APPENDIX

B

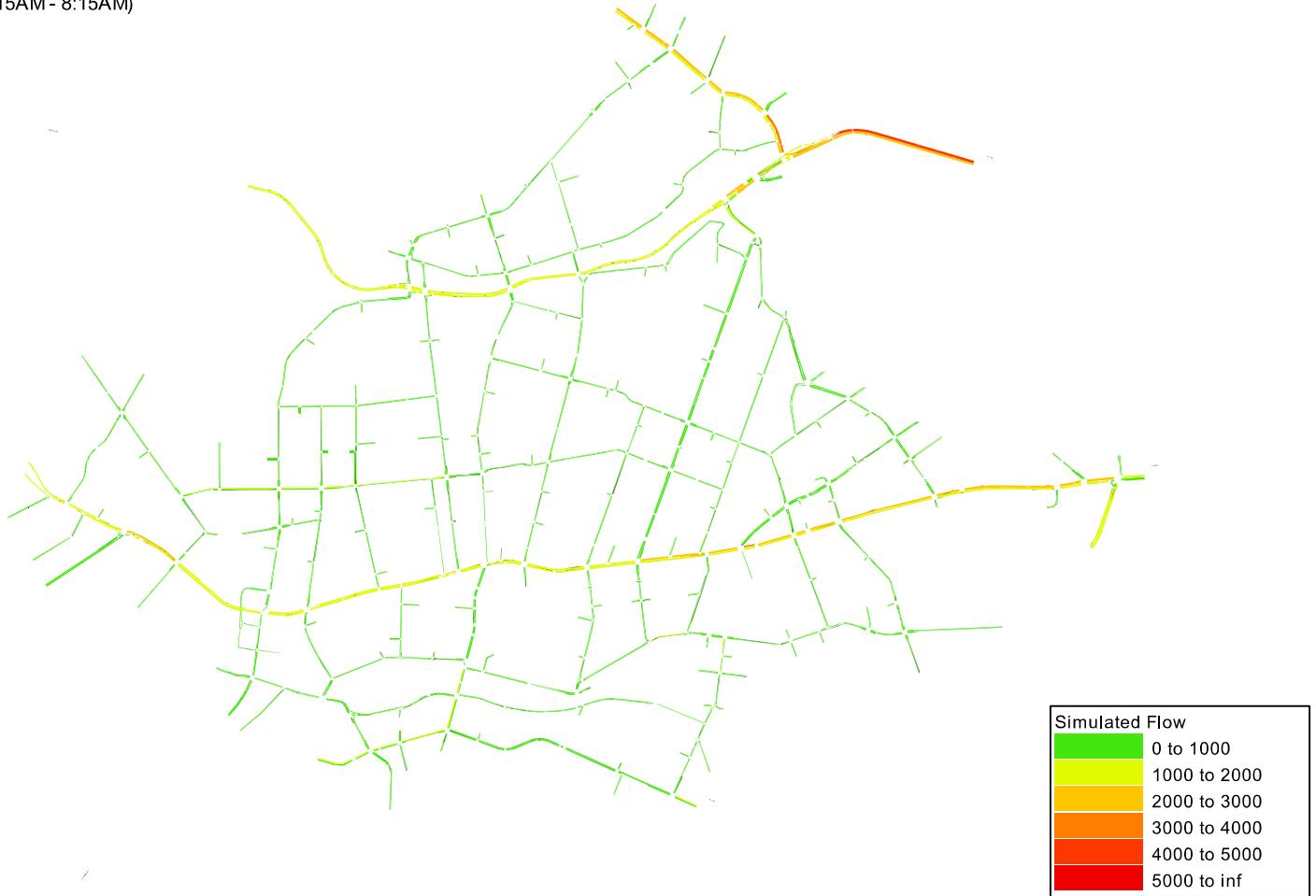## BASE MODEL FLOW PLOTS

Cardno®

Parramatta Road Corridor Urban Transformation Strategy
2018 Base Model
Simulated Flow
AM Peak (7:15AM - 8:15AM)

