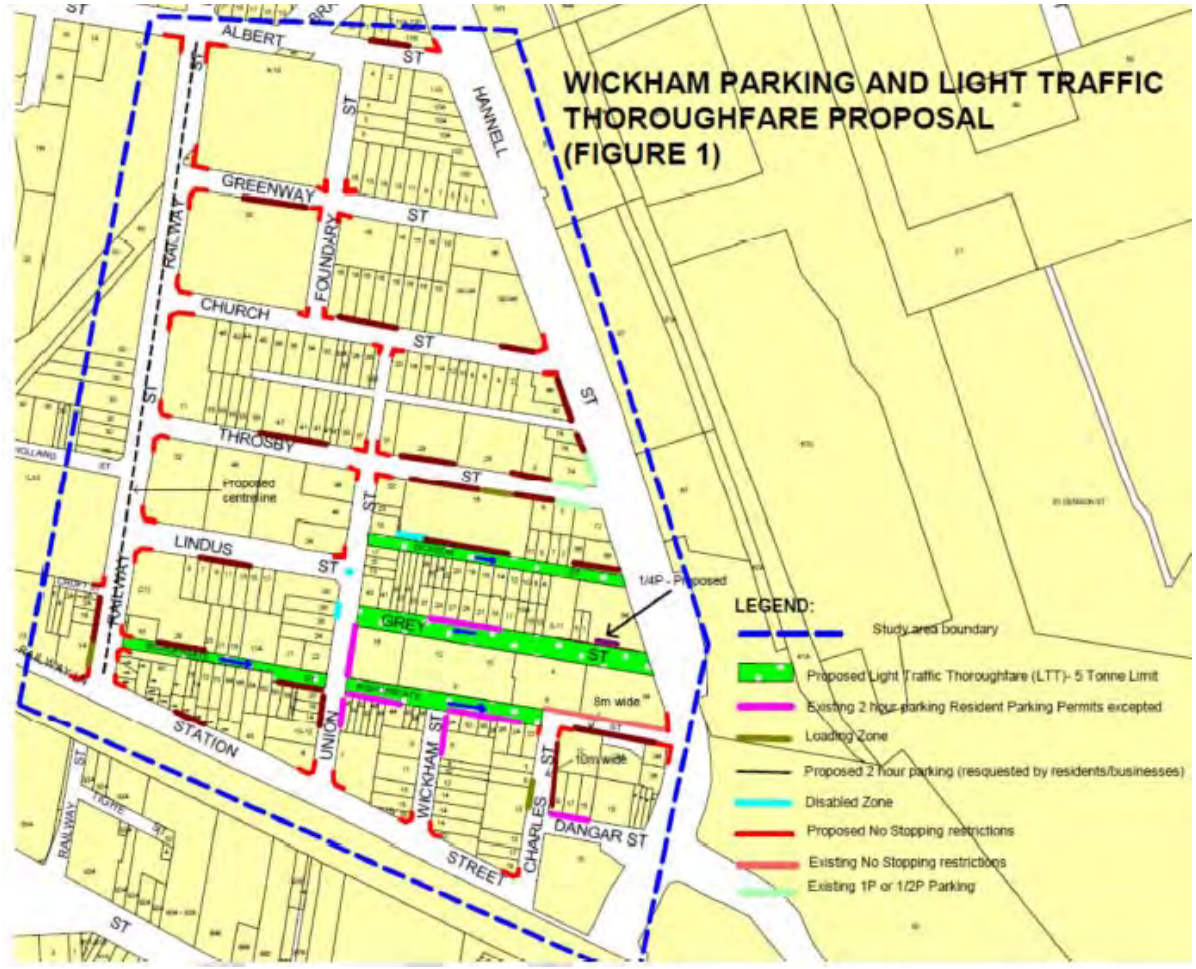
Figure 3.2: Posted Speed Limits within the Study Area

3.1.4 Parking and Property Access

The study area contains a diverse mix of commercial, industrial and residential properties of low to medium density. The light industry buildings in particular occupy a large proportion of their sites and this level of occupancy means that much of the employee parking is taken up on street. Regulated parking times in the master plan area vary significantly but in general "2P" restrictions are in place closer to Hannell Street and closer to Wickham Interchange. The restrictions proposed as part of Council's 2014 parking study are shown in Figure 3.3.

Within the master plan area, access to individual properties is largely unrestricted with access to multiple, small properties provided via individual driveways.

Along Hannell Street, direct property access is limited and most side streets intersecting Hannell Street are restricted to left in / left out. There is limited on street parking within Hannell Street.



Source: Wickham Parking Study (2014)

Figure 3.3: Proposed Parking Restrictions

3.2 PUBLIC TRANSPORT

Current bus routes in the area are shown in Figure 3.4.

Figure 3.4: Current Bus Routes

Route 104 runs on Albert Street between the Hannell Street / Cowper Street North / Branch Street roundabout and to the Maitland Road / Albert Street / Ivy Street signalised intersection. This service runs throughout the day.

Route 106 and 107 runs between Stockland Shopping Centre in Jesmond to Newcastle interchange and travels the length of Hannell Street between the Hannell Street / Cowper Street North / Branch Street roundabout and the Hannell Street / Honeysuckle Drive signalised intersection. Route 106 runs only during peak periods while Route 107 runs between 8.30 am to 3.30pm.

There are multiple bus services that pass through the three signalised intersections along the boundary of the study area including those listed in Table 3.2 below.

Table 3.2: Bus Services at Signalised Intersections in the Study Area

Intersection	Bus Services
Hunter Street / Hannell Street Signalised Intersection	100, 118, 130, 131, 138, 140, 160, 222, 226, 230, 231, 267, 317, 322, 334, 350, 363
King Street / Hannell Street Signalised Intersection	104, 111, 201, 224, 235, 349
Maitland Road / Albert Street / Ivy Street signalised intersection	100, 104, 111, 130, 131, 138, 140, 160, 230, 322, 350, 363

3.3 WALKING AND CYCLING

The current and proposed strategic cycle routes from the Newcastle Cycling Strategy and Action Plan (indicative only) are shown in Figure 3.5. As the figure shows, no major routes were proposed through the master plan study area but were proposed along its edges with routes on Albert Street, Hannell Street and Maitland Road. The proposed R5/R12 route has now been located as far east as the intersection of Selma Street and King Street. The route from Selma Street eastwards is subject to a current study investigating trunk routes into the CBD.

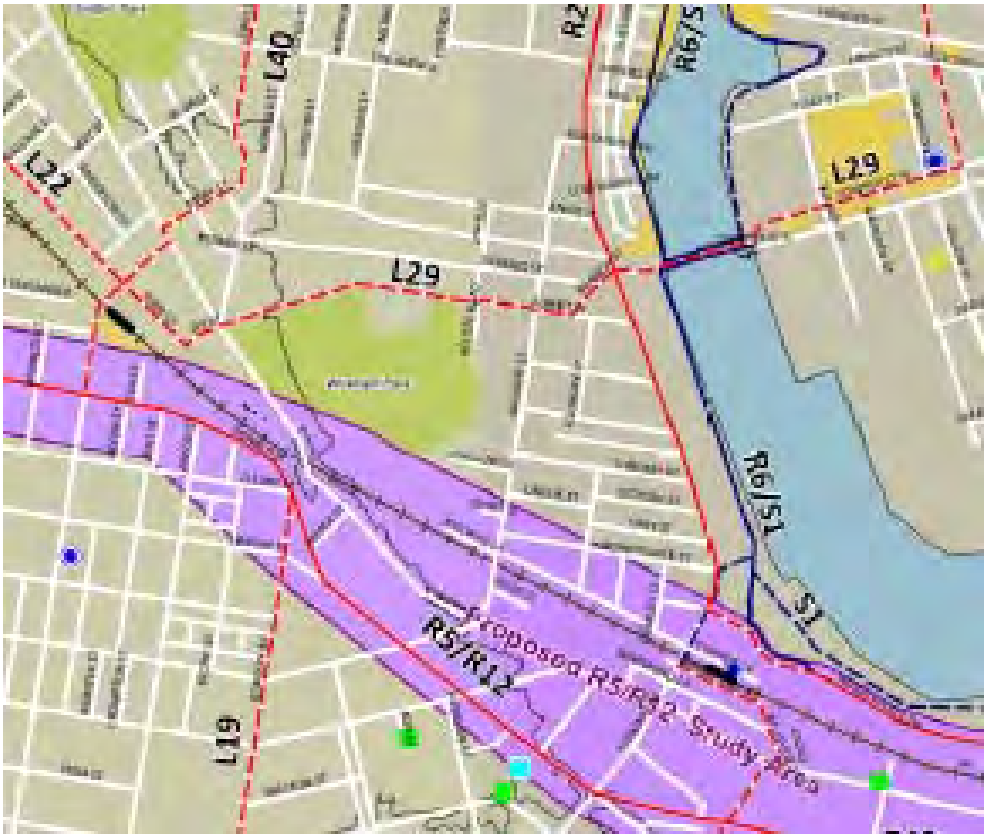


Figure 3.5: Proposed Cycle Routes (indicative only)

On road bike paths are provided on the Stewart Avenue - Hannell Street corridor through the entire study area and via line and pavement marking at the Hannell Street / Cowper Street North / Branch Street roundabout. A section of Hunter Street to the west also has on road marked cycle lanes.

Footpaths are provided on the higher order roads and along some of the lower order local streets within the master plan area. These are of varying width, completeness and quality. All signalised intersections offer pedestrian crossings.

4. TRAFFIC MODEL DEVELOPMENT

4.1 OVERVIEW

The models have been created in accordance with the *Roads and Maritime Traffic Modelling Guidelines 2013.*

The models have been established in VISUM for preliminary network coding and matrix estimation purposes. Following this, the models were converted to VISSIM and run in simulation "mode" to validate them to travel times. This section describes the input data, network coding, traffic demands development and model calibration and validation results.

4.2 DATA SOURCES

4.2.1 Intersection Counts

Traffic surveys were undertaken by Traffic Data and Control (TDC) on the 11th of October 2016 during the following peak hours:

- AM peak period (7:00am to 9:00am); and
- PM peak period (4:00pm to 6:00pm).

The following intersections were included in the traffic surveys:

- Pacific Highway and Albert Street / Ivy Street;
- Railway Street and Throsby Street;
- Albert Street and Railway Street;
- Hannell Street and Branch Street / Cowper Street North;
- Hannell Street and Honeysuckle Drive;
- Hannell Street and Beresford Street;
- Hannell Street and Hunter Street / Maitland Road; and
- Pacific Highway and King Street.

The intersection traffic survey locations are shown in Figure 4.1.

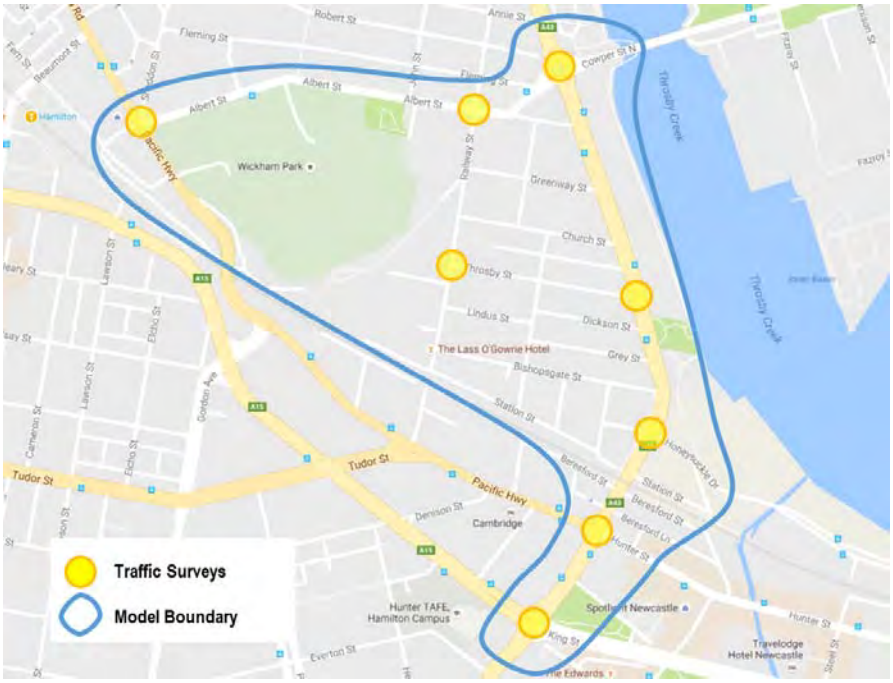


Figure 4.1: Surveyed Intersection Locations

The peak periods are identified as 8:00 to 9:00 and 16:45 to 17:45 pm. A summary of the peak hour intersection counts are provided in Figure 4.2 and Figure 4.3.

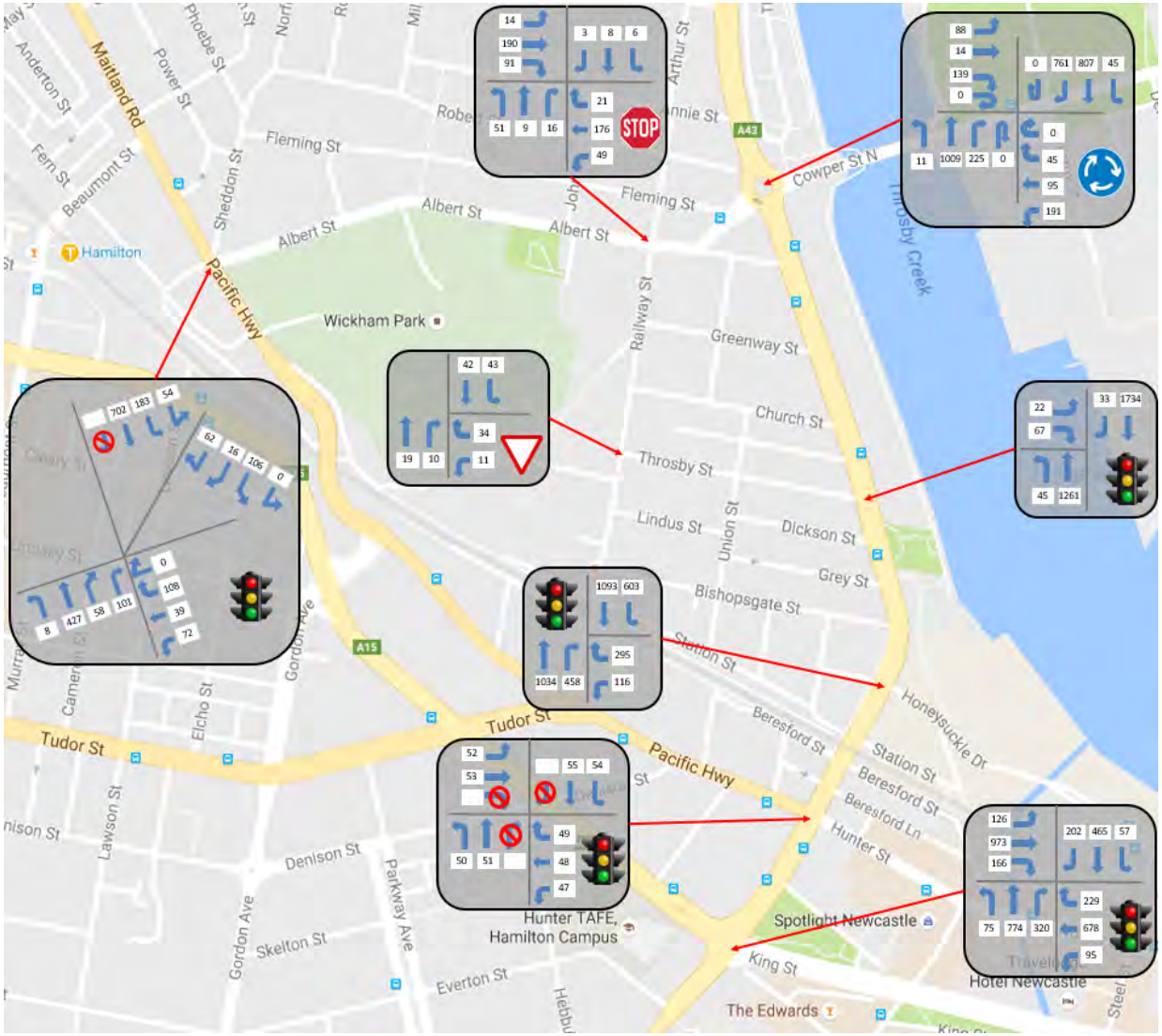


Figure 4.2: AM Peak 1 Hour Volumes Summary

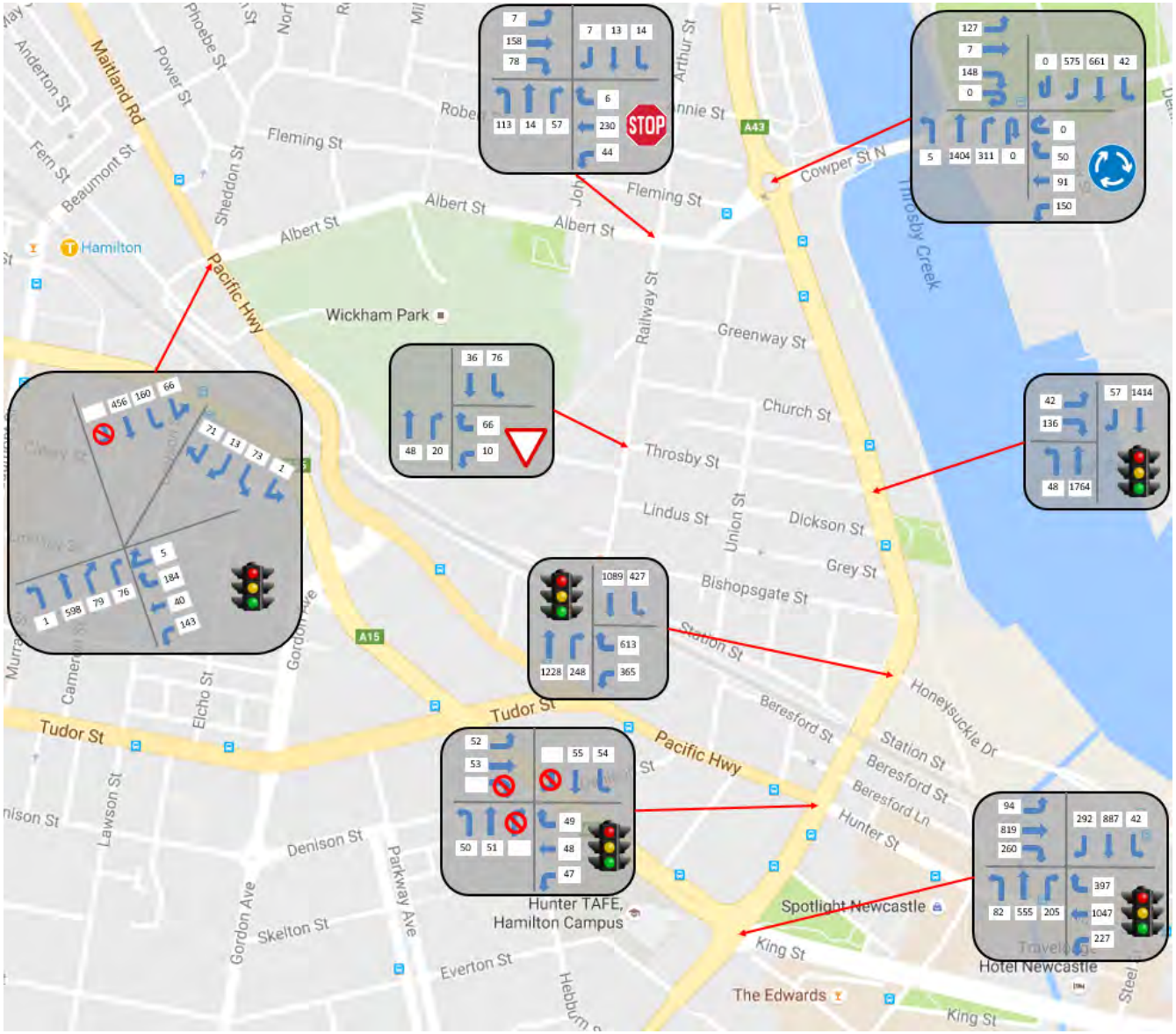
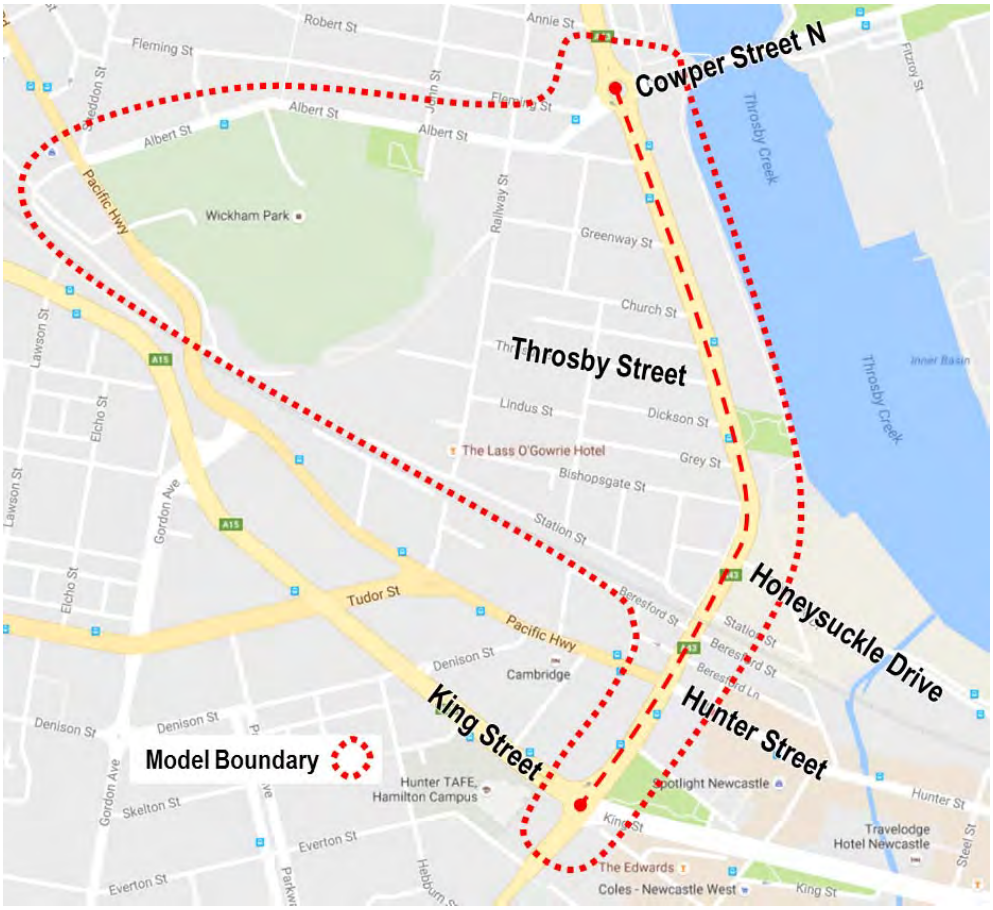


Figure 4.3: PM Peak 1 Hour Volumes Summary

4.2.2 Travel Time Surveys

Travel time surveys were undertaken by TDC on the 11th of October 2016 during the same peak hours as the traffic surveys. The surveys were undertaken on Hannell Street between Cowper Street North and King Street in both directions as shown in Figure 4.4.



SOURCE: Google Maps Australia

Figure 4.4: Travel Time Survey Route

During the AM peak period, a total of 13 runs were undertaken in each direction and in the PM peak period a total of 10 runs were undertaken in each direction.

4.3 OTHER INPUTS

4.3.1 Traffic Release Profiles

Based on the intersection counts, a traffic demand profile over each peak period at each of the count sites was averaged and plotted. These profiles were used for input into the simulation models.

The peak periods are identified as follows:

- 8:00 to 9:00 am; and
- 4:45 to 5:45 pm.

A summary of the average peak period volumes are shown Figure 4.5 and Figure 4.6.

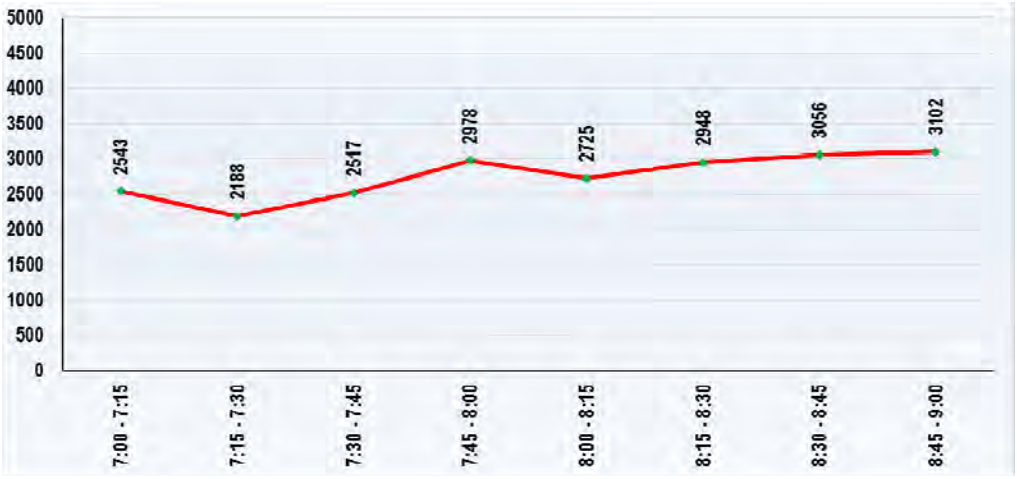


Figure 4.5: AM peak traffic demand profile

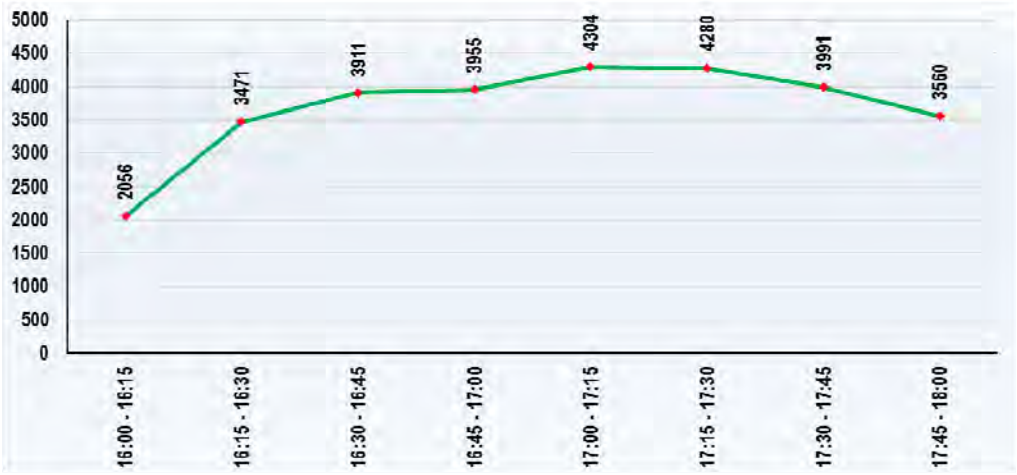


Figure 4.6: PM peak traffic demand profile

4.3.2 Traffic Signal Data

Traffic signal data (SCATS) was obtained from Roads and Maritime Services (RMS) in the form of IDM files for the following intersections:

- Hannell Street / Throsby Street;
- Hannell Street / Honeysuckle Drive;
- Stewart Avenue / Hunter Street;
- Stewart Avenue / King Street / Parry Street; and
- Maitland Road / Albert Street / Sheddon Street / Ivy Street.

4.4 NETWORK CODING

4.4.1 Model Network

The VISUM model network was developed using the VISUM version 15.00-16 software. The network was coded based on the latest available aerial photography with geometrics confirmed during a site visit.

4.4.2 Zoning System

The VISUM model incorporates up to 34 zones at a 'block' level as shown in Figure 4.7 below to ensure the demand matrices can incorporate future development at a masterplan level.

Figure 4.7: Base network and zoning system

4.5 TRAFFIC DEMANDS

4.5.1 Demand Periods and Vehicle Types

The base models include the following demand periods:

- 2016 AM Base Model:
  - warm up period: 7:45am to 8:00am;
  - peak period: 8:00am to 9:00am; and
  - cool-down period: 9:00am to 9:15am.
- 2016 PM Base model:
  - warm up period: 4:30pm to 4:45pm;
  - peak period: 4:45pm to 5:45pm; and
  - cool-down period: 5:45pm to 6:00pm.

The use of 15-minute warm-up / cool-down periods is considered appropriate given the size of the network. Separate matrices for light and heavy vehicles were created for input into the model

4.5.2 Matrix Development Process

The matrix development process firstly involved the calculation of traffic generation (in/out) for each zone in the model. For external zones, these volumes were determined directly from intersection count data.

For internal zones, a comprehensive traffic generation database was created based a property-level assessment of existing land uses and floor areas, and application of industry traffic generation rates to determine traffic into and out of each property and then aggregated to traffic generation to/from each zone. With traffic demand totals identified, a two-dimensional matrix balancing was undertaken to establish a "pattern" matrix. This process considered likely zone-to-zone movements that are not possible or highly unlikely given the boundaries of the model area. This created the "prior" matrices for each peak hour.

The prior matrices were input into the matrix estimation process which used VISUM's in-built matrix estimation function called TFlowFuzzy.

4.6 MODEL CALIBRATION SUMMARY

4.6.1 Criteria

The model was calibrated to the balanced vehicle movement data determined from the turning counts. This was undertaken in accordance with the *Roads and Maritime Traffic Modelling Guidelines 2013*, which stipulates the requirements for model calibration. Essentially:

- for all turn volumes, the range of GEH values must be in accordance with the guidelines;
- for volumes within a "core area", modelled volumes fall within specified "tolerance limits" when compared to surveyed volumes; and
- R^2 value when comparing modelled and actual flows to be 0.9 throughout the network, and 0.95 within the "core area".

4.6.2 GEH Statistic and Calibration Results

The Geoffrey E. Havers (GEH) statistic is an industry standard measure of variance between the observed count and modelled count, expressed by the following:

$$GEH = \sqrt{\frac{2(M-C)^2}{M+C}}$$

Where M is the modelled volume and C is observed volume.

This expression effectively relates the severity of variance to the size of observed volume and allows the variance from both large and small volumes to be assessed by the same measure.

The *RMS Traffic Modelling Guidelines 2013* uses the GEH statistics as the main measurement of variance in microsimulation modelling and sets out the following requirements for calibration to turning movement and link volumes:

- 100% of turns and links with a GEH < 10; and
- 85% of turns and links with a GEH <5.

The GEH results for the weekday AM and PM base models in relation to GEH criteria are summarised in Table 4.1 while the detailed calculations for each movement are shown in Appendix C.

Table 4.1: AM & PM Base Model Turning Movement GEH Results

Measure	AM	PM
% of GEH <10	98%	94%
% GEH <5	2%	6%
Average GEH	0%	0%

Table 4.1 shows that the model satisfies the GEH calibration requirements for both peak periods.

The estimated traffic matrices result in the traffic trip ends shown in Table 4.2. As shown in this table, the majority of traffic trips in the model are associated with external zones, and particularly with traffic passing through the study area (i.e. external to external traffic).

Table 4.2: 2016 Base Traffic Demands Summary

Zone Location and Movement	AM (1hr) Trip Ends	PM (1hr) Trip Ends
External Zone to Internal Zone	412	353
External Zone to External Zone	9,316	9,544
Internal Zone to External Zone	176	419
Total	9,905	10,316

4.6.3 Core Area Tolerance Limits and R^2 Value

The *RMS Guidelines* also requires the following tolerance limits for all modelled volumes within "core areas", in this case consisting of the entire modelled area:

- For Flows < 99 vehicles – to be within 10 vehicles of the observed value;
- For 100 < Flows < 999 – to be within 10% of the observed value;
- For 1000 < Flows < 1999 – to be within 100 vehicles of the observed value;
- For Flows > 2000 – to be within 5% of the observed value; and
- R2 of modelled vs. observed plots to be > 0.95.

The plot of modelled vs. observed flows with the above tolerance margins are shown in Figure 4.8 and Figure 4.9 for the AM and PM peaks. The R^2 and equation of the linear trend line are also shown and meet the RMS calibration requirements.

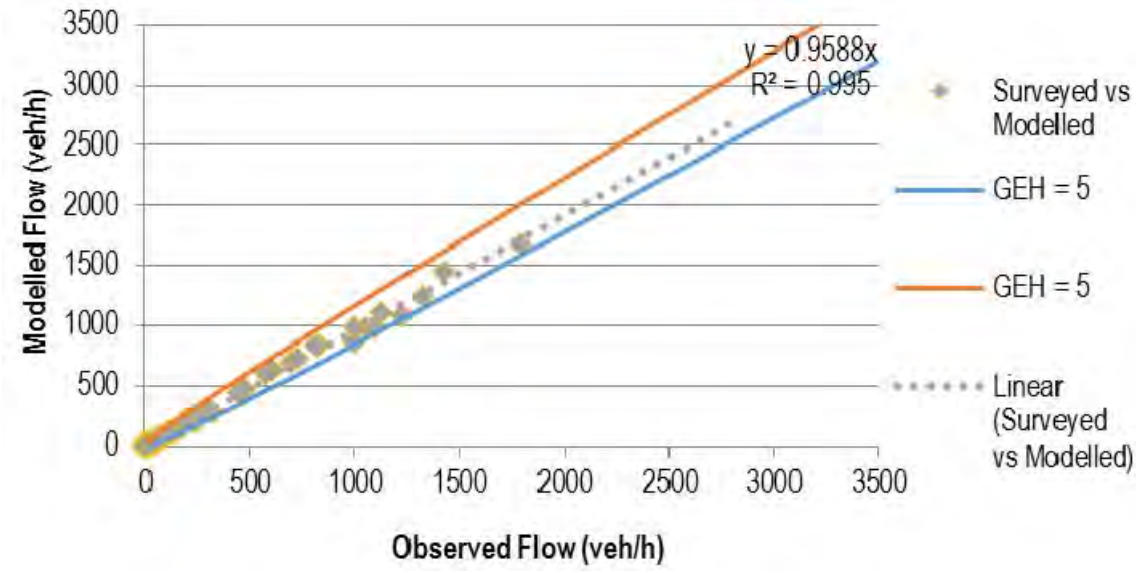


Figure 4.8: AM Peak Traffic Volume Comparison

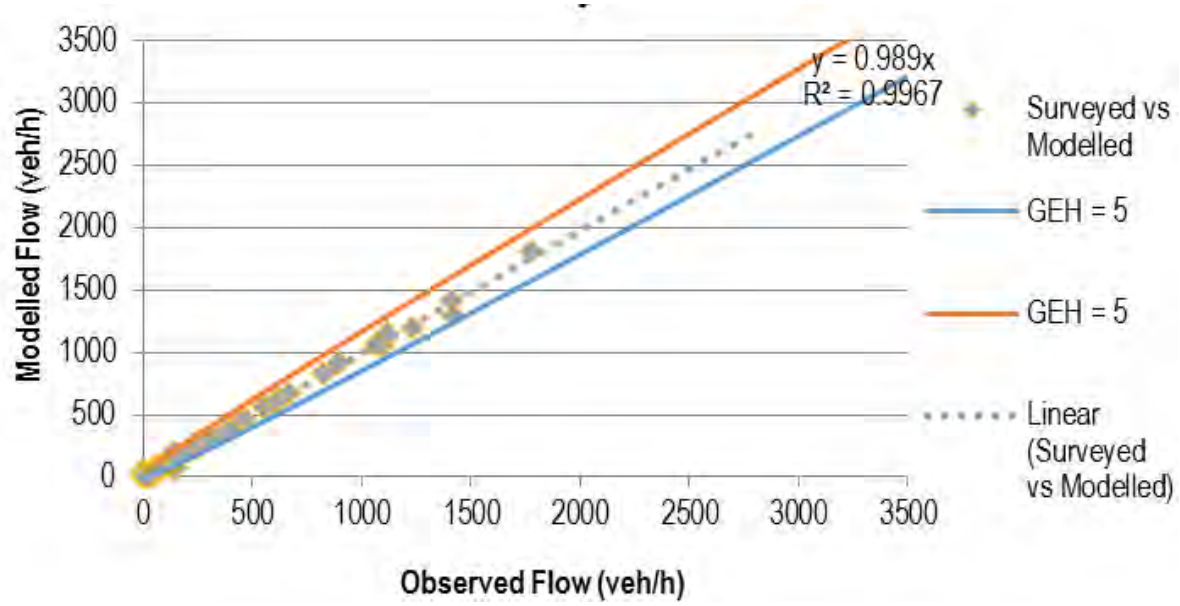


Figure 4.9: PM Peak Traffic Volume Comparison

4.7 Model Validation Summary

Validation of the microsimulation models was undertaken for the travel time route in accordance with RMS Modelling Guidelines. The RMS Modelling Guidelines consider the modelled travel time to be validated if the observed travel time is within ±15% of the observed average. This is demonstrated for each route in each peak by the cumulative time vs. distance graphs in Figure 4.10 to Figure 4.13.

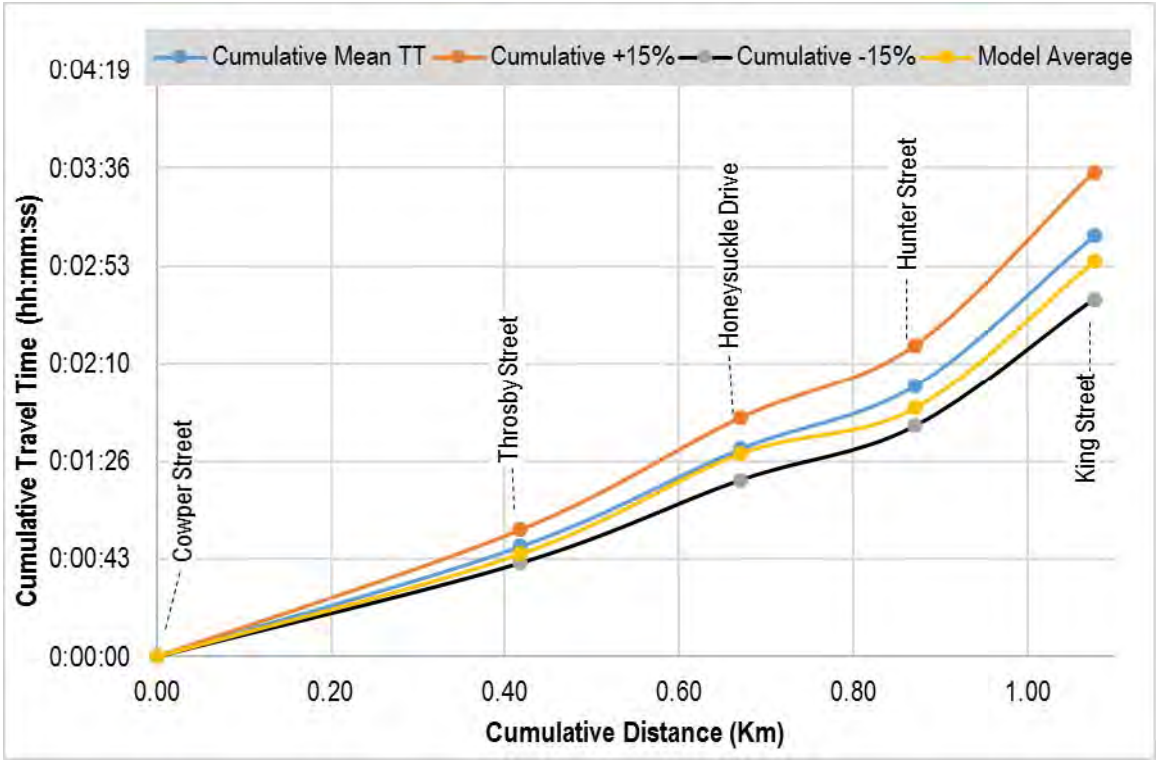


Figure 4.10: AM Peak Travel Time Validation – Southbound

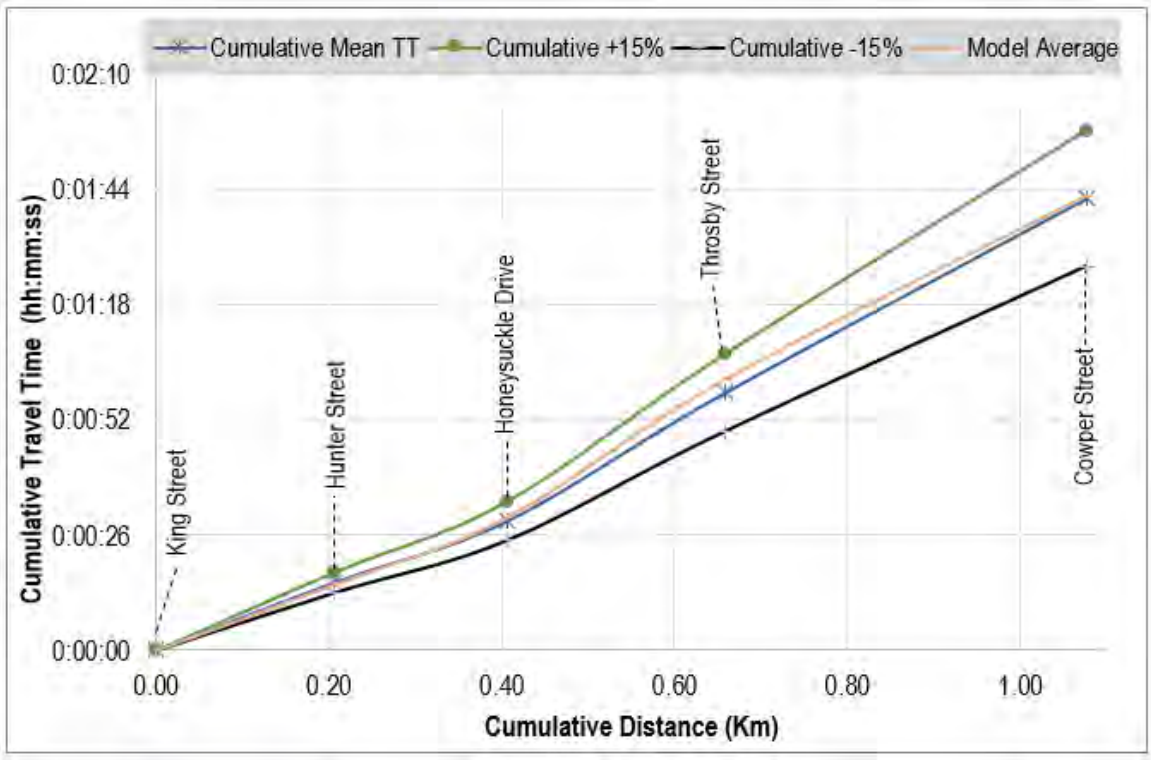


Figure 4.11: AM Peak Travel Time Validation - Northbound

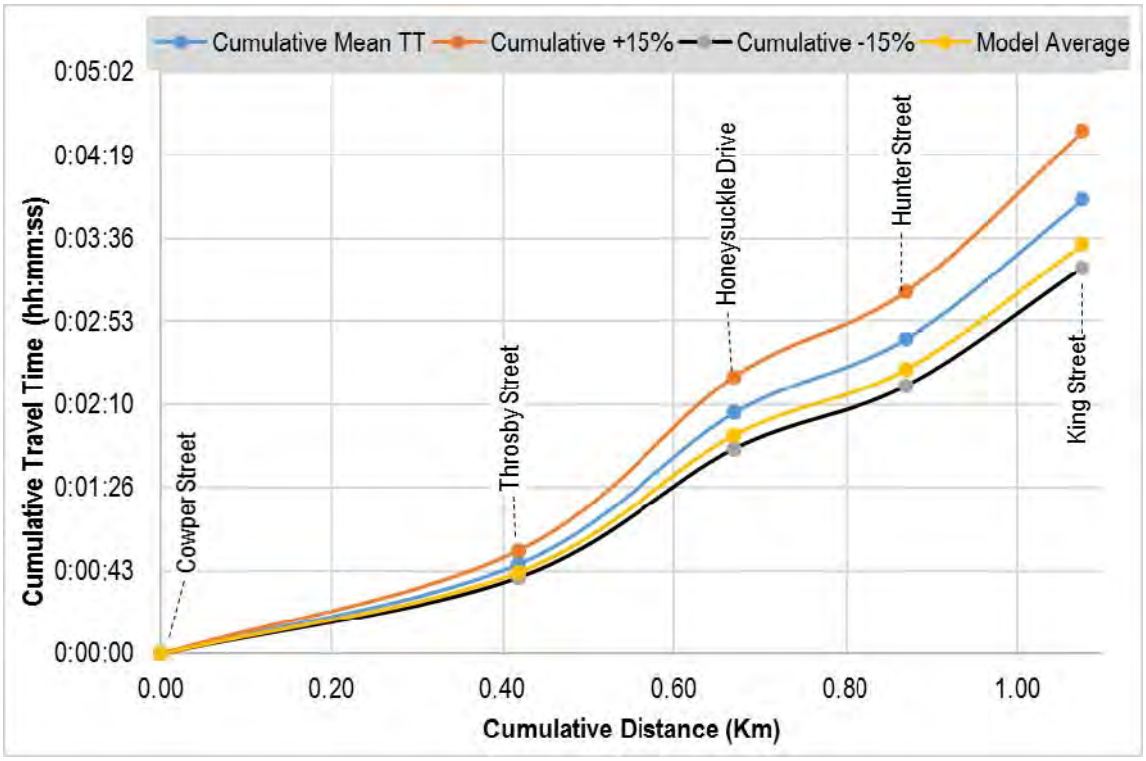


Figure 4.12: PM Peak Travel Time Validation – Southbound

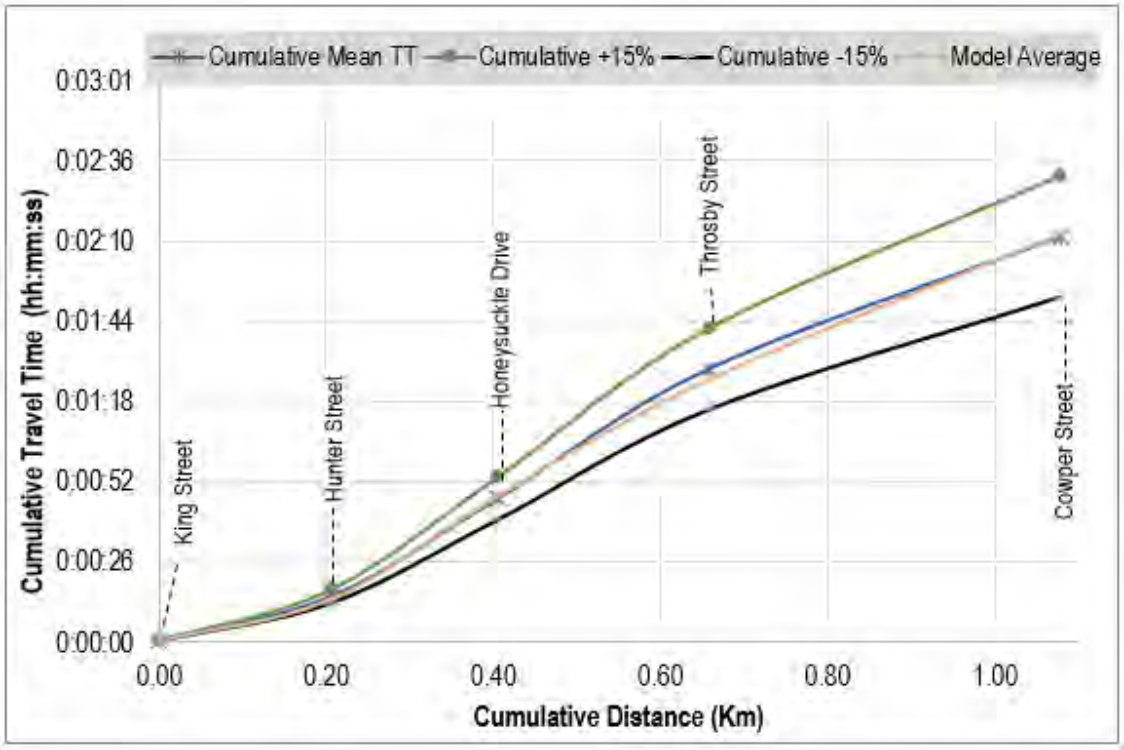


Figure 4.13: PM Peak Travel Time Validation – Northbound

As can be seen in the graphs, the modelled average travel time is within the ±15% tolerance levels for both AM and PM peaks and in both the northbound and southbound directions; meeting the validation tolerances in the RMS Modelling Guidelines.