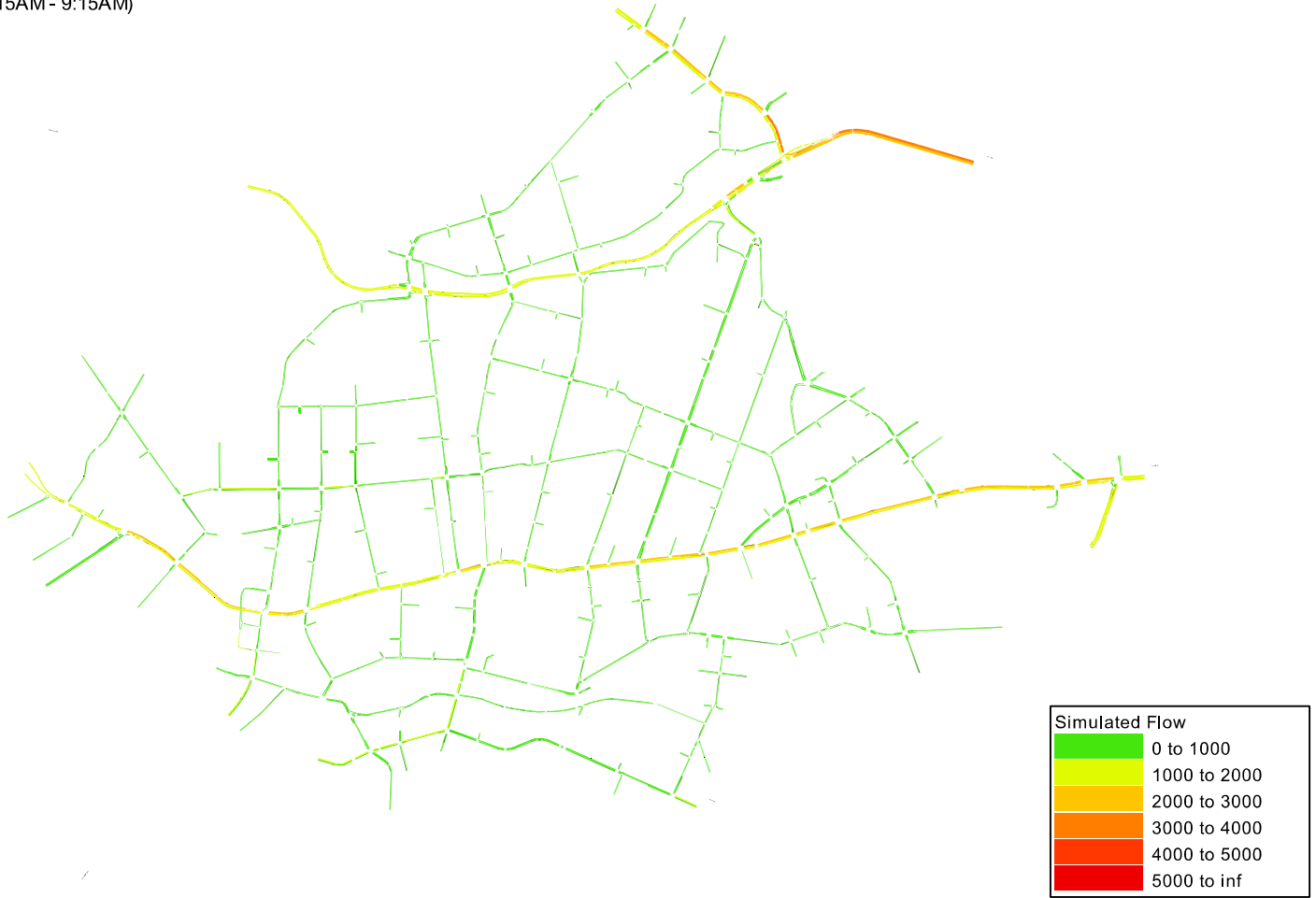| Simulated Flow	
	0 to 1000
	1000 to 2000
	2000 to 3000
	3000 to 4000
	4000 to 5000
	5000 to inf

Parramatta Road Corridor Urban Transformation Strategy
2018 Base Model
Simulated Flow
AM Peak (8:15AM - 9:15AM)

Simulated Flow	
	0 to 1000
	1000 to 2000
	2000 to 3000
	3000 to 4000
	4000 to 5000
	5000 to inf

Parramatta Road Corridor Urban Transformation Strategy
2018 Base Model
Simulated Flow
PM Peak (4:30PM - 5:30PM)