4.8 MODEL STABILITY

Model stability between runs/seed values is particularly important in microsimulation models and is can be demonstrated using a variety of network performance measures. The following network performance measures have been adopted to demonstrate model stability:

- number of vehicles in the model; and
- cumulative travel time across all vehicles using Vehicle Hours Travelled.

Model outputs for each of the two measures are presented in 15 minutes intervals in Figure 4.14 and Figure 4.15. The following five random seeds have been used for this purpose:

- Run 1: Seed 5;
- Run 2: Seed 10;
- Run 3: Seed 15;
- Run 4: Seed 20; and
- Run 5: Seed 25.

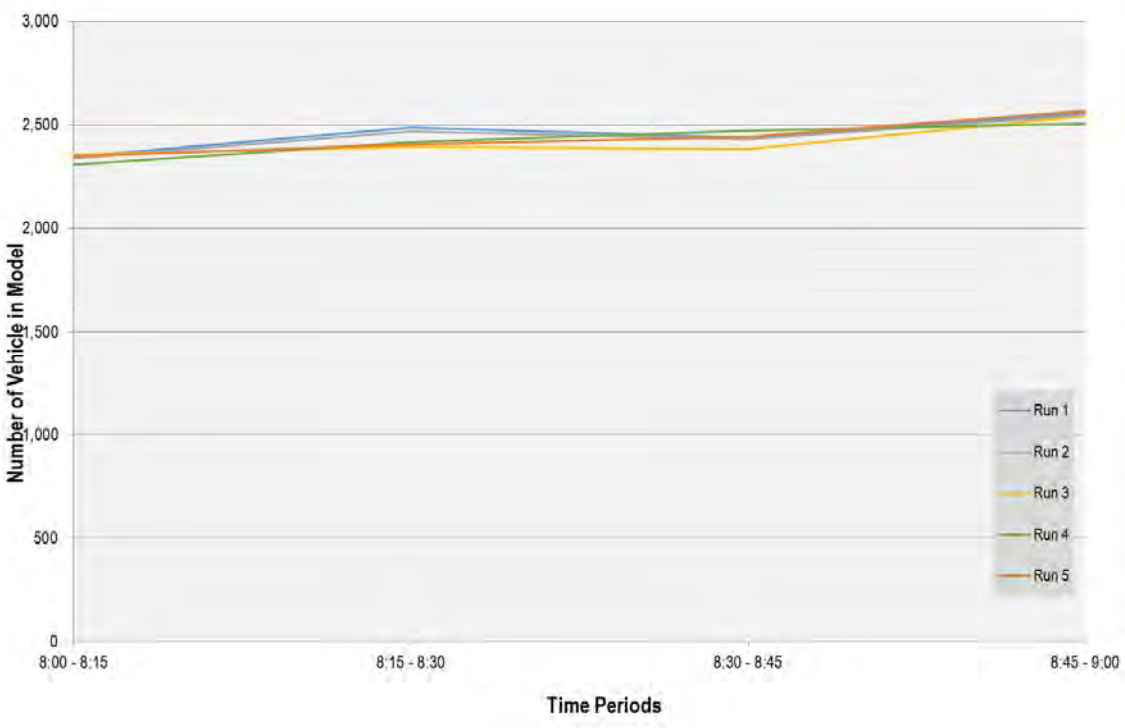


Figure 4.14: AM Peak Number of Vehicles in Model

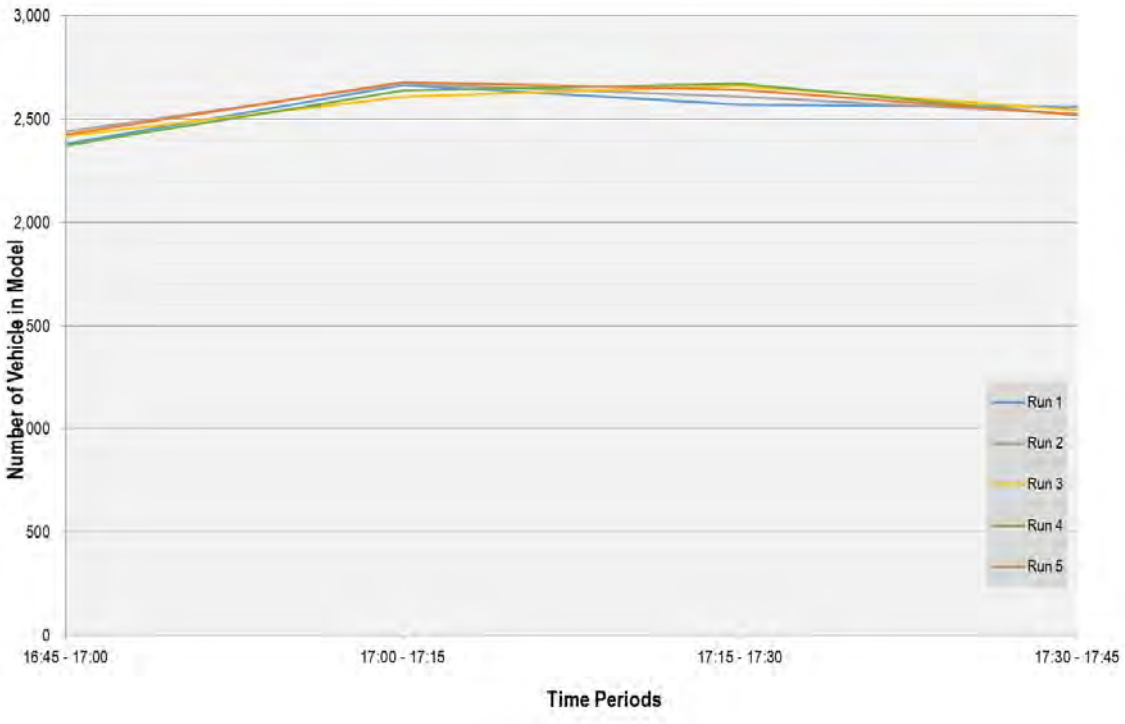


Figure 4.15: PM Peak Number of Vehicles in Model

The median seed for each peak period has been identified by determining the Vehicle Hours Travelled (VHT) for each of the simulated runs. The AM and PM peak median seeds are:

- AM: Seed 15; and
- PM: Seed 10.

All of the subsequent performance outputs reported are drawn from the median seed runs.

4.9 2016 BASE NETWORK PERFORMANCE

Figure 4.16 and Figure 4.17 shows the typical queueing in the 2016 base models in the 2016 peak periods.

Figure 4.16: Typical Queuing – 2016 AM Base Models

Figure 4.17: Typical Queuing – 2016 PM Base Models

5. NETWORK PLANNING PRINCIPLES

5.1 KEY PRINCIPLES

The key traffic and transport planning principles upon which the master plan traffic and transport network has been developed include:

- Intersections at Hannell Street and at Maitland Road to operate no worse for through traffic than without the master plan in 2036;
- Actively discourage through traffic passing within the master plan area through intersection movement restrictions at Hannell Street and Maitland Road, through internal street restrictions and through internal street speed limiting measures (widths, intersection controls and other devices);
- Encourage walking and cycling access to Wickham Interchange through the master plan area by providing clear and direct north-south and east-west routes consistent with Council's bikeway planning external to the study area;
- Improve connections between the master plan area and the Honeysuckle precinct;
- Manage potential disruption to on-street parking given the opening of the Light Rail, the ongoing redevelopment of the master plan area and the heavy usage of on-street parking by workers in the light industrial area;
- Maintain a fine grained road network to improve accessibility and connectivity and reduce walking distances; and
- discourage high levels of car ownership through residential parking rates which recognise the master plan area's proximity to light rail, heavy rail and activities in the Inner City.

5.2 TRAFFIC VOLUME AND INTERSECTION LOS TARGET THRESHOLDS

Target traffic volume threshold for local streets bounded by Albert Street, Hannell Street and the rail line have been defined as follows:

- Railway Street and Throsby Street: 800 vph (two-way); and
- All other streets: 300 vph (two way) or 200 vph (one way).

Intersections within the area bounded by Albert Street, Hannell Street and the rail line are targeted at operating at a peak LoS C or better, with the exception of those intersections consequentially impacted by queues emanating from the Hannell Street corridor. It is accepted that the primary function of Hannell Street is for north-south through traffic and that this may result in queueing back into the Wickham master plan area. These queues will however need to be managed to ensure that reasonable egress is facilitated, such as:

- setting the maximum number of red signal phases faced by any vehicle at the Throsby Street approach to Hannell Street in peak hours as two (i.e. two signal cycles); and
- the maximum delay in entering the Hannell/Albert roundabout from Albert Street as 120 seconds.

Furthermore, queueing back from these intersections should not extend throughout the master plan local traffic network.

5.3 WALKING AND CYCLING FACILITIES

The draft proposed footpaths and cycleways which is demonstrated in Figure 5.1. Primary footpaths and cycleways should be located along the major access spines orientated north-south towards Wickham Interchange and east-west towards Hannell Street, namely along:

- Railway Street;
- Union Street;
- Throsby Street;
- Station Street; and
- East-West through Hawkins Oval (to the Railway Lane and Station Street).

Opportunities to facilitate north-south pedestrian links through development sites towards Railway Street and Union Street and between Union Street and Hannell Street, should also be contemplated.

5.4 PARKING CONSIDERATIONS

5.4.1 Off Street Parking

With some ground floor commercial/retail development proposed in the master plan area, there may be some potential for consolidating employee parking (and to a less extent visitor parking) in one or two parking stations in the master plan area. These parking stations could be created using parking offset contributions by developments in the area instead of providing this commercial/retail parking on site. Key considerations with this approach include:

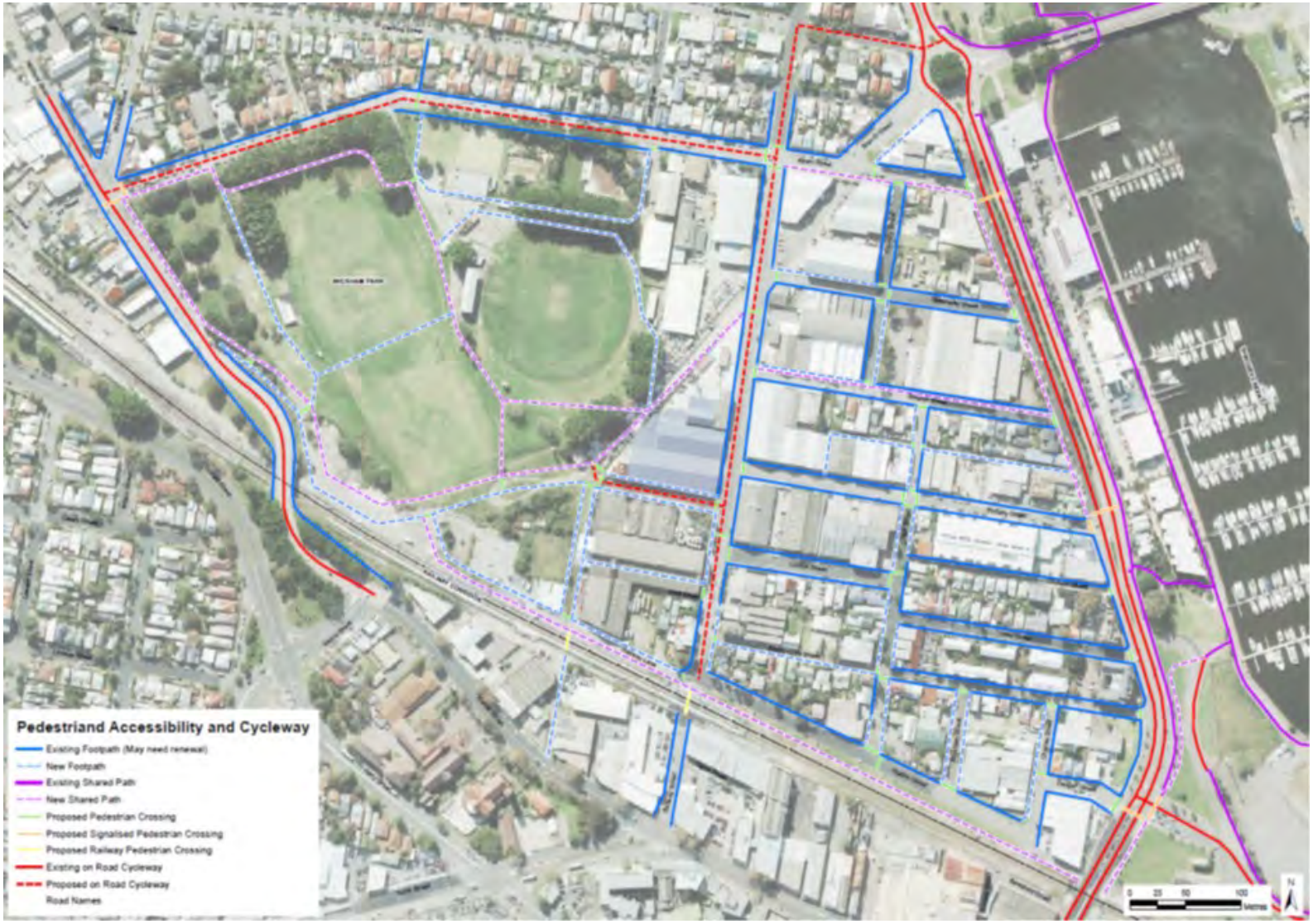
- to incentivise commercial/retail employee parking to be provided "off-site", the contribution rate would be expected to be less than the typical construction rate for building car parking within an individual development site as part of the development;
- a consolidated commercial car park would presumably charge for parking and the presence of such a car park would mean that employees parking in the surrounding development-specific car parks (including existing industrial developments) would be subject to fringe benefits tax implications;
- there are timing risks with this approach in that it may not be commercially viable until such time that council can contribute a significant proportion of the capital investment for the facility which means that a reasonable amount of development (and development traffic) would occur before the car park could be constructed;
- depending on the daily fee imposed relative to parking fees in the CBD post light rail opening, park and ride for the light rail may be a popular use of any commercial car park in the master plan area and may fill up the available space such that employees in the master plan area may be forced elsewhere; and
- a medium-large car park if used by non-master plan development parking will attract additional traffic into the master plan area's local streets.

5.4.2 On-Street Parking

On-street parking in the master plan area, particularly where commercial/retail development is located at ground floor level, will certainly assist in activating the area. As the master plan area transitions from light industrial and detached dwellings to higher density development, there may be conflicts between the heavy employee demands already present on-street, construction traffic and potential visitors to these on-street parking bays for new commercial/retail development. Street parking would therefore need to be carefully managed.

One way and local streets that are wide enough and suited to providing parallel parking should maximise this type of parking and to also preserve a visually and physically "constrained" slow speed driving environment.

It should be highlighted that the area to the north of the rail line, such as along Station Street, may be a convenient Kiss and Ride drop off or pick up location for residents to the north and there may be some intrusion of traffic into local streets for this purpose.



Source: The City of Newcastle

Figure 5.1: Draft Proposed Pedestrian and Cycling Facilities

6. DRAFT MASTER PLAN TRAFFIC MODELLING

6.1 DRAFT MASTER PLAN AND NETWORK

Figure 6.1 shows the assumed potential development areas and assumed Floor Space Ratios (FSRs) for the assessment of the traffic demands associated with the draft master plan. The initially proposed street network and traffic movement directions is shown in Figure 6.2.

6.2 TRAFFIC DEMANDS ESTIMATION

6.2.1 External Traffic Growth

Due to the proximity of the major roads surrounding the master plan area to the Newcastle City Centre, the growth in "through traffic" in the model in peak hours is most likely to be related to the growth in employment in the CBD. This growth has been estimated as:

- 2017-2026: 2.9% p.a.
- 2027-2036: 1.4% p.a.

6.2.2 Master Plan Traffic

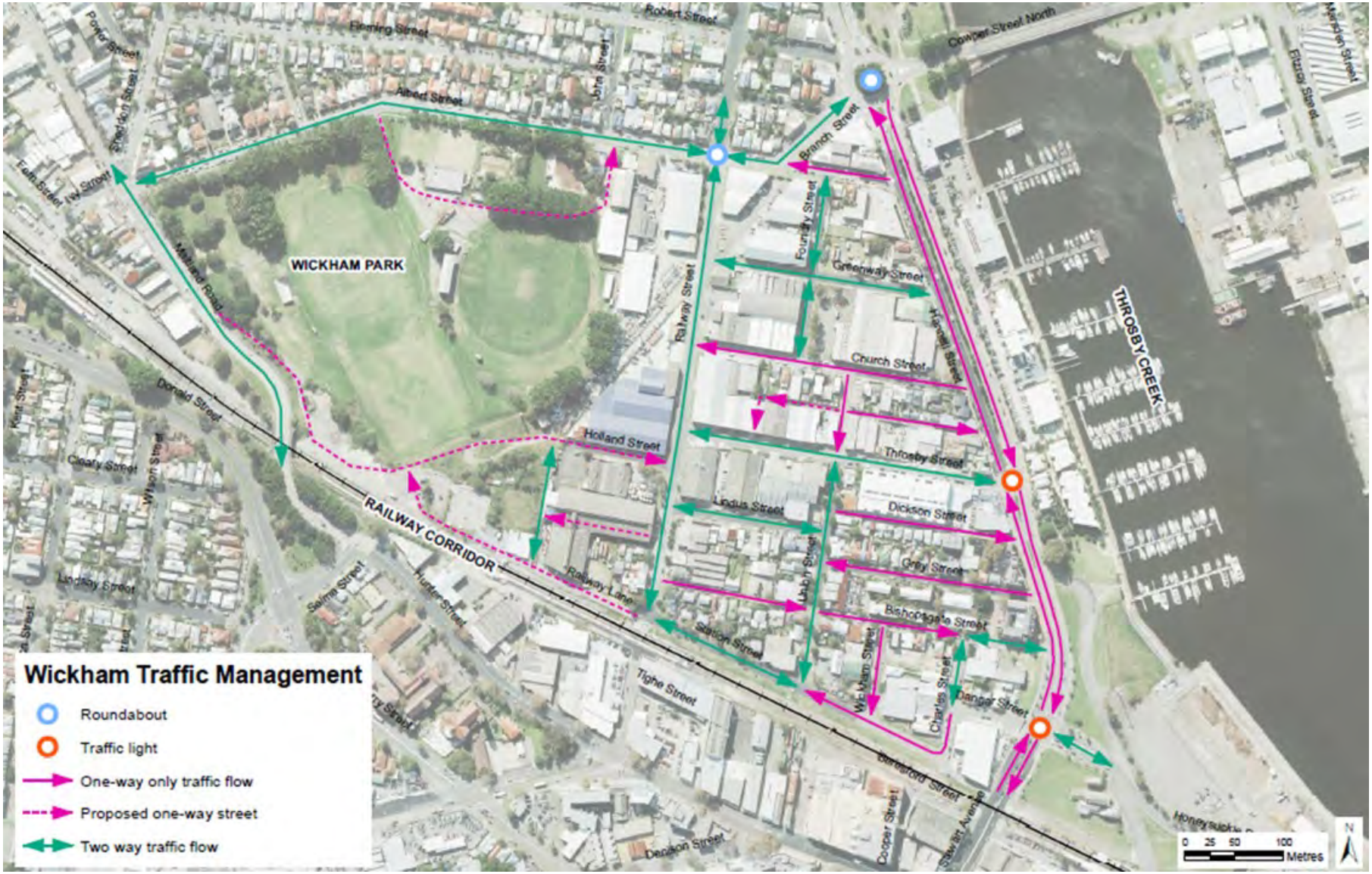
Calculation of the traffic generated by the master plan has been based on:

- developable site areas and assumed Floor Space Ratios (FSRs) shown in Figure 6.1 to calculate estimated GFA;
- where residential buildings are allowed to be greater than 3 storeys, ground floor commercial was assumed with a split of 50% retail and 50% office space; and
- RMS traffic generation rates were then applied to the development assumed on each property to the peak hour traffic generated and assuming that parking for each site would typically be contained on/near each site.

It should be noted that this analysis assumed a 50% take-up of the potential maximum yield based on advice provided by Council.

Source: The City of Newcastle

Figure 6.1: Assumed Development Areas and FSRs



Source: The City of Newcastle

Figure 6.2: Draft Master Plan Street Network and Traffic Flow Directions

6.2.3 Kiss and Ride and Additional Parking Station

Given the orientation and turn restrictions within the road network surrounding the Wickham Interchange, it is inevitable that there will be some Kiss and Ride (KnR) demand north of the interchange and within the master plan area for both light rail and heavy rail trips. For this reason, 100 KnR trips per hour have been assumed for each peak to enter a new zone in the model off Station Street created specifically for KnR activity.

In addition, Council is contemplating an option for a 400 bay parking station on the corner of Holland Street and Station Street, located within "Zone 8" in the model. The parking site has been assumed to generate 200 trips inbound in the morning peak 1 hour and 200 trips outbound in the afternoon peak 1 hour.

6.2.4 Total Traffic Demands

The application of the external traffic growth, master plan development, KnR and parking station demands results in the 2036 traffic trip ends as shown in Table 6.1.

Table 6.1: Study Area Traffic Growth (2016 – 2036)

Zone Location and Movement	2016 AM (1hr) Trip Ends	2036 AM (1hr) Trip Ends	2016 PM (1hr) Trip Ends	2036 PM (1hr) Trip Ends
External Zone to Internal Zone	412	731	353	703
External Zone to External Zone	9,316	13,843	9,544	14,182
Internal Zone to External Zone	176	670	419	709
Total	9,905	15,345	10,316	15,595

Based on the above, total traffic to, from, through and within the modelled area is expected to increase by over 50% between 2016 to 2030, although the vast majority of this growth is in through traffic.

6.3 OPTIONS MODELLED

The options have been modelled based on a future year of 2036. The following options have been assessed:

Option	Description and key assumptions
Base Case	This is the reference case for assessment and includes external traffic growth, no change to 2016 development levels in the master plan area, the introduction of light rail and its associated infrastructure, including the signalised crossing of Hannell Street.
Option 1	This includes the Base Case + full development of the master plan area + the 400 bay parking station at Holland Street/Railway Street and the network shown in Figure 6.2.
Option 2	As per Option 1 but the 400 bay car parking station is removed.
Option 3	As per Option 2 but the intersection of Albert Street and Railway Street is converted from a roundabout to traffic signals
Option 4	As per Option 3 but with a fourth leg added to the intersection of Honeysuckle Drive at Dangar Street. Right turn movements into Dangar Street from Hannell Street have not been allowed due to width constraints and capacity limitations at this busy intersection.
Option 5	Same as Option 1 but Union Street between Station Street and Throsby Road is converted to be one way northbound only.

6.4 2036 BASE CASE

6.4.1 AM Peak

Model Scenario: 2036 AM Peak Base Case

One Hour Traffic Volumes

Typical Queues (Simulation Capture) @ 08:07

Key findings:

- There is limited traffic being generated to / from the study area and "external" traffic movements flow on Hannell Street without any noticeable effects from master plan are traffic.
- The high volume of southbound traffic at the Hannell Street / Cowper Street roundabout restricts the flow of traffic from Cowper Street North from entering the roundabout, generating long queues.
- Apart from the Hannell Street / Cowper Street roundabout, traffic in the network flows relatively well throughout the network.

6.4.2 PM Peak

Model Scenario: 2036 PM Peak Base Case

One Hour Traffic Volumes

Typical Queues (Simulation Capture) @ 17:13

Key findings:

- Heavy northbound and southbound traffic volumes along Hannell Street inhibits flow into Hannell Street from many of its side streets.
- Both northbound and southbound traffic at the Hannell Street / Cowper Street North roundabout reduces the gaps for Branch Street and Cowper Street North traffic from entering the roundabout, which consequently results in very long queues on Branch Street-Albert Street and from Cowper St North. This effect is largely independent of the traffic generated by the master plan area.
- The queue along Branch Street, originating at the Hannell Street / Cowper Street North roundabout, extends along Albert Street and beyond the Railway Street intersection. The queue reaches the Maitland Road intersection for part of the PM peak.
- Queues are also observed along Throsby Street, which consequentially spreads to various internal streets through the peak hour.

6.5 2036 OPTION 1

6.5.1 AM Peak

Model Scenario: 2036 AM Peak Option 1 (with master plan)

One Hour Traffic Volumes

Typical Queues (Simulation Capture) @ 08:10

Key findings:

- The AM peak network runs without excessive queueing at any intersections.
- However, compared to the 2036 base network, there is a noticeable increase in the number of vehicles using the master plan internal road network which is expected considering the additional trips related to master plan development.
- The additional traffic generated by the masterplan, has no noticeable effect on traffic on Hannell Street or other parts of the external road network.
- No residual queues remain at the end of each green period.

6.5.2 PM Peak

Model Scenario: 2036 PM Peak Option 1 (with master plan)

One Hour Traffic Volumes

Typical Queues (Simulation Capture) @ 17:34

Key findings:

- Heavy northbound and southbound through traffic volumes exist along Hannell Street, which restricts flow into Hannell Street from its side streets.
- The northbound and southbound traffic at Hannell Street / Cowper Street North roundabout, restricts entry gaps and results in very long queues on both Branch Street and from Cowper Street North.
- With heavy flows on Albert Street, the new link (south of Wickham Park) whilst providing access to the master plan area attracts some through traffic destined for Hannell Street. This is simply a consequence of excessive congestion at the Hannell Street / Cowper Street North roundabout.
- Long queues are also observed along Throsby Street, which spreads to other internal streets during the PM peak as traffic trying to exit Throsby Street is faced with long queues back from the Hannell Street / Cowper Street North roundabout.
- The queue along Branch Street, originating at the Hannell Street / Cowper Street North roundabout, extends to the proposed roundabout at Railway Street / Albert Street intersection. However, unlike the 2036 Base Case, this queue does not extend back to Maitland Road intersection, primarily due to the presence of the new link south of Wickham Park.

6.6 2036 OPTION 2

6.6.1 AM Peak

Model Scenario: 2036 AM Peak Option 2 (with master plan but no 400 space car park)

One Hour Traffic Volumes

Typical Queues (Simulation Capture) @ 08:13

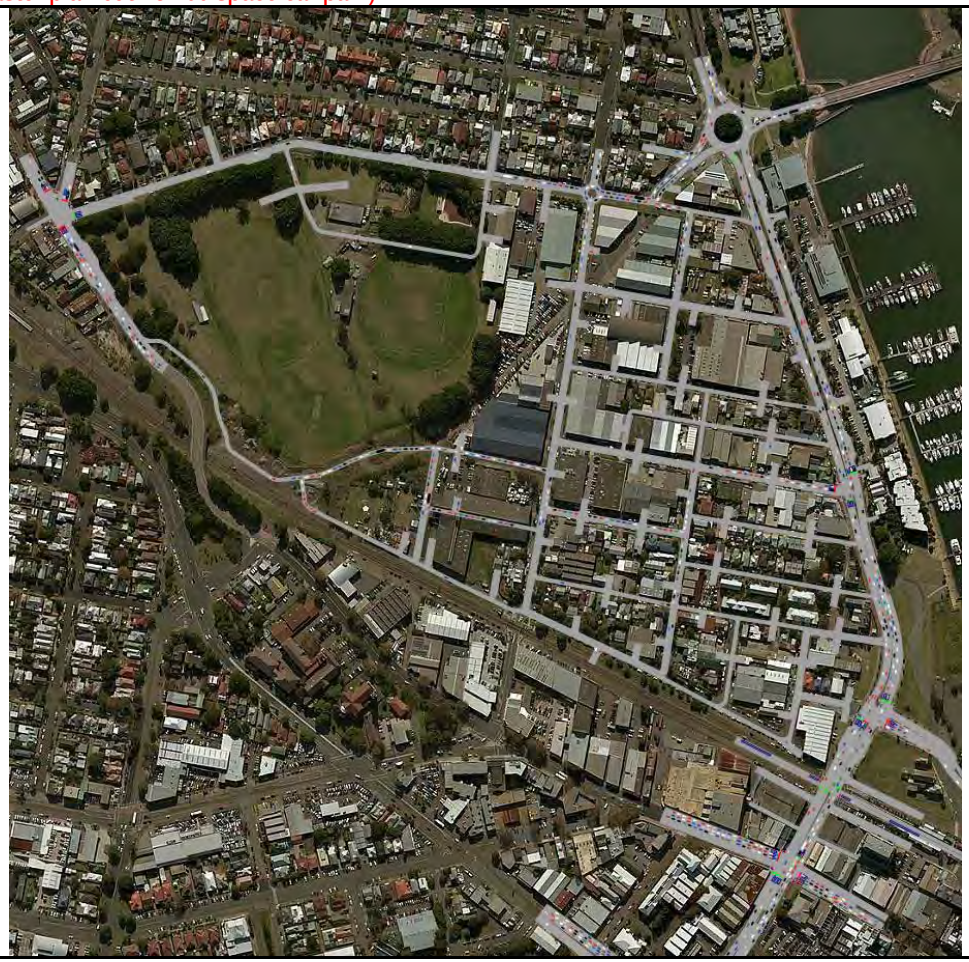
Key findings:

- No major queuing or delays were observed in this case.
- However, compared against the 2036 base case, there are far more vehicles are using the internal road network within the study area which is expected considering the additional trips generated by the master plan.

6.6.2 PM Peak

Model Scenario: 2036 PM Peak Option 2 (with master plan but no 400 space car park)

One Hour Traffic Volumes



Typical Queues (Simulation Capture) @ 17:44

Key findings:

- Heavy northbound and southbound traffic volumes exist along Hannell Street, which restricts flow into Hannell Street from its side streets.
- The northbound and southbound traffic at the Hannell Street / Cowper Street North roundabout restricts flow and results in long queues on Branch Street and from Cowper St North, as per Option 1.
- The queue along Branch Street, originating at Hannell Street, extends to the new roundabout at Railway Street / Albert Street. However, compared against the 2036 Base case, this queue does not extend to Maitland Road.
- Queues are also observed along Throsby Street, which extend to various internal streets as the model run progresses. However, these queues are shorter than those observed in the 2036 Option 1 case.
- The new link (south of Wickham Park) provides access to the master plan areas but also caters for some through traffic due to excessive congestion on Albert Street.

6.7 2036 OPTION 3

6.7.1 AM Peak

Model Scenario: 2036 AM Peak Option 3 (with master plan but no 400 space car park + Albert / Railway signalised)

One Hour Traffic Volumes

Typical Queues (Simulation Capture) @ 08:30

Key findings:

- During the model run, no long queues r excessive delays were observed.
- However, compared to the 2036 base case, a considerable number of vehicles are using the internal road network within the study area as expected with the additional trips related to the master plan development.
- The signalisation of Albert/Railway has no significant queueing or delay effects.

6.7.2 PM Peak

Model Scenario: 2036 PM Peak Option 3 (with master plan but no 400 space car park + Albert / Railway signalised)

One Hour Traffic Volumes

Typical Queues (Simulation Capture) @ 17:26

Key findings:

- Heavy northbound and southbound traffic volumes exist along Hannell Street, which restricts flow into Hannell Street from its side streets.
- Northbound and southbound traffic at the Hannell Street / Cowper Street North roundabout, restricts flow and results in long queues on Branch Street and from Cowper Street North.
- The queue along Branch Street, originating at Hannell St extends to the signalised intersection Railway Street / Albert Street under this option. Compared to the 2036 Base case, this queue does not extend to the Maitland Road intersection and is effectively managed by the signals.
- Queues are observed along Throsby Street, which spreads to various internal streets over the peak hour but not as extensively as Options 1 and 2.
- The new link (south of Wickham Park) provides access to the local masterplan areas and does not appear to be excessively used by through traffic.

6.8 2036 OPTION 4

6.8.1 AM Peak

Model Scenario: 2036 AM Peak Option 4 (with master plan but no 400 space car park + Albert / Railway signalised + Dangar Street access)

One Hour Traffic Volumes

Typical Queues (Simulation Capture) @ 08:30

Key findings:

- No excessive queuing or delays were observed, similar to the Base Case and Options 1-3.
- However, compared to the 2036 base case a considerable volume was observed using the internal road network within the study area which is expected considering the additional trips related to the masterplan development.
- The fourth leg of Dangar Street at the Honeysuckle Drive / Hannell Street intersection has no noticeable effect on the capacity of this intersection if provided with a relatively small green time.

6.8.2 PM Peak

Model Scenario: 2036 PM Peak Option 4 (with master plan but no 400 space car park + Albert / Railway signalised + Dangar Street access)

One Hour Traffic Volumes

Typical Queues (Simulation Capture) @ 17:43

Key findings:

- Heavy northbound and southbound traffic volumes along Hannell Street restricts flow into Hannell Street from its various side streets.
- The northbound and southbound traffic at the Hannell Street / Cowper Street North roundabout restricts flow from and results in minor queues on Branch Street and long queues from Cowper Street North.
- Implementing an at Dangar Street as the fourth leg to the Hannell St / Honeysuckle Drive intersection, results in reduced queues and delays within the internal road network. This change does however lengthen the southbound queue along Hannell Street as the green time for other movements at the intersection is reduced.
- Some queues are also observed along Throsby Street, but are significantly shorter than queues observed in the previous the Base case and Options 1-3 and also rarely extends into adjacent side streets.
- The new link (south of Wickham Park) also reduces in queues as it is not affected by vehicles blocked back from Hannell Street.

6.9 2036 OPTION 5

6.9.1 AM Peak

Model Scenario: 2036 AM Peak Option 5 (with master plan + Union Street one-way northbound - Station Street to Throsby Street)

One Hour Traffic Volumes

Typical Queues (Simulation Capture) @ 08:10

Key findings:

- No excessive queuing or delays were observed, similar to the Base Case and Options 1-4.
- Compared to the 2036 Option 1 there is a considerably higher volume using Throsby (west of Union), Railway Street (south of Throsby Street) and along Bishopsgate Street. This is due to additional circulation distances required with Union Street being limited to one-way.
- The additional traffic generated by the masterplan, has no noticeable effect on traffic on Hannell Street or other parts of the external road network.

6.9.2 PM Peak

Model Scenario: 2036 PM Peak Option 5 (with master plan + Union Street one-way northbound - Station Street to Throsby Street)

One Hour Traffic Volumes

Typical Queues (Simulation Capture) @ 17:39

Key findings:

- Heavy northbound and southbound traffic volumes along Hannell Street restricts flow into Hannell Street from its various side streets.
- The northbound and southbound traffic at the Hannell Street / Cowper Street North roundabout restricts entry gaps and results in long queues on both Branch Street and from Cowper Street North.
- With heavy flows on Albert Street, the new link (south of Wickham Park) whilst providing access to the masterplan area attracts some through traffic destined for Hannell Street. This is simply a consequence of excessive congestion at Hannell Street / Cowper Street North roundabout and at Albert Street / Railway Street roundabout.
- Long queues are also observed along Throsby Street, which spreads to other internal streets during the PM peak as traffic trying to exit Throsby Street is faced with long queues back from the Hannell Street / Cowper Street North roundabout.
- Converting Union Street (between Station Street and Throsby Street) to one way northbound has the following effects on the network compared to Option 1:
  - An increase in southbound traffic on Railway Street to compensate for the removal of southbound movements on Union Street.
  - Some southbound right turn traffic is reduced at the Hannell Street / Throsby Street intersection and diverted to the Hannell Street / Cowper Street North roundabout, thus adding more traffic to the Albert Street / Railway Street roundabout further justifying the need to signalise this intersection.
  - More traffic is observed along Lindus Street and in particular along Bishopsgate Street.

6.9.3 Option 1 and Option 5 Link Volumes Comparison

2036 AM Link Volume Comparison	2036 PM Link Volume Comparison
	

Key findings:

- As expected the removal of southbound traffic along Union Street (between Station Street and Throsby Street) essentially shifts this southbound traffic to Railway Street. In the PM peak this equates to 150-200 vph southbound of which about 50 vph adds to Lindus Street and 100+ vph to Bishopsgate Street (both eastbound).
- Increase in eastbound traffic along Bishopsgate Street is also observed for Option 5 network.
- Southbound traffic headed towards Station Street, now winds its way Wickham Street and Charles Street.

6.10 KEY MODELLING RESULTS COMPARISON

The modelling of the Year 2036 traffic demands has revealed that the "weak point" in the future year networks is the Hannell Street / Branch Street/ Cowper Street North roundabout which is over capacity in the PM peak, regardless of what development occurs in the master plan area. The consequence of this for the master plan development is the long northbound queues in Hannell Street which queue back past Throsby Street and long queues in Albert Street. This in turn reduces the ability master plan area traffic to leave via Albert Street or via Throsby Street and also induces some through traffic into the area via the new one-way link south of Wickham Park.

Upgrading the Hannell Street / Branch Street / Cowper Street North roundabout would remove this issue and would be expected to relieve most of these constraints on the master plan area. In lieu of this, signalising the Railway Street / Albert Street intersection appears to improve management of approach volumes on Albert Street – Branch Street and provides a mechanism for master plan area traffic to exit on Albert Street. Furthermore, the introduction of a fourth leg at the Honeysuckle / Hannell intersection using Dangar Street provides significant benefits, reducing reliance on only the two exit points (Throsby and Railway/Albert) even if only minimal green time was provided for this approach). The consequence of this however is the reduced green time for Hannell Street traffic and particularly for southbound traffic (given the need to preserve northbound capacity due to the proximity of the light rail crossing).

Importantly, there is some reasonable risk of through traffic filtering through the master plan area using the proposed one-way link south of Wickham Park should the capacity issues at the Hannell / Cowper Street North roundabout not be resolved and queues on Albert Street extend as far as Maitland Road.

A secondary issue which arises due to the heavy flow southbound through the Hannell Street / Branch Street/ Cowper Street North roundabout is the almost constant southbound flow through the roundabout, particularly in the PM peak when flows from Hannell Street turning right into Cowper Street North are quite small and therefore don't interrupt this heavy southbound flow. This then makes is very difficult for Cowper Street North traffic to enter the roundabout, generating long queues on this approach. This flow pattern has a secondary effect of "flooding" Hannell Street downstream with a continuous flow of traffic, impacting the Honeysuckle Drive intersection and consequentially queueing back toward Throsby Street. This makes it difficult for master plan area traffic to exit Throsby Street and this issue is heightened by the fact that it is effectively only one of two ways to exit the area to head south.

The option of converting Union Street between Station Street and Throsby Street to one-way northbound does not appear to direct local volumes to such an extent that the environmental capacity on other local streets such as Lindus Street or Bishopsgate Street would be exceeded. The expected volume increase in Railway Street due to this option is mostly south of Throsby Street and equates to about 130 vph in the PM peak and less than 70 vph in the AM peak which is not expected to significantly affect this trunk collector road by pushing it up from about 4,000 vpd under Option 1 to 6,000 vpd under Option 5. Notwithstanding the modelling results the conversion of Union Street to one-way northbound reduces network redundancy and significantly increases circulation distances to seek on-street parking. That is, there is sufficient distance between Union Street and Railway Street without an alternative north-south connection to suggest that it would be desirable to maintain Union Street as two way if possible.

7. RECOMMENDED NETWORKS AND FACILITIES

7.1 STREET NETWORK

The traffic modelling has demonstrated that the local street network has the capacity to accommodate the traffic generated by the master plan development whilst the proposed street network one-way system acts to minimise through traffic passing directly through the local area.

The recommended local street network is shown in Figure 7.1. The configuration has been designed to accommodate the following:

- minimise north-south and east-west traffic passing entirely through the master plan area, such that Albert Street (east-west) and Hannell Street (north-south) are continued to be relied upon to service these functions;
- facilitate local traffic circulation without the need to enter Hannell Street or Albert Street to re-enter the local network;
- with the level of congestion expected on Albert Street in the future, and particularly due to congestion at the Hannell Street roundabout, the alternative new route along the southern edge of Wickham Park provides for direct access from the west into the master plan area;
- a local area roundabout has been proposed at the intersection of Greenway Street and Foundry Street to avoid an uncontrolled four-way intersection, to discourage through traffic avoiding the Hannell/Albert roundabout, to manage circulating traffic and for speed management in this local area. The roundabout would need to be mountable to cater for current larger vehicle movements;
- The roundabout proposed at the Throsby Street/Railway Street intersection is for delineating the change in character of Railway Street proposed south of Throsby and to manage expected turning flows at this location (and circulation); and
- Signalisation of Albert Street / Railway Street better manages the movement of traffic to/from the master plan area given the likelihood of queues extending back from the Hannell Street roundabout along Albert Road in the future. It also introduces benefits for pedestrian and cyclist movement north-south across this intersection.

The typical configurations recommended for each street type are as follows:

Street type	Typical configuration
Primary access and circulation street	These streets will be line marked to delineate the separation between traffic and parking lanes. They will typically include 3.3 - 3.5m travel lanes plus bicycle lanes. Where commercial/retail facilities exist at ground level consideration of angled on street parking through localised street widening could be contemplated depending on block depths and the types of commercial uses at street level, as well as the incentive for developers to provide visitor parking at street level. These are 50 kph streets with footpaths on both sides.
Local access and circulation street	These streets are narrower than the primary access streets providing a more constrained driving environment where the design speed limit approaches 40kph. These streets are unmarked with parallel parking where possible and width permits. Footpaths are provided on at least one side.
Circulation lane way	These lanes-ways provide rear access to development sites but also provide circulation opportunities so that major roads do not need to be used for local traffic circulation.

Whilst not specifically a consequence of master plan development, the intersection of Branch Street / Hannell Street / Cowper Street North is a significant future constraint in the area, generating long queues and preventing the ease of egress from the study area in the PM peak, from both Albert Street and Throsby Street. Signalising this intersection would be expected to alleviate this key constraint.

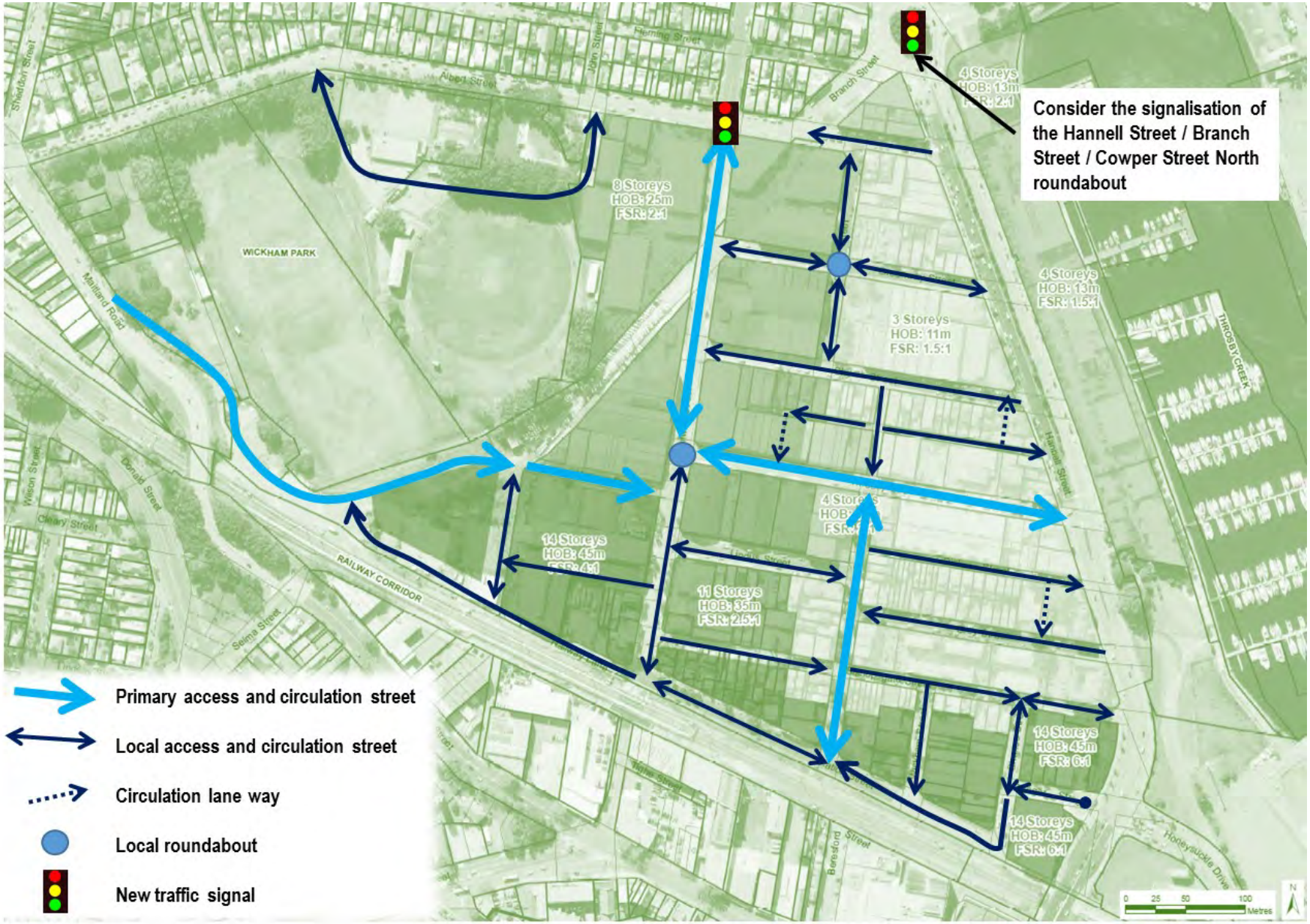


Figure 7.1: Recommended Street Network

7.2 PEDESTRIAN AND CYCLING ROUTES

Draft pedestrian and cycling facilities have been contemplated already by Council. Recommended modifications to these facilities have been provided in Figure 7.2.

Key recommended changes include:

- reinforcing the proposed off road cycle facility on Church Street by endeavouring to achieve a 2 metre wide facility;
- the inclusion of cycle lanes on the proposed key local traffic route of Union Street connecting to the Church Street route given the "directness" of these routes for key movements in the area and their connections to Railway Street and the Wickham Interchange;
- a pedestrian crossing point midway along Throsby Street and to the west of Union Street. A raised crossing in Throsby Street is not recommended given the traffic function of this street however kerbside blisters and a median-located pedestrian refuge would heighten the awareness of drivers to pedestrians and minimise crossing distances;
- the potential for north-south pedestrian links to evolve either side of Union Street due to the relatively long block sizes in these locations and the importance of the "directness" of connections between Wickham Interchange and the development areas to the north within the master plan area; and
- a shared path link between the eastern end of Station Street and the Honeysuckle/Hannell intersection. Whilst a pedestrian signal located adjacent to the light rail crossing of Hannell Street would be preferred (and should be discussed further with TfNSW), in lieu of this, this short connection provides for access across Hannell Street at the next closest opportunity.

The scale of development proposed in the area and the grid nature of streets means that there are no foreseen issues with pedestrian capacity on footpaths or at crossing points of roads. Key internal crossing points are likely to include across Station Street and across Throsby Street; both of which are very unlikely to have pedestrian volumes that would disrupt traffic, especially at Station Street where volume swill be low. The primary east-west crossing points will be at the Honeysuckle Drive and Throsby Street signalised intersections with Hannell Street where sufficient pedestrian facilities already exist.

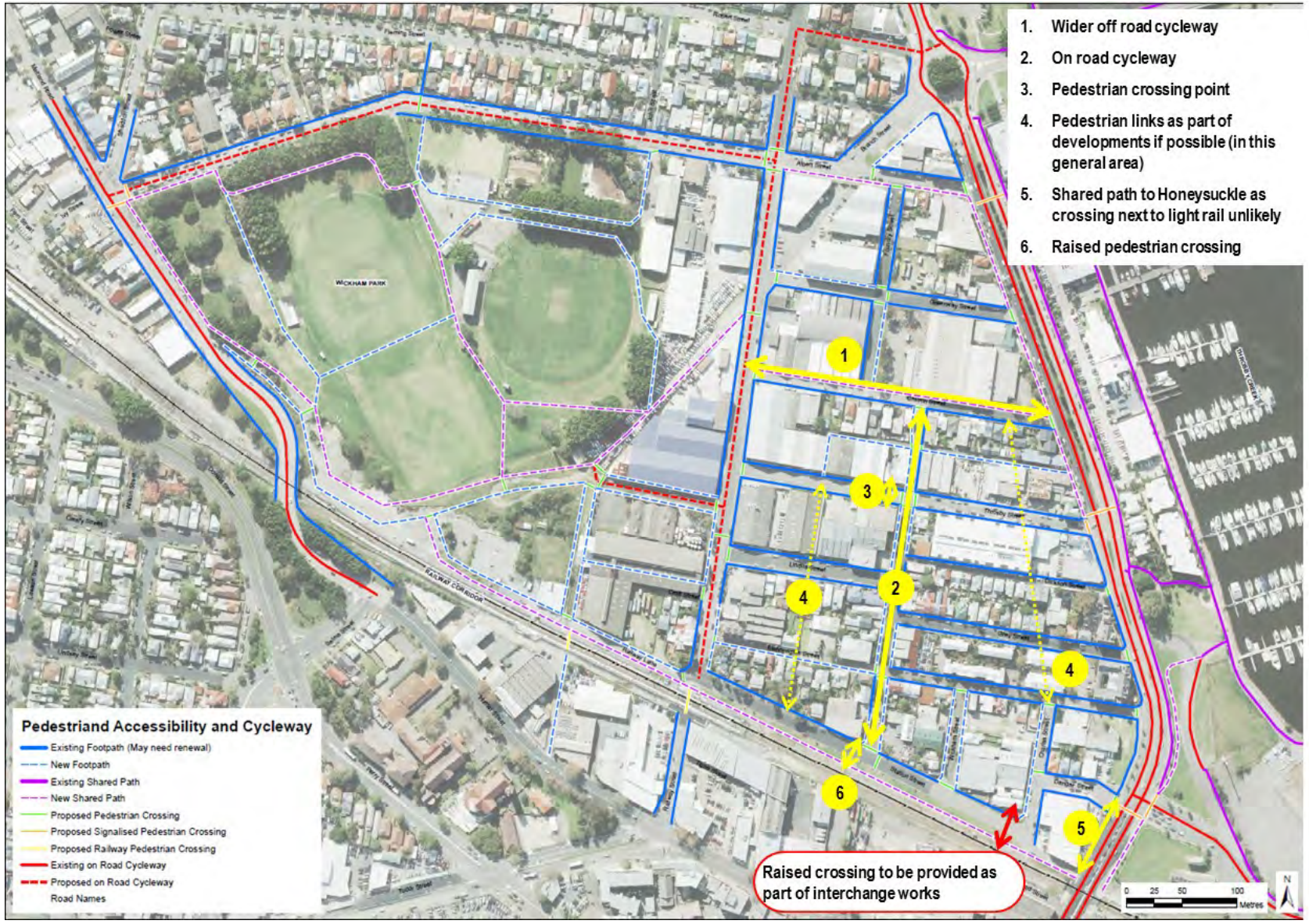


Figure 7.2: Recommended Footpath and Cycle Facility Amendments

7.3 PARKING

7.3.1 On street

Much of the Wickham master plan area is heavily parked during peak periods primarily due to the light industrial development in the area involving most of these sites occupied by building area and little off street parking. This means that a lot of the staff parking is occurring on street. Also, there have been observations of people parking in the study area and walking towards Honeysuckle Drive for access to office-based employment.

Figure 7.3 shows parking occupancy data from recent surveys for the area. By the middle of the day, the areas that are not "2P" are at their practical parking capacity, whilst there is still some capacity on the 2P areas, which is understandable give the nature of development in the study area.

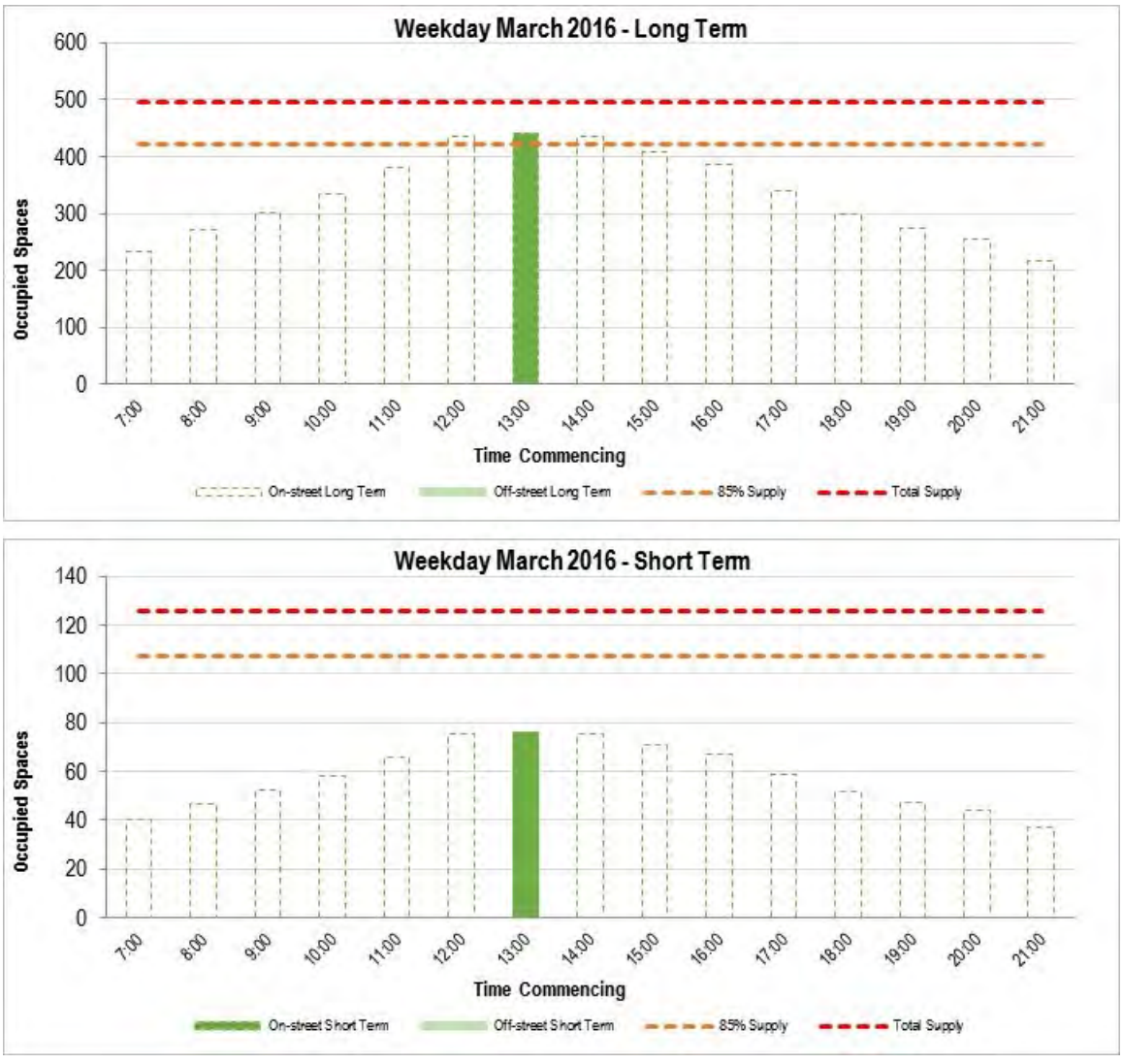


Figure 7.3: Parking Occupancy Levels in the Study Area

Upon opening of the Wickham Interchange, there is expected to be an exacerbation of these issues. Given the fees to park all day in the City Centre, it is conceivable that people working in the city centre could try and park for free in the Wickham Master Plan area and then use the light rail to commute into the city centre.

Further exacerbation of these issues is likely to occur over the 10-15 years of construction and transition that the study area is facing. Additional construction/trades-related vehicles plus the relocation of current on street all day parked vehicles to other areas as sites develop all suggest an emerging significance on street parking issue facing the Wickham Master Plan area.

Key strategies to address these issues considering the nature of the proposed land use in the master plan include:

- identify a suitable site or sites for a commercial off street car park to draw long term parking off local streets (see section 7.3.2);
- consider land dedication at the front of sites with retail office frontages to facilitate on street angled parking along the streets identified in Figure 7.4;
- maximise the quantity of parallel parking on "Local Access and Circulation" streets;
- consider a "5 minute" pick and drop off zone between Charles Street and Wickham Street;
- consider providing parking "pockets" along the new road through Wickham park to reinforce its local function and slow speed environment whilst providing alternative parking areas for park users; and
- further extend the 2P limits deeper into the master plan area when the Wickham Interchange is completed and development occurs.

Figure 7.4 shows the recommended parking strategy associated with the master plan.

7.3.2 Off Street Parking

There are existing on street parking capacity issues within the study area related to long term parking. In areas of high parking demand for on street space, long term/long stay parking should ideally be accommodated off road in individual developments or in a "communal" off street parking facility. Whilst an off street parking station may not be commercially viable yet in this area, there may be opportunities for Council to consider a partnering arrangement, given the inherent benefits to council in addressing current capacity issues. Also, the viability of commercial off street car parks is largely related to the availability of proximate on street parking and extension of 2P regulations further into the study area, as proposed in Section 7.3.1, would further increase the viability of a commercial off street car park. This would particularly be the case if the parking site was within proximity of Wickham Interchange.

Development within the master plan area is proposed to primarily comprise residential units with ground floor commercial/retail in some locations. Parking associated with this new development will therefore include:

- residents;
- visitors to residents;
- commercial/retail employees; and
- commercial/retail visitors.

Resident and Resident Visitor Parking

The proximity of the master plan area to the city centre and the Wickham Interchange suggests that development parking rates should work towards minimising on-site parking and encourage residents moving into this area to re-consider the number of private vehicles they use. The development parking rates in the current DCP for "renewal corridors" appear appropriate and are:

- Small (<75m^2 or 1 bedroom): average 0.6 spaces per dwelling;
- Medium (75m^2 - 100m^2 or 2 bedrooms: average 0.9 spaces per dwelling;
- Large (>100m^2 or 3 bedrooms): average 1.4 spaces per dwelling; and
- Visitor parking: 1 space for the first 3 dwellings plus 1 space for every 5 thereafter or part thereof.

Commercial/Retail Parking

The nature of commercial/retail tenancies in the study area are expected to be relatively small in floor area and parking demands will vary widely depending on the uses that evolve. The DCP rate of 1 space per 60 sqm of floor area appears appropriate however, should one or even two commercial off-street car parks be introduced along with more 2P restrictions on street to cater for visitors, then this rate could be reduced further to 1 per 100sqm over time.

The local parking policy/requirement could also require commercial development in the study area to provide a cash-in-lieu contribution for a centralised parking station within the study area, instead of on-site provision.

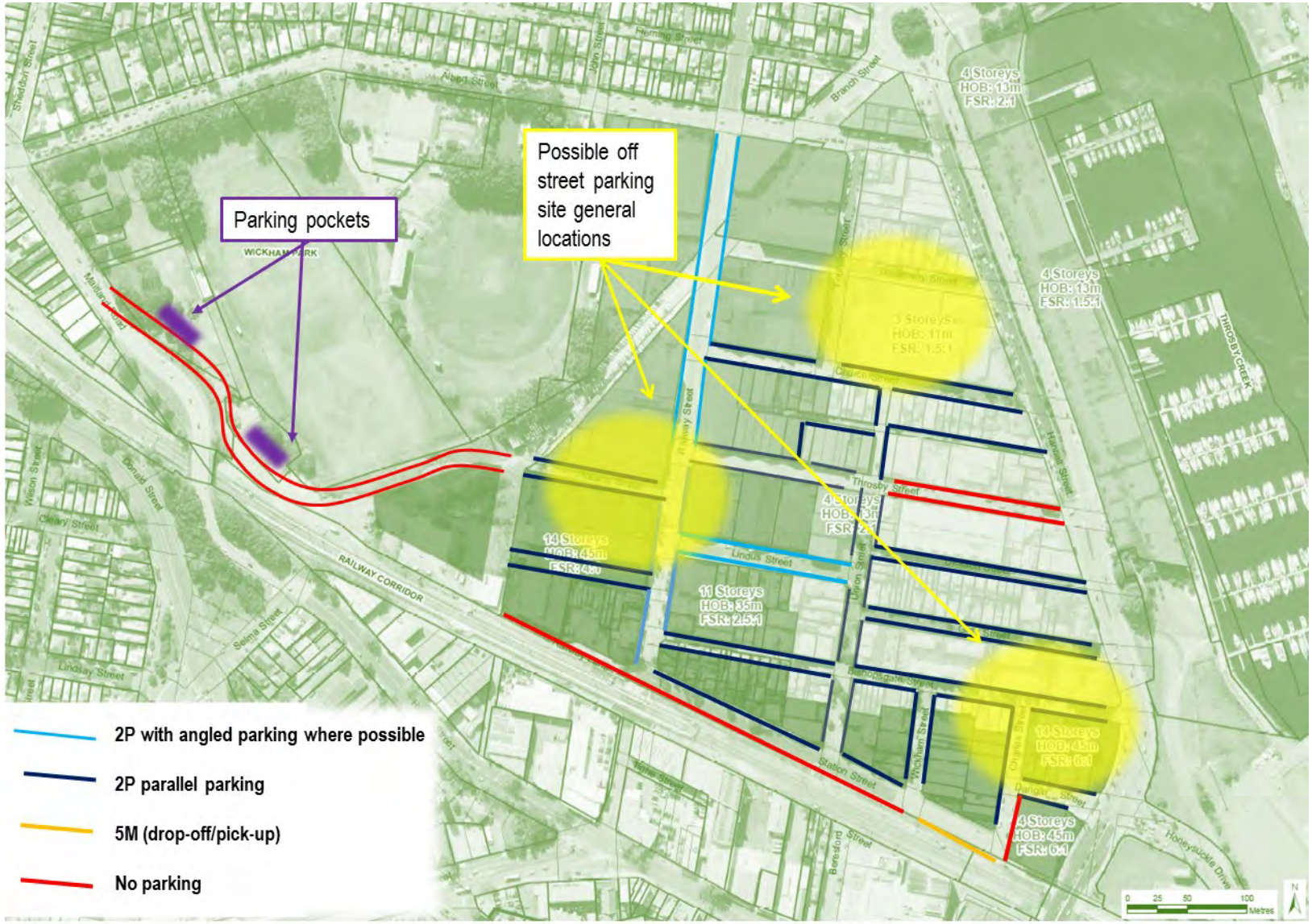


Figure 7.4: Recommended Parking Strategy

APPENDIX A

TRAFFIC SURVEY DATA

Site ID: 3

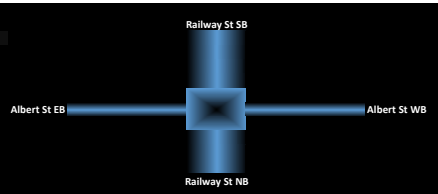
Location: Albert St & Railway St, Wickham

Date: 11-Oct-2016

Period 2 Time: 7:00 AM to 9:00 AM

Weather: Fine

Period 2 Peak Hour: 8:00 AM to 9:00 AM



TDC Traffic Data & Control

TOTALS AND PEAKS

Period 2 Total	10	2	0	0	11	2	0	8	6	2	0	1	0	0	0	0	5	106	7	6	2	304	28	1	13	30	2	0	0	0	0	0	0	2
Period 2 Peak Hr	6	1	0	0	8	0	0	7	3	1	0	0	0	0	0	0	0	49	4	1	2	176	21	1	10	21	2	0	0	0	0	0	0	0

Time Starting	Railway St SB	Railway St SB	Railway St SB	Railway St SB	Railway St SB	Railway St SB	Railway St SB	Railway St SB	Railway St SB	Railway St SB	Railway St SB	Railway St SB	Railway St SB	Railway St SB	Railway St SB	Railway St SB	Railway St SB	Albert St WB	Albert St WB	Albert St WB	Albert St WB	Albert St WB	Albert St WB	Albert St WB	Albert St WB	Albert St WB	Albert St WB	Albert St WB	Albert St WB	Albert St WB	Albert St WB	Albert St WB	Albert St WB
	Left	Left	Left	Left	Through	Through	Through	Through	Right	Right	Right	Right	U-turn	U-turn	U-turn	U-turn	Cross 1	Left	Left	Left	Left	Through	Through	Through	Through	Right	Right	Right	Right	U-turn	U-turn	U-turn	U-turn	Cross 1
	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Pedestrians	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Pedestrians
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08:45	1	0	0	0	5	0	0	2	2	1	0	0	0	0	0	0	0	13	0	1	1	51	6	1	5	4	0	0	0	0	0	0	0	0

TOTALS AND PEAKS

Period 1 Total	93	10	1	2	12	0	1	0	39	8	5	0	0	0	0	0	7	24	2	0	0	349	24	0	9	194	4	0	5	0	0	0	0	6
Period 1 Peak Hr	51	6	1	0	9	0	0	0	16	4	3	0	0	0	0	0	5	14	2	0	0	190	10	0	3	91	2	0	4	0	0	0	0	5

Time Starting	Railway St NB	Railway St NB	Railway St NB	Railway St NB	Railway St NB	Railway St NB	Railway St NB	Railway St NB	Railway St NB	Railway St NB	Railway St NB	Railway St NB	Railway St NB	Railway St NB	Railway St NB	Railway St NB	Railway St NB	Albert St EB	Albert St EB	Albert St EB	Albert St EB	Albert St EB	Albert St EB	Albert St EB	Albert St EB	Albert St EB	Albert St EB	Albert St EB	Albert St EB	Albert St EB	Albert St EB	Albert St EB	Albert St EB
	Left	Left	Left	Left	Through	Through	Through	Through	Right	Right	Right	Right	U-turn	U-turn	U-turn	U-turn	Cross 1	Left	Left	Left	Left	Through	Through	Through	Through	Right	Right	Right	Right	U-turn	U-turn	U-turn	U-turn	Cross 1
	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Pedestrians	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Pedestrians
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Site ID: 3

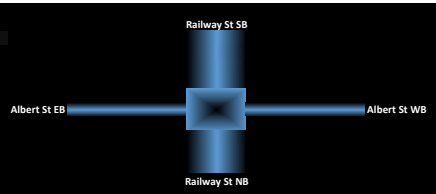
Location: Albert St & Railway St, Wickham

Date: 11-Oct-2016

Period 2 Time: 4:00 PM to 6:00 PM

Weather: Fine

Period 2 Peak Hour: 4:45 PM to 5:45 PM



TDC Traffic Data & Control

TOTALS AND PEAKS

Period 2 Total	17	1	0	0	17	1	0	0	19	1	0	0	0	0	0	0	5	82	2	0	1	413	6	0	10	14	0	0	3	2	0	0	0	3
Period 2 Peak Hr	14	0	0	0	13	0	0	0	7	0	0	0	0	0	0	0	3	44	0	0	1	230	3	0	4	6	0	0	2	1	0	0	0	2

Time Starting	Railway St SB	Railway St SB	Railway St SB	Railway St SB	Railway St SB	Railway St SB	Railway St SB	Railway St SB	Railway St SB	Railway St SB	Railway St SB	Railway St SB	Railway St SB	Railway St SB	Railway St SB	Railway St SB	Railway St SB	Albert St WB	Albert St WB	Albert St WB	Albert St WB	Albert St WB	Albert St WB	Albert St WB	Albert St WB	Albert St WB	Albert St WB	Albert St WB	Albert St WB	Albert St WB	Albert St WB	Albert St WB
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	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Pedestrians	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Pedestrians
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17:45	1	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	1	7	0	0	0	40	2	0	1	5	0	0	1	1	0	0	0	1

TOTALS AND PEAKS

Period 1 Total	205	10	0	5	23	0	0	2	103	6	1	0	0	0	0	0	11	17	2	0	1	317	7	0	2	137	7	0	1	0	0	0	0	5
Period 1 Peak Hr	113	3	0	3	14	0	0	2	57	5	0	0	0	0	0	0	5	7	0	0	1	158	3	0	2	78	5	0	1	0	0	0	0	2

Time Starting	Railway St NB	Railway St NB	Railway St NB	Railway St NB	Railway St NB	Railway St NB	Railway St NB	Railway St NB	Railway St NB	Railway St NB	Railway St NB	Railway St NB	Railway St NB	Railway St NB	Railway St NB	Railway St NB	Railway St NB	Albert St EB	Albert St EB	Albert St EB	Albert St EB	Albert St EB	Albert St EB	Albert St EB	Albert St EB	Albert St EB	Albert St EB	Albert St EB	Albert St EB	Albert St EB	Albert St EB	Albert St EB
	Left	Left	Left	Left	Through	Through	Through	Through	Right	Right	Right	Right	U-turn	U-turn	U-turn	U-turn	Cross 1	Left	Left	Left	Left	Through	Through	Through	Through	Right	Right	Right	Right	U-turn	U-turn	U-turn	Cross 1
	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Pedestrians	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Pedestrians
16:00	32	3	0	1	3	0	0	0	13	0	0	0	0	0	0	0	3	4	0	0	0	38	1	0	0	20	1	0	0	0	0	0	0	0
16:15	19	3	0	0	1	0	0	0	13	1	1	0	0	0	0	0	0	1	1	0	0	44	0	0	0	17	0	0	0	0	0	0	0	0
16:30	21	1	0	1	3	0	0	0	10	0	0	0	0	0	0	0	3	1	1	0	0	37	2	0	0	11	1	0	0	0	0	0	0	2
16:45	19	1	0	1	3	0	0	0	6	0	0	0	0	0	0	0	1	2	0	0	0	33	1	0	0	22	1	0	0	0	0	0	0	0
17:00	41	0	0	2	8	0	0	0	24	4	0	0	0	0	0	0	3	1	0	0	0	48	1	0	1	25	0	0	1	0	0	0	0	0
17:15	25	1	0	0	1	0	0	0	13	0	0	0	0	0	0	0	0	2	0	0	1	41	0	0	1	17	4	0	0	0	0	0	0	1
17:30	28	1	0	0	2	0	0	2	14	1	0	0	0	0	0	0	1	2	0	0	0	36	1	0	0	14	0	0	0	0	0	0	0	1
17:45	20	0	0	0	2	0	0	0	10	0	0	0	0	0	0	0	0	4	0	0	0	40	1	0	0	11	0	0	0	0	0	0	0	1

Site ID: 4

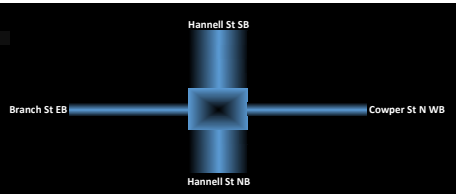
Location: Hannell St & Branch St/Cowper St N, Wickham

Date: 11-Oct-2016

Period 2 Time: 7:00 AM to 9:00 AM

Weather: Fine

Period 2 Peak Hour: 7:45 AM to 8:45 AM



TDC Traffic Data & Control

TOTALS AND PEAKS

	Hannell St SB																															
	Left				Through				Right				U-turn				Cross 1	Left				Through				Right				U-turn				Cross 1
	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Pedestrians	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Pedestrians
Period 2 Total	106	9	3	1	1435	52	14	11	1288	38	9	5	0	0	0	0	0	327	11	4	2	157	8	0	3	96	7	4	1	0	0	0	0	0
Period 2 Peak Hr	49	3	1	0	796	23	5	6	742	28	1	4	0	0	0	0	0	187	7	2	1	86	2	0	3	44	0	0	1	0	0	0	0	0
Time Starting																																		
07:00	20	1	2	1	124	8	4	0	86	1	4	0	0	0	0	0	0	29	1	0	0	14	1	0	0	16	3	0	0	0	0	0	0	0
07:15	20	3	0	0	129	7	1	1	105	3	1	0	0	0	0	0	0	30	2	2	0	16	2	0	0	8	2	0	0	0	0	0	0	0
07:30	5	0	0	0	171	10	1	2	150	3	3	0	0	0	0	0	0	43	1	0	0	12	1	0	0	18	2	3	0	0	0	0	0	0
07:45	16	0	1	0	204	3	0	1	186	6	0	0	0	0	0	0	0	34	2	2	0	20	0	0	0	9	0	0	0	0	0	0	0	0
08:00	11	1	0	0	191	4	3	1	189	9	0	0	0	0	0	0	0	49	1	0	0	21	1	0	1	9	0	0	1	0	0	0	0	0
08:15	13	0	0	0	202	7	1	2	197	2	0	0	0	0	0	0	0	54	3	0	1	22	1	0	2	10	0	0	0	0	0	0	0	0
08:30	9	2	0	0	199	9	1	2	170	11	1	4	0	0	0	0	0	50	1	0	0	23	0	0	0	16	0	0	0	0	0	0	0	0
08:45	12	2	0	0	215	4	3	2	205	3	0	1	0	0	0	0	0	38	0	0	1	29	2	0	0	10	0	1	0	0	0	0	0	0

TOTALS AND PEAKS

	Hannell St NB																															
	Left				Through				Right				U-turn				Cross 1	Left				Through				Right				U-turn				Cross 1
	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Pedestrians	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Pedestrians
Period 1 Total	19	1	1	2	2084	57	18	6	467	8	5	0	0	0	0	0	0	166	17	6	5	22	4	1	7	271	11	0	0	0	0	0	0	0
Period 1 Peak Hr	12	0	0	0	1092	29	14	3	214	5	2	0	0	0	0	0	0	94	10	5	1	15	2	1	5	146	4	0	0	0	0	0	0	0
Time Starting																																		
07:00	1	0	0	1	226	4	0	1	65	0	0	0	0	0	0	0	0	17	3	0	4	2	0	0	0	36	1	0	0	0	0	0	0	0
07:15	3	0	0	1	255	6	1	1	65	2	0	0	0	0	0	0	0	19	2	0	0	1	2	0	2	21	1	0	0	0	0	0	0	0
07:30	2	0	0	0	279	9	3	0	59	0	0	0	0	0	0	0	0	19	1	1	0	1	0	0	0	34	1	0	0	0	0	0	0	0
07:45	2	0	0	0	315	8	4	2	53	0	0	0	0	0	0	0	0	23	2	2	1	4	1	0	0	41	3	0	0	0	0	0	0	0
08:00	4	0	0	0	287	6	4	0	48	0	0	0	0	0	0	0	0	22	3	2	0	2	0	0	1	34	0	0	0	0	0	0	0	0
08:15	3	0	0	0	252	8	3	0	55	2	1	0	0	0	0	0	0	25	2	1	0	4	1	1	2	31	0	0	0	0	0	0	0	0
08:30	3	0	0	0	238	7	3	1	58	3	1	0	0	0	0	0	0	24	3	0	0	5	0	0	2	40	1	0	0	0	0	0	0	0
08:45	1	1	1	0	232	9	0	1	64	1	3	0	0	0	0	0	0	17	1	0	0	3	0	0	0	34	4	0	0	0	0	0	0	0

Site ID: 4

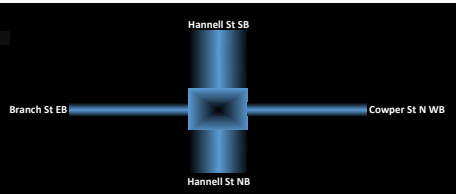
Location: Hannell St & Branch St/Cowper St N, Wickham

Date: 11-Oct-2016

Period 2 Time: 4:00 PM to 6:00 PM

Weather: Fine

Period 2 Peak Hour: 4:15 PM to 5:15 PM



TDC Traffic Data & Control

TOTALS AND PEAKS

Period 2 Total	58	8	2	1	1361	17	1	4	1187	10	6	0	0	0	0	0	0	372	4	0	3	163	3	0	2	123	3	1	1	0	0	0	0	0
Period 2 Peak Hr	26	3	2	1	659	12	1	2	613	6	2	0	0	0	0	0	0	188	4	0	2	85	1	0	0	60	1	1	1	0	0	0	0	0

	Hannell St SB	Hannell St SB	Hannell St SB	Hannell St SB	Hannell St SB	Hannell St SB	Hannell St SB	Hannell St SB	Hannell St SB	Hannell St SB	Hannell St SB	Hannell St SB	Hannell St SB	Hannell St SB	Hannell St SB	Hannell St SB	Hannell St SB	Cowper St N WB	Cowper St N WB	Cowper St N WB	Cowper St N WB	Cowper St N WB	Cowper St N WB	Cowper St N WB	Cowper St N WB	Cowper St N WB	Cowper St N WB	Cowper St N WB	Cowper St N WB	Cowper St N WB	Cowper St N WB	Cowper St N WB
	Left	Left	Left	Left	Through	Through	Through	Through	Right	Right	Right	Right	U-turn	U-turn	U-turn	U-turn	Cross 1	Left	Left	Left	Left	Through	Through	Through	Through	Right	Right	Right	Right	U-turn	U-turn	U-turn	U-turn	Cross 1
Time Starting	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Pedestrians	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Pedestrians
16:00	5	1	0	0	181	3	0	0	158	2	4	0	0	0	0	0	0	82	0	0	1	20	1	0	0	29	2	0	0	0	0	0	0	0
16:15	6	1	0	0	170	5	1	0	159	3	0	0	0	0	0	0	0	50	1	0	0	17	0	0	0	19	1	0	0	0	0	0	0	0
16:30	3	2	1	0	157	3	0	0	156	2	1	0	0	0	0	0	0	51	2	0	0	19	0	0	0	18	0	0	1	0	0	0	0	0
16:45	7	0	1	0	159	2	0	1	156	0	0	0	0	0	0	0	0	49	0	0	1	33	1	0	0	12	0	0	0	0	0	0	0	0
17:00	10	0	0	1	173	2	0	1	142	1	1	0	0	0	0	0	0	38	1	0	1	16	0	0	0	11	0	1	0	0	0	0	0	0
17:15	12	0	0	0	160	0	0	2	145	2	0	0	0	0	0	0	0	23	0	0	0	20	0	0	2	10	0	0	0	0	0	0	0	0
17:30	13	2	0	0	169	1	0	0	132	0	0	0	0	0	0	0	0	40	0	0	0	22	0	0	0	17	0	0	0	0	0	0	0	0
17:45	2	2	0	0	192	1	0	0	139	0	0	0	0	0	0	0	0	39	0	0	0	16	1	0	0	7	0	0	0	0	0	0	0	0

TOTALS AND PEAKS

Period 1 Total	22	0	0	1	2654	30	5	14	544	7	0	0	0	0	0	0	0	231	8	2	0	12	3	0	1	288	2	0	0	0	0	0	0	0
Period 1 Peak Hr	12	0	0	1	1387	13	3	5	275	3	0	0	0	0	0	0	0	128	7	1	0	9	1	0	0	145	1	0	0	0	0	0	0	0

	Hannell St NB	Hannell St NB	Hannell St NB	Hannell St NB	Hannell St NB	Hannell St NB	Hannell St NB	Hannell St NB	Hannell St NB	Hannell St NB	Hannell St NB	Hannell St NB	Hannell St NB	Hannell St NB	Hannell St NB	Hannell St NB	Hannell St NB	Branch St EB	Branch St EB	Branch St EB	Branch St EB	Branch St EB	Branch St EB	Branch St EB	Branch St EB	Branch St EB	Branch St EB	Branch St EB	Branch St EB	Branch St EB	Branch St EB	Branch St EB
	Left	Left	Left	Left	Through	Through	Through	Through	Right	Right	Right	Right	U-turn	U-turn	U-turn	U-turn	Cross 1	Left	Left	Left	Left	Through	Through	Through	Through	Right	Right	Right	Right	U-turn	U-turn	U-turn	U-turn	Cross 1
Time Starting	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Pedestrians	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Pedestrians
16:00	5	0	0	0	283	11	1	1	53	2	0	0	0	0	0	0	0	25	0	1	0	0	0	0	0	38	1	0	0	0	0	0	0	0
16:15	5	0	0	1	351	6	2	1	61	1	0	0	0	0	0	0	0	31	0	0	0	4	0	0	0	32	0	0	0	0	0	0	0	0
16:30	2	0	0	0	335	2	1	0	58	2	0	0	0	0	0	0	0	24	2	1	0	0	0	0	0	43	1	0	0	0	0	0	0	0
16:45	3	0	0	0	326	1	0	0	82	0	0	0	0	0	0	0	0	20	0	0	0	0	1	0	0	23	0	0	0	0	0	0	0	0
17:00	2	0	0	0	375	4	0	4	74	0	0	0	0	0	0	0	0	53	5	0	0	5	0	0	0	47	0	0	0	0	0	0	0	0
17:15	0	0	0	0	346	3	0	3	78	1	0	0	0	0	0	0	0	30	0	0	0	0	0	0	0	35	0	0	0	0	0	0	0	0
17:30	0	0	0	0	357	2	0	2	77	1	0	0	0	0	0	0	0	24	1	0	0	2	2	0	1	43	0	0	0	0	0	0	0	0
17:45	5	0	0	0	281	1	1	3	61	0	0	0	0	0	0	0	0	24	0	0	0	1	0	0	0	27	0	0	0	0	0	0	0	0

Site ID: 5

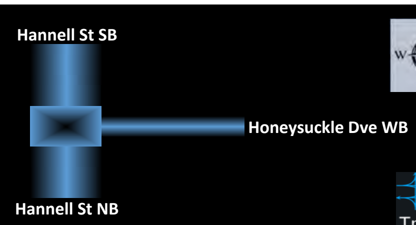
Location: Hannell St & Honeysuckle Dve, Wickham

Date: 11-Oct-2016

Period 1 Time: 7:00 AM to 9:00 AM

Weather: Fine

Period 1 Peak Hour: 7:45 AM to 8:45 AM



Traffic Data & Control

TOTALS AND PEAKS

Time Starting	Hannell St SB Left Light Vehicles	Hannell St SB Left Light Trucks (3-5)	Hannell St SB Left Heavy Trucks (6-12)	Hannell St SB Left Bicycles on Road	Hannell St SB Through Light Vehicles	Hannell St SB Through Light Trucks (3-5)	Hannell St SB Through Heavy Trucks (6-12)	Hannell St SB Through Bicycles on Road	Hannell St SB U-turn Light Vehicles	Hannell St SB U-turn Light Trucks (3-5)	Hannell St SB U-turn Heavy Trucks (6-12)	Hannell St SB U-turn Bicycles on Road	Hannell St SB Cross 1 Pedestrians
Period 1 Total	1037	8	3	0	1890	67	15	0	0	0	0	0	0
Period 1 Peak Hr	627	5	0	0	1033	34	6	0	0	0	0	0	0
07:00	65	1	0	0	191	9	6	0	0	0	0	0	0
07:15	74	0	2	0	150	14	1	0	0	0	0	0	0
07:30	118	0	1	0	215	5	2	0	0	0	0	0	0
07:45	177	1	0	0	241	7	1	0	0	0	0	0	0
08:00	132	0	0	0	247	6	1	0	0	0	0	0	0
08:15	165	3	0	0	272	9	2	0	0	0	0	0	0
08:30	153	1	0	0	273	12	2	0	0	0	0	0	0
08:45	153	2	0	0	301	5	0	0	0	0	0	0	0

Time Starting	Honeysuckle Dve WB Left Light Vehicles	Honeysuckle Dve WB Left Light Trucks (3-5)	Honeysuckle Dve WB Left Heavy Trucks (6-12)	Honeysuckle Dve WB Left Bicycles on Road	Honeysuckle Dve WB Right Light Vehicles	Honeysuckle Dve WB Right Light Trucks (3-5)	Honeysuckle Dve WB Right Heavy Trucks (6-12)	Honeysuckle Dve WB Right Bicycles on Road	Honeysuckle Dve WB U-turn Light Vehicles	Honeysuckle Dve WB U-turn Light Trucks (3-5)	Honeysuckle Dve WB U-turn Heavy Trucks (6-12)	Honeysuckle Dve WB U-turn Bicycles on Road	Honeysuckle Dve WB Cross 1 Pedestrians
Period 1 Total	184	13	1	1	587	17	3	2	0	0	0	0	51
Period 1 Peak Hr	104	5	1	0	309	8	3	1	0	0	0	0	37
07:00	12	0	0	0	57	2	0	0	0	0	0	0	0
07:15	17	3	0	0	75	0	0	0	0	0	0	0	4
07:30	20	3	0	1	84	3	0	0	0	0	0	0	3
07:45	19	0	1	0	76	0	1	0	0	0	0	0	8
08:00	26	2	0	0	84	3	0	0	0	0	0	0	3
08:15	20	0	0	0	65	4	1	1	0	0	0	0	17
08:30	39	3	0	0	84	1	1	0	0	0	0	0	9
08:45	31	2	0	0	62	4	0	1	0	0	0	0	7

Time Starting	Hannell St NB Through Light Vehicles	Hannell St NB Through Light Trucks (3-5)	Hannell St NB Through Heavy Trucks (6-12)	Hannell St NB Through Bicycles on Road	Hannell St NB Right Light Vehicles	Hannell St NB Right Light Trucks (3-5)	Hannell St NB Right Heavy Trucks (6-12)	Hannell St NB Right Bicycles on Road	Hannell St NB U-turn Light Vehicles	Hannell St NB U-turn Light Trucks (3-5)	Hannell St NB U-turn Heavy Trucks (6-12)	Hannell St NB U-turn Bicycles on Road	Hannell St NB Cross 1 Pedestrians
Period 1 Total	2179	83	13	3	809	7	1	5	1	0	0	0	73
Period 1 Peak Hr	1080	46	6	1	476	2	0	1	1	0	0	0	55
07:00	256	7	0	1	50	2	0	2	0	0	0	0	3
07:15	273	10	1	1	82	3	0	0	0	0	0	0	2
07:30	293	10	1	0	98	0	1	0	0	0	0	0	9
07:45	323	7	0	1	121	1	0	1	1	0	0	0	15
08:00	265	9	2	0	123	0	0	0	0	0	0	0	14
08:15	246	16	3	0	112	0	0	0	0	0	0	0	15
08:30	246	14	1	0	120	1	0	0	0	0	0	0	11
08:45	277	10	5	0	103	0	0	2	0	0	0	0	4

Site ID: 5

Location: Hannell St & Honeysuckle Dve, Wickham

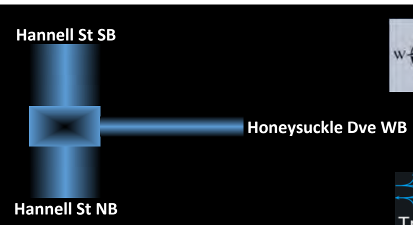
Date: 11-Oct-2016

Period 2 Time: 4:00 PM to 6:00 PM

Weather: Fine

Period 2 Peak Hour: 4:45 PM to 5:45 PM

Comment - Camera turned away from intersection between 4:00pm & 4:08pm



TDC Traffic Data & Control

TOTALS AND PEAKS

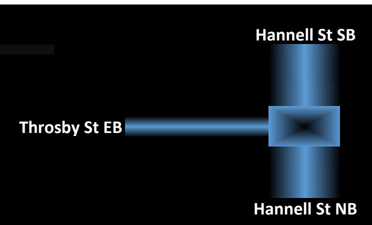
Time Starting	Hannell St SB Left Light Vehicles	Hannell St SB Left Light Trucks (3-5)	Hannell St SB Left Heavy Trucks (6-12)	Hannell St SB Left Bicycles on Road	Hannell St SB Through Light Vehicles	Hannell St SB Through Light Trucks (3-5)	Hannell St SB Through Heavy Trucks (6-12)	Hannell St SB Through Bicycles on Road	Hannell St SB U-turn Light Vehicles	Hannell St SB U-turn Light Trucks (3-5)	Hannell St SB U-turn Heavy Trucks (6-12)	Hannell St SB U-turn Bicycles on Road	Hannell St SB Cross 1 Pedestrians
Period 2 Total	788	11	2	2	2137	19	0	7	0	0	0	0	0
Period 2 Peak Hr	427	5	1	2	1089	5	0	6	0	0	0	0	0
16:00	30	0	0	0	134	0	0	0	0	0	0	0	0
16:15	117	4	1	0	310	8	0	0	0	0	0	0	0
16:30	98	1	0	0	315	5	0	1	0	0	0	0	0
16:45	103	2	1	2	280	2	0	0	0	0	0	0	0
17:00	75	2	0	0	280	1	0	0	0	0	0	0	0
17:15	138	1	0	0	254	2	0	4	0	0	0	0	0
17:30	111	0	0	0	275	0	0	2	0	0	0	0	0
17:45	116	1	0	0	289	1	0	0	0	0	0	0	0

Time Starting	Honeysuckle Dve Left Light Vehicles	Honeysuckle Dve Left Light Trucks (3-5)	Honeysuckle Dve Left Heavy Trucks (6-12)	Honeysuckle Dve Left Bicycles on Road	Honeysuckle Dve Right Light Vehicles	Honeysuckle Dve Right Light Trucks (3-5)	Honeysuckle Dve Right Heavy Trucks (6-12)	Honeysuckle Dve Right Bicycles on Road	Honeysuckle Dve U-turn Light Vehicles	Honeysuckle Dve U-turn Light Trucks (3-5)	Honeysuckle Dve U-turn Heavy Trucks (6-12)	Honeysuckle Dve U-turn Bicycles on Road	Honeysuckle Dve Cross 1 Pedestrians
Period 2 Total	611	2	0	2	1029	15	0	9	0	0	0	0	30
Period 2 Peak Hr	365	0	0	1	613	7	0	5	0	0	0	0	21
16:00	43	0	0	1	51	1	0	1	0	0	0	0	2
16:15	74	1	0	0	139	3	0	1	0	0	0	0	2
16:30	68	1	0	0	127	2	0	0	0	0	0	0	4
16:45	79	0	0	0	145	2	0	0	0	0	0	0	4
17:00	122	0	0	0	149	1	0	2	0	0	0	0	3
17:15	90	0	0	0	147	4	0	1	0	0	0	0	7
17:30	74	0	0	1	172	0	0	2	0	0	0	0	7
17:45	61	0	0	0	99	2	0	2	0	0	0	0	1

Time Starting	Hannell St NB Through Light Vehicles	Hannell St NB Through Light Trucks (3-5)	Hannell St NB Through Heavy Trucks (6-12)	Hannell St NB Through Bicycles on Road	Hannell St NB Right Light Vehicles	Hannell St NB Right Light Trucks (3-5)	Hannell St NB Right Heavy Trucks (6-12)	Hannell St NB Right Bicycles on Road	Hannell St NB U-turn Light Vehicles	Hannell St NB U-turn Light Trucks (3-5)	Hannell St NB U-turn Heavy Trucks (6-12)	Hannell St NB U-turn Bicycles on Road	Hannell St NB Cross 1 Pedestrians
Period 2 Total	2135	22	4	5	390	15	0	1	0	0	0	0	86
Period 2 Peak Hr	1228	9	1	4	248	4	0	0	0	0	0	0	57
16:00	125	2	0	0	13	1	0	0	0	0	0	0	9
16:15	265	8	2	0	27	4	0	0	0	0	0	0	9
16:30	263	2	0	0	34	6	0	1	0	0	0	0	4
16:45	280	4	1	1	47	2	0	0	0	0	0	0	13
17:00	334	1	0	1	61	1	0	0	0	0	0	0	28
17:15	327	4	0	1	44	0	0	0	0	0	0	0	7
17:30	287	0	0	1	96	1	0	0	0	0	0	0	9
17:45	254	1	1	1	68	0	0	0	0	0	0	0	7

Site ID: 6
Location: Hannell St & Throsby St, Wickham
Date: 11-Oct-2016
Period 1 Time: 7:00 AM to 9:00 AM
Weather: Fine

Period 1 Peak Hour: 8:00 AM to 9:00 AM



TDC Traffic Data & Control

TOTALS AND PEAKS

Time Starting	Hannell St SB Through Light Vehicles	Hannell St SB Through Light Trucks (3-5)	Hannell St SB Through Heavy Trucks (6-12)	Hannell St SB Through Bicycles on Road	Hannell St SB Right Light Vehicles	Hannell St SB Right Light Trucks (3-5)	Hannell St SB Right Heavy Trucks (6-12)	Hannell St SB Right Bicycles on Road	Hannell St SB U-turn Light Vehicles	Hannell St SB U-turn Light Trucks (3-5)	Hannell St SB U-turn Heavy Trucks (6-12)	Hannell St SB U-turn Bicycles on Road	Hannell St SB Cross 1 Pedestrians
Period 1 Total	2914	103	15	8	61	1	2	0	0	0	0	0	88
Period 1 Peak Hr	1734	53	5	4	33	0	1	0	0	0	0	0	54
07:00	241	14	6	1	3	0	0	0	0	0	0	0	3
07:15	226	13	1	1	6	0	0	0	0	0	0	0	7
07:30	314	13	2	2	10	0	0	0	0	0	0	0	8
07:45	399	10	1	0	9	1	1	0	0	0	0	0	16
08:00	398	13	1	1	3	0	1	0	0	0	0	0	20
08:15	406	11	2	0	12	0	0	0	0	0	0	0	17
08:30	451	21	2	0	9	0	0	0	0	0	0	0	8
08:45	479	8	0	3	9	0	0	0	0	0	0	0	9

Time Starting	Hannell St NB Left Light Vehicles	Hannell St NB Left Light Trucks (3-5)	Hannell St NB Left Heavy Trucks (6-12)	Hannell St NB Left Bicycles on Road	Hannell St NB Through Light Vehicles	Hannell St NB Through Light Trucks (3-5)	Hannell St NB Through Heavy Trucks (6-12)	Hannell St NB Through Bicycles on Road	Hannell St NB U-turn Light Vehicles	Hannell St NB U-turn Light Trucks (3-5)	Hannell St NB U-turn Heavy Trucks (6-12)	Hannell St NB U-turn Bicycles on Road	Hannell St NB Cross 1 Pedestrians
Period 1 Total	81	1	0	0	2604	82	10	7	0	0	0	0	5
Period 1 Peak Hr	45	0	0	0	1261	51	6	5	0	0	0	0	5
07:00	9	0	0	0	299	5	0	1	0	0	0	0	0
07:15	10	0	0	0	317	8	1	0	0	0	0	0	0
07:30	8	0	0	0	355	9	2	0	0	0	0	0	0
07:45	9	1	0	0	372	9	1	1	0	0	0	0	0
08:00	9	0	0	0	337	9	0	1	0	0	0	0	2
08:15	10	0	0	0	306	14	3	0	0	0	0	0	0
08:30	15	0	0	0	299	16	0	2	0	0	0	0	2
08:45	11	0	0	0	319	12	3	2	0	0	0	0	1

Time Starting	Throsby St EB Left Light Vehicles	Throsby St EB Left Light Trucks (3-5)	Throsby St EB Left Heavy Trucks (6-12)	Throsby St EB Left Bicycles on Road	Throsby St EB Right Light Vehicles	Throsby St EB Right Light Trucks (3-5)	Throsby St EB Right Heavy Trucks (6-12)	Throsby St EB Right Bicycles on Road	Throsby St EB U-turn Light Vehicles	Throsby St EB U-turn Light Trucks (3-5)	Throsby St EB U-turn Heavy Trucks (6-12)	Throsby St EB U-turn Bicycles on Road	Throsby St EB Cross 1 Pedestrians
Period 1 Total	48	1	0	0	120	0	0	2	0	0	0	0	17
Period 1 Peak Hr	22	0	0	0	67	0	0	1	0	0	0	0	5
07:00	5	0	0	0	13	0	0	1	0	0	0	0	4
07:15	6	0	0	0	9	0	0	0	0	0	0	0	2
07:30	7	0	0	0	13	0	0	0	0	0	0	0	2
07:45	8	1	0	0	18	0	0	0	0	0	0	0	4
08:00	10	0	0	0	16	0	0	0	0	0	0	0	1
08:15	3	0	0	0	21	0	0	0	0	0	0	0	1
08:30	3	0	0	0	16	0	0	1	0	0	0	0	1
08:45	6	0	0	0	14	0	0	0	0	0	0	0	2

Site ID: 6

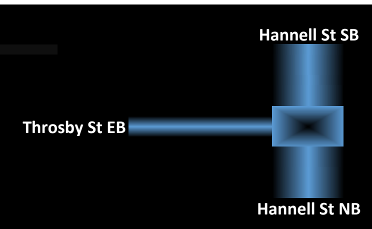
Location: Hannell St & Throsby St, Wickham

Date: 11-Oct-2016

Period 2 Time: 4:00 PM to 6:00 PM

Weather: Fine

Period 2 Peak Hour: 4:45 PM to 5:45 PM



TDC Traffic Data & Control

TOTALS AND PEAKS

Time Starting	Hannell St SB Through Light Vehicles	Hannell St SB Through Light Trucks (3-5)	Hannell St SB Through Heavy Trucks (6-12)	Hannell St SB Through Bicycles on Road	Hannell St SB Right Light Vehicles	Hannell St SB Right Light Trucks (3-5)	Hannell St SB Right Heavy Trucks (6-12)	Hannell St SB Right Bicycles on Road	Hannell St SB U-turn Light Vehicles	Hannell St SB U-turn Light Trucks (3-5)	Hannell St SB U-turn Heavy Trucks (6-12)	Hannell St SB U-turn Bicycles on Road	Hannell St SB Cross 1 Pedestrians
Period 2 Total	2926	21	0	7	95	0	1	1	2	0	0	0	111
Period 2 Peak Hr	1414	10	0	6	57	0	0	0	0	0	0	0	70
16:00	391	1	0	1	7	0	0	1	1	0	0	0	7
16:15	374	5	0	0	13	0	1	0	0	0	0	0	12
16:30	384	4	0	0	12	0	0	0	0	0	0	0	10
16:45	357	4	0	2	10	0	0	0	0	0	0	0	23
17:00	332	1	0	0	9	0	0	0	0	0	0	0	17
17:15	371	4	0	4	19	0	0	0	0	0	0	0	16
17:30	354	1	0	0	19	0	0	0	0	0	0	0	14
17:45	363	1	0	0	6	0	0	0	1	0	0	0	12

Time Starting	Hannell St NB Left Light Vehicles	Hannell St NB Left Light Trucks (3-5)	Hannell St NB Left Heavy Trucks (6-12)	Hannell St NB Left Bicycles on Road	Hannell St NB Through Light Vehicles	Hannell St NB Through Light Trucks (3-5)	Hannell St NB Through Heavy Trucks (6-12)	Hannell St NB Through Bicycles on Road	Hannell St NB U-turn Light Vehicles	Hannell St NB U-turn Light Trucks (3-5)	Hannell St NB U-turn Heavy Trucks (6-12)	Hannell St NB U-turn Bicycles on Road	Hannell St NB Cross 1 Pedestrians
Period 2 Total	85	5	0	0	3182	34	3	0	0	0	0	0	2
Period 2 Peak Hr	48	2	0	0	1764	12	0	0	0	0	0	0	1
16:00	8	2	0	0	329	9	0	0	0	0	0	0	0
16:15	4	1	0	0	377	9	1	0	0	0	0	0	0
16:30	12	0	0	0	377	4	0	0	0	0	0	0	1
16:45	5	2	0	0	400	1	0	0	0	0	0	0	0
17:00	5	0	0	0	468	5	0	0	0	0	0	0	0
17:15	23	0	0	0	439	4	0	0	0	0	0	0	1
17:30	15	0	0	0	457	2	0	0	0	0	0	0	0
17:45	13	0	0	0	335	0	2	0	0	0	0	0	0

Time Starting	Throsby St EB Left Light Vehicles	Throsby St EB Left Light Trucks (3-5)	Throsby St EB Left Heavy Trucks (6-12)	Throsby St EB Left Bicycles on Road	Throsby St EB Right Light Vehicles	Throsby St EB Right Light Trucks (3-5)	Throsby St EB Right Heavy Trucks (6-12)	Throsby St EB Right Bicycles on Road	Throsby St EB U-turn Light Vehicles	Throsby St EB U-turn Light Trucks (3-5)	Throsby St EB U-turn Heavy Trucks (6-12)	Throsby St EB U-turn Bicycles on Road	Throsby St EB Cross 1 Pedestrians
Period 2 Total	76	2	0	0	249	7	0	2	0	0	0	0	46
Period 2 Peak Hr	42	0	0	0	136	5	0	1	0	0	0	0	28
16:00	9	2	0	0	36	0	0	0	0	0	0	0	4
16:15	9	0	0	0	31	0	0	1	0	0	0	0	4
16:30	11	0	0	0	21	1	0	0	0	0	0	0	4
16:45	17	0	0	0	35	1	0	0	0	0	0	0	10
17:00	8	0	0	0	44	2	0	0	0	0	0	0	11
17:15	8	0	0	0	29	2	0	1	0	0	0	0	4
17:30	9	0	0	0	28	0	0	0	0	0	0	0	3
17:45	5	0	0	0	25	1	0	0	0	0	0	0	6

Site ID: 1
Location: Pacific Hw y & Albert St
Suburb: Islington
Weather: Fine
Duration: 7:00am-9:00am & 4:00pm-6:00pm
Day/Date: Tuesday, 11 October 2016
AM Peak 09:00 (hour ending)
PM Peak 17:30 (hour ending)
Traffic Control:
HOME

Maitland Road (Southbound)

TIME	Hard Left				Left				Through				Right				Uturn			
15 MINUTE PERIOD ENDING	Cars, Utilities & Motorcycles	Light Trucks	Heavy Trucks	Bicycles	Cars, Utilities & Motorcycles	Light Trucks	Heavy Trucks	Bicycles	Cars, Utilities & Motorcycles	Light Trucks	Heavy Trucks	Bicycles	Cars, Utilities & Motorcycles	Light Trucks	Heavy Trucks	Bicycles	Cars, Utilities & Motorcycles	Light Trucks	Heavy Trucks	Bicycles
1 7:15 AM	6	0	0	0	39	3	0	0	71	2	0	0	0	0	0	0	0	0	0	0
2 7:30 AM	16	0	0	0	39	2	0	0	71	6	0	1	0	0	0	0	0	0	0	0
3 7:45 AM	10	0	0	0	42	4	0	0	113	6	0	0	0	0	0	0	0	0	0	0
4 8:00 AM	14	0	0	0	50	3	0	1	147	4	0	1	0	0	0	0	0	0	0	0
5 8:15 AM	15	0	0	0	46	2	0	1	135	4	0	1	0	0	0	0	0	0	0	0
6 8:30 AM	16	0	0	0	50	2	0	1	213	10	1	1	0	0	0	0	0	0	0	0
7 8:45 AM	18	0	0	0	37	4	0	1	173	2	0	0	0	0	0	0	0	0	0	0
8 9:00 AM	5	0	0	0	50	3	0	2	181	6	0	0	0	0	0	0	0	0	0	0
2HR Total	100	0	0	0	353	23	0	6	1104	40	1	4	0	0	0	0	0	0	0	0
Peak Hour Total	54	0	0	0	183	11	0	5	702	22	1	2	0	0	0	0	0	0	0	0

Sheddon Street (Southwestbound)

TIME	Hard Left				Left				Bear Right				Hard Right				Uturn			
15 MINUTE PERIOD ENDING	Cars, Utilities & Motorcycles	Light Trucks	Heavy Trucks	Bicycles	Cars, Utilities & Motorcycles	Light Trucks	Heavy Trucks	Bicycles	Cars, Utilities & Motorcycles	Light Trucks	Heavy Trucks	Bicycles	Cars, Utilities & Motorcycles	Light Trucks	Heavy Trucks	Bicycles	Cars, Utilities & Motorcycles	Light Trucks	Heavy Trucks	Bicycles
1 7:15 AM	0	0	0	0	7	0	0	0	5	0	0	0	4	0	0	0	0	0	0	0
2 7:30 AM	1	0	0	0	6	0	0	1	4	0	0	0	8	0	0	0	0	0	0	0
3 7:45 AM	0	0	0	0	17	2	0	0	6	0	0	0	7	0	0	0	0	0	0	0
4 8:00 AM	0	0	0	0	27	0	0	0	1	0	0	0	14	0	0	0	0	0	0	0
5 8:15 AM	0	0	0	0	33	0	1	0	6	0	0	0	21	0	0	0	0	0	0	0
6 8:30 AM	0	0	0	0	21	0	0	0	2	0	0	1	13	0	0	0	0	0	0	0
7 8:45 AM	0	0	0	0	30	1	0	1	5	0	0	0	20	0	0	1	0	0	0	0
8 9:00 AM	0	0	0	0	22	1	0	0	3	1	0	0	8	0	1	0	0	0	0	0
2HR Total	1	0	0	0	163	4	1	2	32	1	0	1	95	0	1	1	0	0	0	0
Peak Hour Total	0	0	0	0	106	2	1	1	16	1	0	1	62	0	1	1	0	0	0	0

Albert Street (Westbound)

TIME	Left				Through				Right				Hard Right				Uturn			
15 MINUTE PERIOD ENDING	Cars, Utilities & Motorcycles	Light Trucks	Heavy Trucks	Bicycles	Cars, Utilities & Motorcycles	Light Trucks	Heavy Trucks	Bicycles	Cars, Utilities & Motorcycles	Light Trucks	Heavy Trucks	Bicycles	Cars, Utilities & Motorcycles	Light Trucks	Heavy Trucks	Bicycles	Cars, Utilities & Motorcycles	Light Trucks	Heavy Trucks	Bicycles
1 7:15 AM	4	0	0	0	12	0	0	0	17	2	0	0	0	0	0	0	0	0	0	0
2 7:30 AM	10	2	0	0	13	1	0	0	21	2	0	1	0	0	0	0	0	0	0	0
3 7:45 AM	13	0	0	0	11	1	0	0	26	2	0	1	0	0	0	0	0	0	0	0
4 8:00 AM	13	1	0	0	9	0	0	1	25	0	0	1	0	0	0	0	0	0	0	0
5 8:15 AM	16	2	0	0	11	2	0	1	24	0	0	0	0	0	0	0	0	0	0	0
6 8:30 AM	9	1	0	0	7	3	0	0	24	1	0	0	0	0	0	0	0	0	0	0
7 8:45 AM	27	4	0	0	10	3	0	0	27	1	0	0	0	0	0	0	0	0	0	0
8 9:00 AM	20	2	1	0	11	2	0	2	33	6	1	0	0	0	0	0	0	0	0	0
2HR Total	112	12	1	0	84	12	0	4	197	14	1	3	0	0	0	0	0	0	0	0
Peak Hour Total	72	9	1	0	39	10	0	3	108	8	1	0	0	0	0	0	0	0	0	0

Maitland Road (Northbound)

TIME	Left				Through								Right				Uturn			
15 MINUTE PERIOD ENDING	Cars, Utilities & Motorcycles	Light Trucks	Heavy Trucks	Bicycles	Cars, Utilities & Motorcycles	Light Trucks	Heavy Trucks	Bicycles	Buses	Light Trucks	Heavy Trucks	Bicycles	Cars, Utilities & Motorcycles	Light Trucks	Heavy Trucks	Bicycles	Cars, Utilities & Motorcycles	Light Trucks	Heavy Trucks	Bicycles
1 7:15 AM	2	2	0	0	45	5	0	1		0	0	0	16	0	0	0	0	0	0	0
2 7:30 AM	1	3	0	0	71	4	0	1		1	0	0	25	1	0	0	0	0	0	0
3 7:45 AM	1	3	0	0	67	4	0	0		0	0	0	21	1	0	1	0	0	0	0
4 8:00 AM	2	2	0	0	102	3	0	0		1	0	0	38	2	0	0	0	0	0	0
5 8:15 AM	2	3	0	0	84	4	0	0		1	0	0	20	0	0	0	0	0	0	0
6 8:30 AM	3	2	0	1	112	6	0	2		0	0	0	26	2	0	0	0	0	0	0
7 8:45 AM	0	3	0	0	114	4	0	1		1	0	0	27	2	0	0	0	0	0	0
8 9:00 AM	3	0	0	0	117	6	0	2		1	0	0	28	4	0	0	0	0	0	0
2HR Total	14	18	0	1	712	36	0	7	0	5	0	0	201	12	0	1	0	0	0	0
Peak Hour Total	8	8	0	1	427	20	0	5	0	3	0	0	101	8	0	0	0	0	0	0

Ivy Street (Eastbound)

TIME	Left				Bear Left				Through				Right				Uturn			
15 MINUTE PERIOD ENDING	Cars, Utilities & Motorcycles	Light Trucks	Heavy Trucks	Bicycles	Cars, Utilities & Motorcycles	Light Trucks	Heavy Trucks	Bicycles	Cars, Utilities & Motorcycles	Light Trucks	Heavy Trucks	Bicycles	Cars, Utilities & Motorcycles	Light Trucks	Heavy Trucks	Bicycles	Cars, Utilities & Motorcycles	Light Trucks	Heavy Trucks	Bicycles
1 7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2 7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3 7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4 8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6 8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7 8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 9:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2HR Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Peak Hour Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Maitland Road (Southbound)

TIME	Hard Left				Left				Through				Right				Uturn			
15 MINUTE PERIOD ENDING	Cars, Utilities & Motorcycles	Light Trucks	Heavy Trucks	Bicycles	Cars, Utilities & Motorcycles	Light Trucks	Heavy Trucks	Bicycles	Cars, Utilities & Motorcycles	Light Trucks	Heavy Trucks	Bicycles	Cars, Utilities & Motorcycles	Light Trucks	Heavy Trucks	Bicycles	Cars, Utilities & Motorcycles	Light Trucks	Heavy Trucks	Bicycles
1 4:15 PM	10	0	0	0	46	1	0	0	117	2	0	0	0	0	0	0	0	0	0	0
2 4:30 PM	21	0	0	0	48	1	0	0	126	2	1	0	0	0	0	0	0	0	0	0
3 4:45 PM	10	0	0	0	41	3	0	0	117	1	1	0	0	0	0	0	0	0	0	0
4 5:00 PM	24	0	0	0	43	2	0	0	131	4	0	0	0	0	0	0	0	0	0	0
5 5:15 PM	15	0	0	0	45	1	0	0	110	3	0	0	0	0	0	0	0	0	0	0
6 5:30 PM	13	0	0	0	37	1	0	0	115	2	0	0	0	0	0	0	1	0	0	0
7 5:45 PM	14	0	0	0	35	0	0	0	100	1	0	0	0	0	0	0	0	0	0	0
8 6:00 PM	15	2	0	0	43	1	0	0	120	2	0	0	0	0	0	0	0	0	0	0
2HR Total	122	2	0	0	338	10	0	0	936	17	2	0	0	0	0	0	1	0	0	0
Peak Hour Total	62	0	0	0	166	7	0	0	473	10	1	0	0	0	0	0	1	0	0	0

Sheddon Street (Southwestbound)

TIME	Hard Left				Left				Bear Right				Hard Right				Uturn			
15 MINUTE PERIOD ENDING	Cars, Utilities & Motorcycles	Light Trucks	Heavy Trucks	Bicycles	Cars, Utilities & Motorcycles	Light Trucks	Heavy Trucks	Bicycles	Cars, Utilities & Motorcycles	Light Trucks	Heavy Trucks	Bicycles	Cars, Utilities & Motorcycles	Light Trucks	Heavy Trucks	Bicycles	Cars, Utilities & Motorcycles	Light Trucks	Heavy Trucks	Bicycles
1 4:15 PM	0	0	0	0	15	1	0	0	0	0	0	0	15	0	0	0	0	0	0	0
2 4:30 PM	0	0	0	0	13	0	0	0	1	0	0	2	14	0	0	0	0	0	0	0
3 4:45 PM	0	0	0	0	19	0	0	0	11	0	0	0	20	0	0	0	0	0	0	0
4 5:00 PM	1	0	0	0	19	1	0	0	1	0	0	0	18	0	0	0	0	0	0	0
5 5:15 PM	0	0	0	0	18	0	0	0	2	0	0	0	23	0	0	0	0	0	0	0
6 5:30 PM	0	0	0	0	19	1	0	0	4	0	0	0	19	1	0	0	0	0	0	0
7 5:45 PM	0	0	0	0	17	0	0	0	6	0	0	0	11	0	0	0	0	0	0	0
8 6:00 PM	2	0	0	0	16	0	0	0	5	0	0	0	11	0	0	0	0	0	0	0
2HR Total	3	0	0	0	136	3	0	0	30	0	0	2	131	1	0	0	0	0	0	0
Peak Hour Total	1	0	0	0	75	2	0	0	18	0	0	0	80	1	0	0	0	0	0	0

Albert Street (Westbound)

TIME	Left				Through				Right				Hard Right				Uturn			
15 MINUTE PERIOD ENDING	Cars, Utilities & Motorcycles	Light Trucks	Heavy Trucks	Bicycles	Cars, Utilities & Motorcycles	Light Trucks	Heavy Trucks	Bicycles	Cars, Utilities & Motorcycles	Light Trucks	Heavy Trucks	Bicycles	Cars, Utilities & Motorcycles	Light Trucks	Heavy Trucks	Bicycles	Cars, Utilities & Motorcycles	Light Trucks	Heavy Trucks	Bicycles
1 4:15 PM	29	2	0	0	11	0	0	1	55	2	0	0	1	0	0	0	0	0	0	0
2 4:30 PM	21	0	0	0	11	0	0	1	37	2	0	0	0	0	0	0	0	0	0	0
3 4:45 PM	28	0	0	0	8	1	0	0	31	1	0	0	1	0	0	0	0	0	0	0
4 5:00 PM	29	1	0	0	11	0	0	0	49	1	0	0	2	0	0	0	0	0	0	0
5 5:15 PM	38	0	0	0	10	0	0	1	51	0	0	0	2	0	0	0	0	0	0	0
6 5:30 PM	44	0	0	0	7	0	0	0	45	1	0	0	0	0	0	0	0	0	0	0
7 5:45 PM	32	0	0	0	12	0	0	0	39	0	0	0	1	0	0	0	0	0	0	0
8 6:00 PM	21	1	0	0	8	0	0	0	30	1	0	0	0	0	0	0	0	0	0	0
2HR Total	242	4	0	0	78	1	0	3	337	8	0	0	7	0	0	0	0	0	0	0
Peak Hour Total	139	1	0	0	36	1	0	1	176	3	0	0	5	0	0	0	0	0	0	0

Maitland Road (Northbound)

TIME	Left				Through								Right				Uturn			
15 MINUTE PERIOD ENDING	Cars, Utilities & Motorcycles	Light Trucks	Heavy Trucks	Bicycles	Cars, Utilities & Motorcycles	Light Trucks	Heavy Trucks	Bicycles	Buses	Light Trucks	Heavy Trucks	Bicycles	Cars, Utilities & Motorcycles	Light Trucks	Heavy Trucks	Bicycles	Cars, Utilities & Motorcycles	Light Trucks	Heavy Trucks	Bicycles
1 4:15 PM	1	2	0	0	131	5	0	0		0	0	0	16	1	0	0	0	0	0	0
2 4:30 PM	2	3	0	0	108	9	0	0		1	0	1	19	1	0	0	0	0	0	0
3 4:45 PM	4	1	0	0	143	4	0	0		0	0	0	13	2	0	0	0	0	0	0
4 5:00 PM	1	0	0	0	137	6	0	0		0	0	0	19	2	0	0	0	0	0	0
5 5:15 PM	0	2	0	0	153	4	0	0		0	0	0	16	1	0	0	0	0	0	0
6 5:30 PM	0	2	0	0	180	7	0	0		1	0	0	27	2	0	0	0	0	0	0
7 5:45 PM	0	0	0	0	128	2	0	0		1	0	0	14	0	0	0	0	0	0	0
8 6:00 PM	3	1	0	0	113	5	0	0		0	0	0	23	0	0	0	0	0	0	0
2HR Total	11	11	0	0	1093	42	0	0	0	3	0	1	147	9	0	0	0	0	0	0
Peak Hour Total	5	5	0	0	613	21	0	0	0	1	0	0	75	7	0	0	0	0	0	0

Ivy Street (Eastbound)

TIME	Left				Bear Left				Through				Right				Uturn			
15 MINUTE PERIOD ENDING	Cars, Utilities & Motorcycles	Light Trucks	Heavy Trucks	Bicycles	Cars, Utilities & Motorcycles	Light Trucks	Heavy Trucks	Bicycles	Cars, Utilities & Motorcycles	Light Trucks	Heavy Trucks	Bicycles	Cars, Utilities & Motorcycles	Light Trucks	Heavy Trucks	Bicycles	Cars, Utilities & Motorcycles	Light Trucks	Heavy Trucks	Bicycles
1 4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2 4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3 4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4 5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6 5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7 5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 6:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2HR Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Peak Hour Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site ID: 8

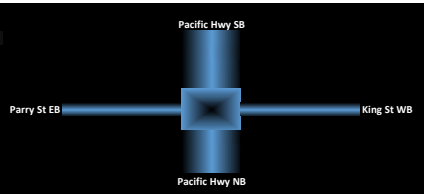
Location: Pacific Hwy & King St, Newcastle West

Date: 11-Oct-2016

Period 2 Time: 7:00 AM to 9:00 AM

Weather: Fine

Period 2 Peak Hour: 8:00 AM to 9:00 AM



TOTALS AND PEAKS

Period 2 Total	97	5	2	0	846	46	14	8	358	12	2	0	0	0	0	0	49	173	13	0	1	1168	32	0	14	408	13	3	1	1	0	0	0	41
Period 2 Peak Hr	57	3	1	0	465	20	5	4	202	9	1	0	0	0	0	0	30	95	8	0	0	678	20	0	7	229	9	1	0	0	0	0	0	24

	Pacific Hwy SB	Pacific Hwy SB	Pacific Hwy SB	Pacific Hwy SB	Pacific Hwy SB	Pacific Hwy SB	Pacific Hwy SB	Pacific Hwy SB	Pacific Hwy SB	Pacific Hwy SB	Pacific Hwy SB	Pacific Hwy SB	Pacific Hwy SB	Pacific Hwy SB	Pacific Hwy SB	Pacific Hwy SB	Pacific Hwy SB	King St WB	King St WB	King St WB	King St WB	King St WB	King St WB	King St WB	King St WB	King St WB	King St WB	King St WB	King St WB	King St WB	King St WB	King St WB
	Left	Left	Left	Left	Through	Through	Through	Through	Right	Right	Right	Right	U-turn	U-turn	U-turn	U-turn	Cross 1	Left	Left	Left	Left	Through	Through	Through	Through	Right	Right	Right	Right	U-turn	U-turn	U-turn	U-turn	Cross 1
Time Starting	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Pedestrians	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Pedestrians
07:00	11	0	1	0	96	7	4	0	32	0	1	0	0	0	0	0	0	12	1	0	1	77	1	0	0	38	0	0	0	0	0	0	0	2
07:15	11	1	0	0	81	4	2	0	23	2	0	0	0	0	0	0	1	17	0	0	0	104	3	0	1	43	1	1	0	1	0	0	0	6
07:30	7	0	0	0	100	6	1	3	55	1	0	0	0	0	0	0	0	23	3	0	0	139	3	0	3	39	2	1	0	0	0	0	0	0
07:45	11	1	0	0	104	9	2	1	46	0	0	0	0	0	0	0	18	26	1	0	0	170	5	0	3	59	1	0	1	0	0	0	0	9
08:00	13	0	0	0	114	3	1	1	52	1	0	0	0	0	0	0	4	18	3	0	0	141	8	0	1	48	1	0	0	0	0	0	0	6
08:15	14	0	1	0	99	4	1	1	44	1	1	0	0	0	0	0	12	24	0	0	0	179	3	0	1	63	1	1	0	0	0	0	0	11
08:30	12	2	0	0	126	9	2	1	65	4	0	0	0	0	0	0	8	27	2	0	0	173	1	0	3	45	4	0	0	0	0	0	0	3
08:45	18	1	0	0	126	4	1	1	41	3	0	0	0	0	0	0	6	26	3	0	0	185	8	0	2	73	3	0	0	0	0	0	0	4

TOTALS AND PEAKS

Period 1 Total	144	4	1	0	1673	31	6	4	471	13	1	1	0	0	0	0	33	238	8	1	0	1718	48	4	9	296	12	1	0	1	0	0	0	40
Period 1 Peak Hr	75	3	0	0	774	19	5	1	320	5	0	1	0	0	0	0	28	126	0	1	0	973	20	1	9	166	5	1	0	0	0	0	0	31

	Pacific Hwy NB	Pacific Hwy NB	Pacific Hwy NB	Pacific Hwy NB	Pacific Hwy NB	Pacific Hwy NB	Pacific Hwy NB	Pacific Hwy NB	Pacific Hwy NB	Pacific Hwy NB	Pacific Hwy NB	Pacific Hwy NB	Pacific Hwy NB	Pacific Hwy NB	Pacific Hwy NB	Pacific Hwy NB	Pacific Hwy NB	Parry St EB	Parry St EB	Parry St EB	Parry St EB	Parry St EB	Parry St EB	Parry St EB	Parry St EB	Parry St EB	Parry St EB	Parry St EB	Parry St EB	Parry St EB	Parry St EB	Parry St EB	Parry St EB
	Left	Left	Left	Left	Through	Through	Through	Through	Right	Right	Right	Right	U-turn	U-turn	U-turn	U-turn	Cross 1	Left	Left	Left	Left	Through	Through	Through	Through	Right	Right	Right	Right	U-turn	U-turn	U-turn	U-turn	Cross 1
Time Starting	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Pedestrians	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Pedestrians
07:00	14	0	0	0	201	6	0	1	27	1	0	0	0	0	0	0	0	15	1	0	0	137	8	2	0	33	0	0	0	1	0	0	0	2
07:15	15	0	1	0	207	2	0	2	39	3	1	0	0	0	0	0	1	31	5	0	0	188	6	1	0	30	4	0	0	0	0	0	0	0
07:30	20	0	0	0	237	2	1	0	43	2	0	0	0	0	0	0	2	32	2	0	0	186	8	0	0	19	3	0	0	0	0	0	0	0
07:45	20	1	0	0	254	2	0	0	42	2	0	0	0	0	0	0	2	34	0	0	0	234	6	0	0	48	0	0	0	0	0	0	0	7
08:00	13	1	0	0	218	4	1	0	70	1	0	0	0	0	0	0	8	26	0	0	0	215	3	1	0	33	2	0	0	0	0	0	0	9
08:15	22	0	0	0	192	5	0	1	61	2	0	0	0	0	0	0	3	32	0	1	0	256	5	0	1	52	2	0	0	0	0	0	0	9
08:30	21	1	0	0	187	5	1	0	91	1	0	1	0	0	0	0	6	28	0	0	0	241	5	0	4	42	1	0	0	0	0	0	0	2
08:45	19	1	0	0	177	5	3	0	98	1	0	0	0	0	0	0	11	40	0	0	0	261	7	0	4	39	0	1	0	0	0	0	0	11

Site ID: 8

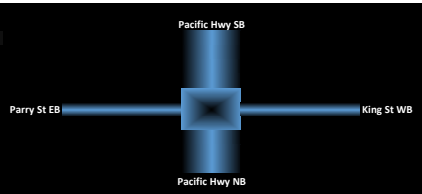
Location: Pacific Hwy & King St, Newcastle West

Date: 11-Oct-2016

Period 2 Time: 4:00 PM to 6:00 PM

Weather: Fine

Period 2 Peak Hour: 4:45 PM to 5:45 PM



TDC Traffic Data & Control

TOTALS AND PEAKS

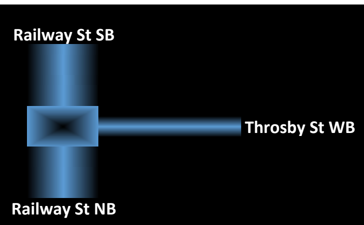
	Pacific Hwy SB																	King St WB													
	Left				Through				Right				U-turn				Cross 1	Left				Through				Right				U-turn			Cross 1
	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Pedestrians	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Pedestrians
Period 2 Total	79	1	0	0	1528	13	0	8	470	6	0	0	1	0	0	0	37	384	4	1	1	1657	23	0	15	605	2	0	0	0	0	0	0	25
Period 2 Peak Hr	42	0	0	0	887	5	0	4	292	3	0	0	1	0	0	0	22	227	3	1	0	1047	16	0	13	397	1	0	0	0	0	0	0	22
Time Starting																																		
16:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:15	7	0	0	0	187	5	0	0	48	1	0	0	0	0	0	0	1	32	0	0	0	131	3	0	0	46	1	0	0	0	0	0	0	1
16:30	10	1	0	0	246	3	0	2	70	2	0	0	0	0	0	0	14	72	1	0	0	267	3	0	2	81	0	0	0	0	0	0	0	1
16:45	17	0	0	0	236	2	0	0	75	0	0	0	1	0	0	0	3	60	1	0	0	228	3	0	1	91	0	0	0	0	0	0	0	3
17:00	13	0	0	0	217	0	0	0	70	1	0	0	0	0	0	0	8	56	0	1	0	266	4	0	4	103	0	0	0	0	0	0	0	7
17:15	4	0	0	0	221	2	0	4	93	0	0	0	0	0	0	0	8	54	0	0	0	298	3	0	4	89	0	0	0	0	0	0	0	9
17:30	8	0	0	0	213	1	0	0	54	2	0	0	0	0	0	0	3	57	2	0	0	255	6	0	4	114	1	0	0	0	0	0	0	3
17:45	20	0	0	0	208	0	0	2	60	0	0	0	0	0	0	0	0	53	0	0	1	212	1	0	0	81	0	0	0	0	0	0	0	1

TOTALS AND PEAKS

	Pacific Hwy NB																	Parry St EB													
	Left				Through				Right				U-turn				Cross 1	Left				Through				Right				U-turn			Cross 1
	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Pedestrians	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Lights	Light Trucks	Heavy Trucks	Bicycles on Road	Pedestrians
Period 1 Total	134	0	0	0	859	8	1	1	326	11	0	0	0	0	0	0	32	150	9	1	0	1330	12	0	1	384	2	0	1	0	0	0	0	21
Period 1 Peak Hr	82	0	0	0	555	1	0	1	205	5	0	0	0	0	0	0	20	94	3	0	0	819	9	0	0	260	1	0	0	0	0	0	0	14
Time Starting																																		
16:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:15	19	0	0	0	71	4	1	0	34	2	0	0	0	0	0	0	3	16	3	0	0	140	0	0	0	27	0	0	0	0	0	0	0	0
16:30	16	0	0	0	97	3	0	0	36	3	0	0	0	0	0	0	3	19	2	0	0	203	2	0	1	61	1	0	0	0	0	0	0	6
16:45	12	0	0	0	134	0	0	0	54	1	0	0	0	0	0	0	6	20	2	0	0	180	2	0	0	48	0	0	0	0	0	0	0	5
17:00	23	0	0	0	128	0	0	1	51	1	0	0	0	0	0	0	2	24	0	0	0	211	3	0	0	72	1	0	0	0	0	0	0	3
17:15	20	0	0	0	163	1	0	0	59	0	0	0	0	0	0	0	10	31	1	0	0	220	3	0	0	63	0	0	0	0	0	0	0	3
17:30	27	0	0	0	130	0	0	0	41	3	0	0	0	0	0	0	2	19	0	0	0	208	1	0	0	77	0	0	0	0	0	0	0	3
17:45	17	0	0	0	136	0	0	0	51	1	0	0	0	0	0	0	6	21	1	1	0	168	1	0	0	36	0	0	1	0	0	0	0	1

Site ID: 2
Location: Railway St & Throsby St, Wickham
Date: 11-Oct-2016
Period 1 Time: 7:00 AM to 9:00 AM
Weather: Fine

Period 1 Peak Hour: 7:45 AM to 8:45 AM



TDC Traffic Data & Control

TOTALS AND PEAKS

Time Starting	Railway St SB Left Light Vehicles	Railway St SB Left Light Trucks (3-5)	Railway St SB Left Heavy Trucks (6-12)	Railway St SB Left Bicycles on Road	Railway St SB Through Light Vehicles	Railway St SB Through Light Trucks (3-5)	Railway St SB Through Heavy Trucks (6-12)	Railway St SB Through Bicycles on Road	Railway St SB U-turn Light Vehicles	Railway St SB U-turn Light Trucks (3-5)	Railway St SB U-turn Heavy Trucks (6-12)	Railway St SB U-turn Bicycles on Road	Railway St SB Cross 1 Pedestrians
Period 1 Total	100	3	0	8	77	5	4	3	5	0	0	0	0
Period 1 Peak Hr	56	1	0	3	41	5	1	3	1	0	0	0	0
07:00	15	0	0	0	11	0	1	0	1	0	0	0	0
07:15	6	0	0	0	10	0	1	0	2	0	0	0	0
07:30	13	1	0	2	6	0	1	0	0	0	0	0	0
07:45	23	1	0	0	8	1	1	0	1	0	0	0	0
08:00	9	0	0	1	11	3	0	1	0	0	0	0	0
08:15	16	0	0	0	13	0	0	1	0	0	0	0	0
08:30	8	0	0	2	9	1	0	1	0	0	0	0	0
08:45	10	1	0	3	9	0	0	0	1	0	0	0	0

Time Starting	Throsby St WB Left Light Vehicles	Throsby St WB Left Light Trucks (3-5)	Throsby St WB Left Heavy Trucks (6-12)	Throsby St WB Left Bicycles on Road	Throsby St WB Right Light Vehicles	Throsby St WB Right Light Trucks (3-5)	Throsby St WB Right Heavy Trucks (6-12)	Throsby St WB Right Bicycles on Road	Throsby St WB U-turn Light Vehicles	Throsby St WB U-turn Light Trucks (3-5)	Throsby St WB U-turn Heavy Trucks (6-12)	Throsby St WB U-turn Bicycles on Road	Throsby St WB Cross 1 Pedestrians
Period 1 Total	22	2	0	0	51	3	0	1	1	0	0	0	9
Period 1 Peak Hr	11	1	0	0	29	2	0	0	1	0	0	0	3
07:00	5	0	0	0	4	1	0	0	0	0	0	0	0
07:15	3	1	0	0	5	0	0	0	0	0	0	0	4
07:30	1	0	0	0	4	0	0	0	0	0	0	0	0
07:45	2	1	0	0	4	1	0	0	0	0	0	0	1
08:00	2	0	0	0	7	1	0	0	0	0	0	0	0
08:15	4	0	0	0	10	0	0	0	0	0	0	0	1
08:30	3	0	0	0	8	0	0	0	1	0	0	0	1
08:45	2	0	0	0	9	0	0	1	0	0	0	0	2

Time Starting	Railway St NB Through Light Vehicles	Railway St NB Through Light Trucks (3-5)	Railway St NB Through Heavy Trucks (6-12)	Railway St NB Through Bicycles on Road	Railway St NB Right Light Vehicles	Railway St NB Right Light Trucks (3-5)	Railway St NB Right Heavy Trucks (6-12)	Railway St NB Right Bicycles on Road	Railway St NB U-turn Light Vehicles	Railway St NB U-turn Light Trucks (3-5)	Railway St NB U-turn Heavy Trucks (6-12)	Railway St NB U-turn Bicycles on Road	Railway St NB Cross 1 Pedestrians
Period 1 Total	44	14	5	1	16	1	0	0	0	0	0	0	2
Period 1 Peak Hr	14	9	4	1	9	1	0	0	0	0	0	0	2
07:00	4	2	0	0	1	0	0	0	0	0	0	0	0
07:15	11	3	0	0	1	0	0	0	0	0	0	0	0
07:30	8	0	1	0	2	0	0	0	0	0	0	0	0
07:45	2	2	1	1	2	1	0	0	0	0	0	0	0
08:00	5	1	2	0	2	0	0	0	0	0	0	0	0
08:15	2	2	1	0	1	0	0	0	0	0	0	0	1
08:30	5	4	0	0	4	0	0	0	0	0	0	0	1
08:45	7	0	0	0	3	0	0	0	0	0	0	0	0

Site ID: 2

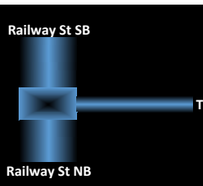
Location: Railway St & Throsby St, Wickham

Date: 11-Oct-2016

Period 2 Time: 4:00 PM to 6:00 PM

Weather: Fine

Period 2 Peak Hour: 4:45 PM to 5:45 PM



TDC Traffic Data & Control

TOTALS AND PEAKS

Period 2 Total	114	2	0	0	65	5	1	2	1	0	0	0	2	18	2	0	0	107	3	1	5	1	0	0	0	10	88	7	0	1	29	0	0	0	2	0	0	0	7
Period 2 Peak Hr	76	0	0	0	36	3	0	2	1	0	0	0	1	10	0	0	0	66	0	0	3	0	0	0	0	4	48	6	0	0	20	0	0	0	1	0	0	0	5

Time Starting	Railway St SB Left Light Vehicles	Railway St SB Left Light Trucks (3-5)	Railway St SB Left Heavy Trucks (6-12)	Railway St SB Left Bicycles on Road	Railway St SB Through Light Vehicles	Railway St SB Through Light Trucks (3-5)	Railway St SB Through Heavy Trucks (6-12)	Railway St SB Through Bicycles on Road	Railway St SB U-turn Light Vehicles	Railway St SB U-turn Light Trucks (3-5)	Railway St SB U-turn Heavy Trucks (6-12)	Railway St SB U-turn Bicycles on Road	Railway St SB Cross 1 Pedestrians	Throsby St WB Left Light Vehicles	Throsby St WB Left Light Trucks (3-5)	Throsby St WB Left Heavy Trucks (6-12)	Throsby St WB Left Bicycles on Road	Throsby St WB Right Light Vehicles	Throsby St WB Right Light Trucks (3-5)	Throsby St WB Right Heavy Trucks (6-12)	Throsby St WB Right Bicycles on Road	Throsby St WB U-turn Light Vehicles	Throsby St WB U-turn Light Trucks (3-5)	Throsby St WB U-turn Heavy Trucks (6-12)	Throsby St WB U-turn Bicycles on Road	Throsby St WB Cross 1 Pedestrians	Railway St NB Through Light Vehicles	Railway St NB Through Light Trucks (3-5)	Railway St NB Through Heavy Trucks (6-12)	Railway St NB Through Bicycles on Road	Railway St NB Right Light Vehicles	Railway St NB Right Light Trucks (3-5)	Railway St NB Right Heavy Trucks (6-12)	Railway St NB Right Bicycles on Road	Railway St NB U-turn Light Vehicles	Railway St NB U-turn Light Trucks (3-5)	Railway St NB U-turn Heavy Trucks (6-12)	Railway St NB U-turn Bicycles on Road	Railway St NB Cross 1 Pedestrians
16:00	7	1	0	0	9	0	0	0	0	0	0	0	0	5	2	0	0	13	0	0	2	0	0	0	0	0	8	0	0	0	2	0	0	0	0	0	0	0	2
16:15	13	1	0	0	9	0	1	0	0	0	0	0	0	2	0	0	0	9	2	1	0	1	0	0	0	2	9	1	0	0	2	0	0	0	0	0	0	0	0
16:30	10	0	0	0	5	2	0	0	0	0	0	0	0	1	0	0	0	8	1	0	0	0	0	0	0	3	15	0	0	0	3	0	0	0	1	0	0	0	0
16:45	19	0	0	0	8	1	0	0	0	0	0	0	0	5	0	0	0	12	0	0	1	0	0	0	0	0	7	2	0	0	7	0	0	0	1	0	0	0	1
17:00	17	0	0	0	17	0	0	1	1	0	0	0	0	1	0	0	0	23	0	0	0	0	0	0	0	0	22	2	0	0	8	0	0	0	0	0	0	0	3
17:15	20	0	0	0	6	2	0	0	0	0	0	0	1	2	0	0	0	20	0	0	0	0	0	0	0	3	11	2	0	0	5	0	0	0	0	0	0	0	1
17:30	20	0	0	0	5	0	0	1	0	0	0	0	0	2	0	0	0	11	0	0	2	0	0	0	0	1	8	0	0	0	0	0	0	0	0	0	0	0	0
17:45	8	0	0	0	6	0	0	0	0	0	0	0	1	0	0	0	0	11	0	0	0	0	0	0	0	1	8	0	0	1	2	0	0	0	0	0	0	0	0

TDC
Traffic Data & Control

NBD - AM

Hannell Street Travel Time Survey - Cowper St to King St

End Point	1	2	3	4	5	6	7	8	9	10	11	12	13	Average Travel Time
King St	6:58:59	7:06:00	7:13:29	7:20:43	7:28:14	7:37:47	7:47:21	7:57:46	8:09:48	8:21:47	8:33:42	8:43:48	8:51:47	
Hunter St	6:59:14	7:06:16	7:13:44	7:20:58	7:28:29	7:38:01	7:47:34	7:58:01	8:10:01	8:22:04	8:33:59	8:44:04	8:52:04	
Honeysuckle Dve	6:59:28	7:06:31	7:13:57	7:21:14	7:28:43	7:38:14	7:47:49	7:58:13	8:10:15	8:22:17	8:34:13	8:44:18	8:52:18	
Throsby St	6:59:45	7:06:49	7:14:35	7:21:35	7:29:00	7:38:31	7:48:08	7:58:42	8:11:01	8:22:59	8:34:53	8:44:52	8:52:55	
Cowper St	7:00:29	7:07:29	7:15:15	7:22:15	7:29:45	7:39:08	7:48:56	7:59:29	8:11:40	8:23:37	8:35:58	8:45:36	8:53:35	
Run Time														
King St														
Hunter St	0:00:15	0:00:16	0:00:15	0:00:15	0:00:15	0:00:14	0:00:13	0:00:15	0:00:13	0:00:17	0:00:17	0:00:16	0:00:17	0:00:15
Honeysuckle Dve	0:00:14	0:00:15	0:00:13	0:00:16	0:00:14	0:00:13	0:00:15	0:00:12	0:00:14	0:00:13	0:00:14	0:00:14	0:00:14	0:00:14
Throsby	0:00:17	0:00:18	0:00:38	0:00:21	0:00:17	0:00:17	0:00:19	0:00:29	0:00:46	0:00:42	0:00:40	0:00:34	0:00:37	0:00:29
Cowper St	0:00:44	0:00:40	0:00:40	0:00:40	0:00:45	0:00:37	0:00:48	0:00:47	0:00:39	0:00:38	0:01:05	0:00:44	0:00:40	0:00:44
total	01:30	01:29	01:46	01:32	01:31	01:21	01:35	01:43	01:52	01:50	02:16	01:48	01:48	0:01:42

NBD - PM

End Point	1	2	3	4	5	6	7	8	9	10	Average Travel Time
King St	15:58:32	16:06:37	16:24:19	16:36:17	16:48:27	17:00:26	17:14:25	17:32:26	17:44:16	17:54:08	
Hunter St	15:58:43	16:06:53	16:24:33	16:36:31	16:48:42	17:00:39	17:14:40	17:32:41	17:44:31	17:54:23	
Honeysuckle Dve	15:59:02	16:10:05	16:24:47	16:36:45	16:48:56	17:00:52	17:14:53	17:32:54	17:44:44	17:54:37	
Throsby St	15:59:39	16:10:23	16:25:03	16:37:36	16:49:42	17:01:44	17:15:43	17:33:40	17:45:43	17:55:20	
Cowper St	16:00:20	16:11:16	16:25:41	16:38:17	16:50:22	17:02:26	17:16:28	17:34:23	17:46:23	17:56:03	
Run Time											
King St											
Hunter St	0:00:11	0:00:16	0:00:14	0:00:14	0:00:15	0:00:13	0:00:15	0:00:15	0:00:15	0:00:15	0:00:14
Honeysuckle Dve	0:00:19	0:03:12	0:00:14	0:00:14	0:00:14	0:00:13	0:00:13	0:00:13	0:00:13	0:00:14	0:00:32
Throsby	0:00:37	0:00:18	0:00:16	0:00:51	0:00:46	0:00:52	0:00:50	0:00:46	0:00:59	0:00:43	0:00:42
Cowper St	0:00:41	0:00:53	0:00:38	0:00:41	0:00:40	0:00:42	0:00:45	0:00:43	0:00:40	0:00:43	0:00:43
total	01:48	04:39	01:22	02:00	01:55	02:00	02:03	01:57	02:07	01:55	0:02:11

TDC
Traffic Data & Control

SBD - AM

Hannell Street Travel Time Survey - Cowper St to King St

End Point	1	2	3	4	5	6	7	8	9	10	11	12	13	Average Travel Time
CowperStreet	7:00:29	7:07:29	7:15:15	7:22:15	7:29:45	7:39:08	7:48:56	7:59:29	8:11:40	8:23:37	8:35:58	8:45:36	8:53:35	
Throsby Street	7:01:06	7:08:04	7:16:01	7:22:57	7:30:26	7:39:45	7:51:05	8:00:16	8:12:41	8:24:12	8:36:56	8:46:07	8:54:08	
Honeysuckle Dve	7:01:23	7:08:21	7:16:33	7:23:18	7:31:46	7:40:20	7:51:51	8:00:41	8:13:47	8:25:17	8:37:18	8:47:25	8:55:02	
Hunter St	7:02:09	7:08:35	7:16:58	7:23:32	7:32:01	7:41:31	7:52:09	8:01:45	8:14:04	8:25:32	8:37:41	8:47:40	8:55:31	
King St	7:02:34	7:09:49	7:17:15	7:24:39	7:33:38	7:41:49	7:53:46	8:03:32	8:15:47	8:25:46	8:39:38	8:49:29	8:55:50	
Run Time														
CowperStreet														
Throsby Street	0:00:37	0:00:35	0:00:46	0:00:42	0:00:41	0:00:37	0:02:09	0:00:47	0:01:01	0:00:35	0:00:58	0:00:31	0:00:33	0:00:49
Honeysuckle Dve	0:00:17	0:00:17	0:00:32	0:00:21	0:01:20	0:00:35	0:00:46	0:00:25	0:01:06	0:01:05	0:00:22	0:01:18	0:00:54	0:00:43
Hunter St	0:00:46	0:00:14	0:00:25	0:00:14	0:00:15	0:01:11	0:00:18	0:01:04	0:00:17	0:00:15	0:00:23	0:00:15	0:00:29	0:00:28
King St	0:00:25	0:01:14	0:00:17	0:01:07	0:01:37	0:00:18	0:01:37	0:01:47	0:01:43	0:00:14	0:01:57	0:01:49	0:00:19	0:01:06
total	02:05	02:20	02:00	02:24	03:53	02:41	04:50	04:03	04:07	02:09	03:40	03:53	02:15	0:03:06

SBD - PM

End Point	1	2	3	4	5	6	7	8	9	10	Average Travel Time
CowperStreet	16:00:20	16:11:16	16:25:41	16:38:17	16:50:22	17:02:26	17:16:28	17:34:23	17:46:23	17:56:03	
Throsby Street	16:00:55	16:12:14	16:26:28	16:38:49	16:50:57	17:03:04	17:18:17	17:34:56	17:46:56	17:56:39	
Honeysuckle Dve	16:01:16	16:14:04	16:28:13	16:40:07	16:52:27	17:04:14	17:19:58	17:36:05	17:48:01	17:57:50	
Hunter St	16:02:30	16:14:47	16:28:52	16:40:25	16:53:04	17:04:35	17:21:01	17:36:28	17:48:29	17:58:15	
King St	16:02:46	16:16:27	16:30:33	16:40:41	16:54:30	17:06:17	17:22:45	17:38:19	17:48:45		
Run Time											
CowperStreet											
Throsby Street	0:00:35	0:00:58	0:00:47	0:00:32	0:00:35	0:00:38	0:01:49	0:00:33	0:00:33	0:00:36	0:00:47
Honeysuckle Dve	0:00:21	0:01:50	0:01:45	0:01:18	0:01:30	0:01:10	0:01:41	0:01:09	0:01:05	0:01:11	0:01:19
Hunter St	0:01:14	0:00:43	0:00:39	0:00:18	0:00:37	0:00:21	0:01:03	0:00:23	0:00:28	0:00:25	0:00:38
King St	0:00:16	0:01:40	0:01:41	0:00:16	0:01:26	0:01:42	0:01:44	0:01:51	0:00:16		0:01:12
total	02:26	05:11	04:52	02:24	04:08	03:51	06:17	03:56	02:22		0:03:56


RENAULT