Simulated Flow
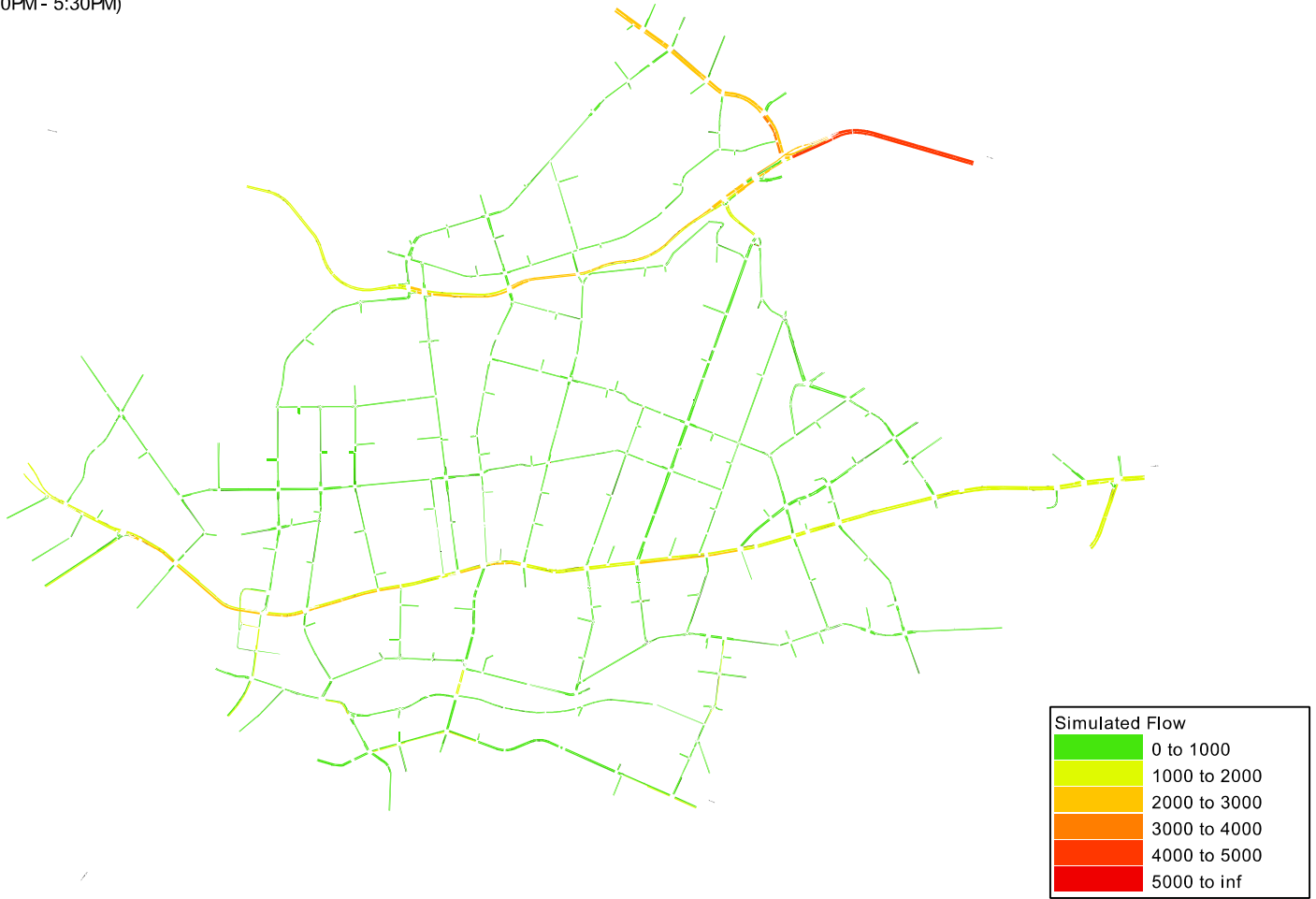0 to 1000
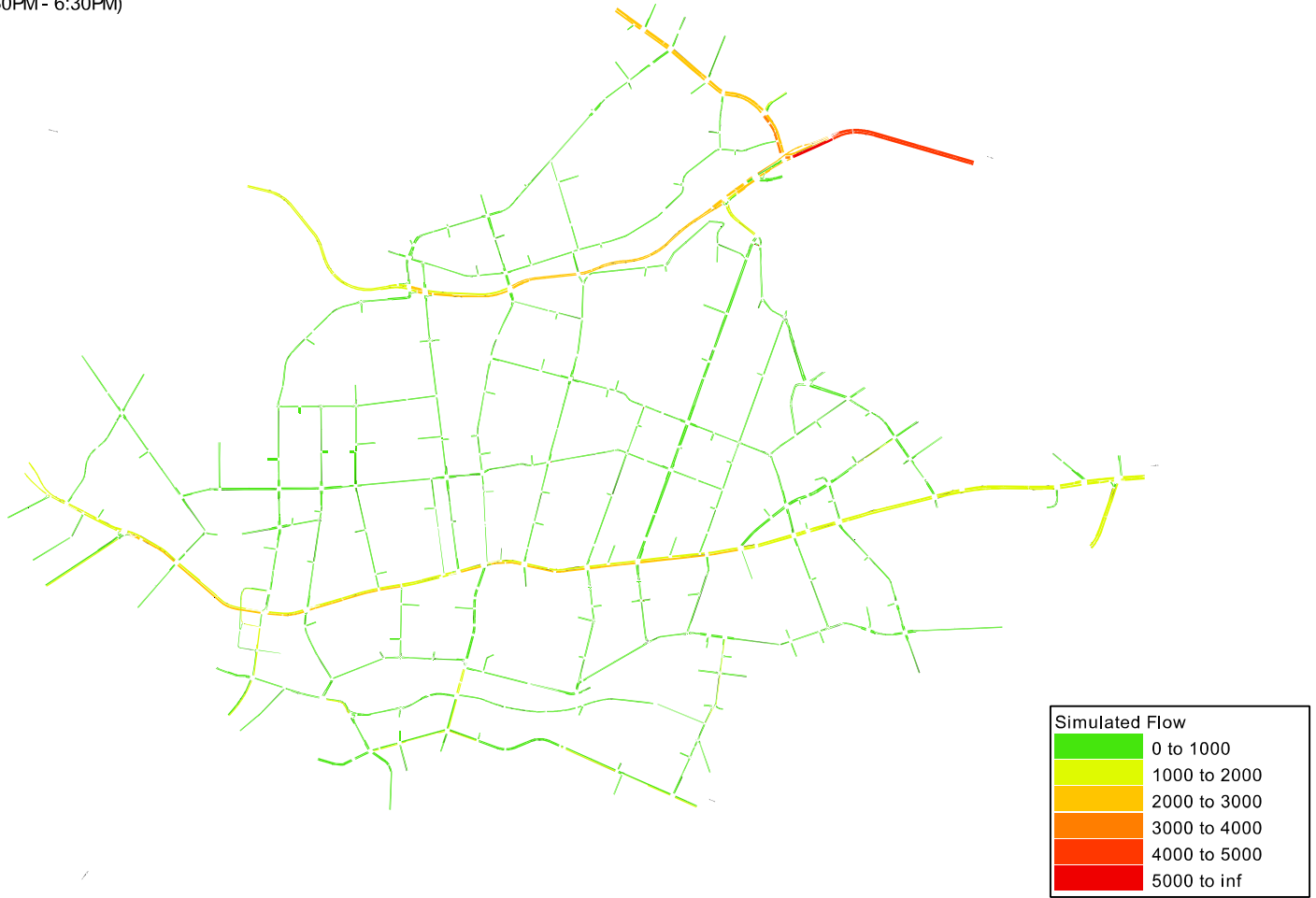1000 to 2000
2000 to 3000
3000 to 4000
4000 to 5000
5000 to inf

Parramatta Road Corridor Urban Transformation Strategy
2018 Base Model
Simulated Flow
PM Peak (5:30PM - 6:30PM)

Simulated Flow
- 0 to 1000
- 1000 to 2000
- 2000 to 3000
- 3000 to 4000
- 4000 to 5000
- 5000 to inf

APPENDIX

C

BASE MODEL DENSITY PLOTS

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Parramatta Road Corridor Urban Transformation Strategy
2018 Base Model
Simulated Density
AM Peak (7:15AM - 8:15AM)
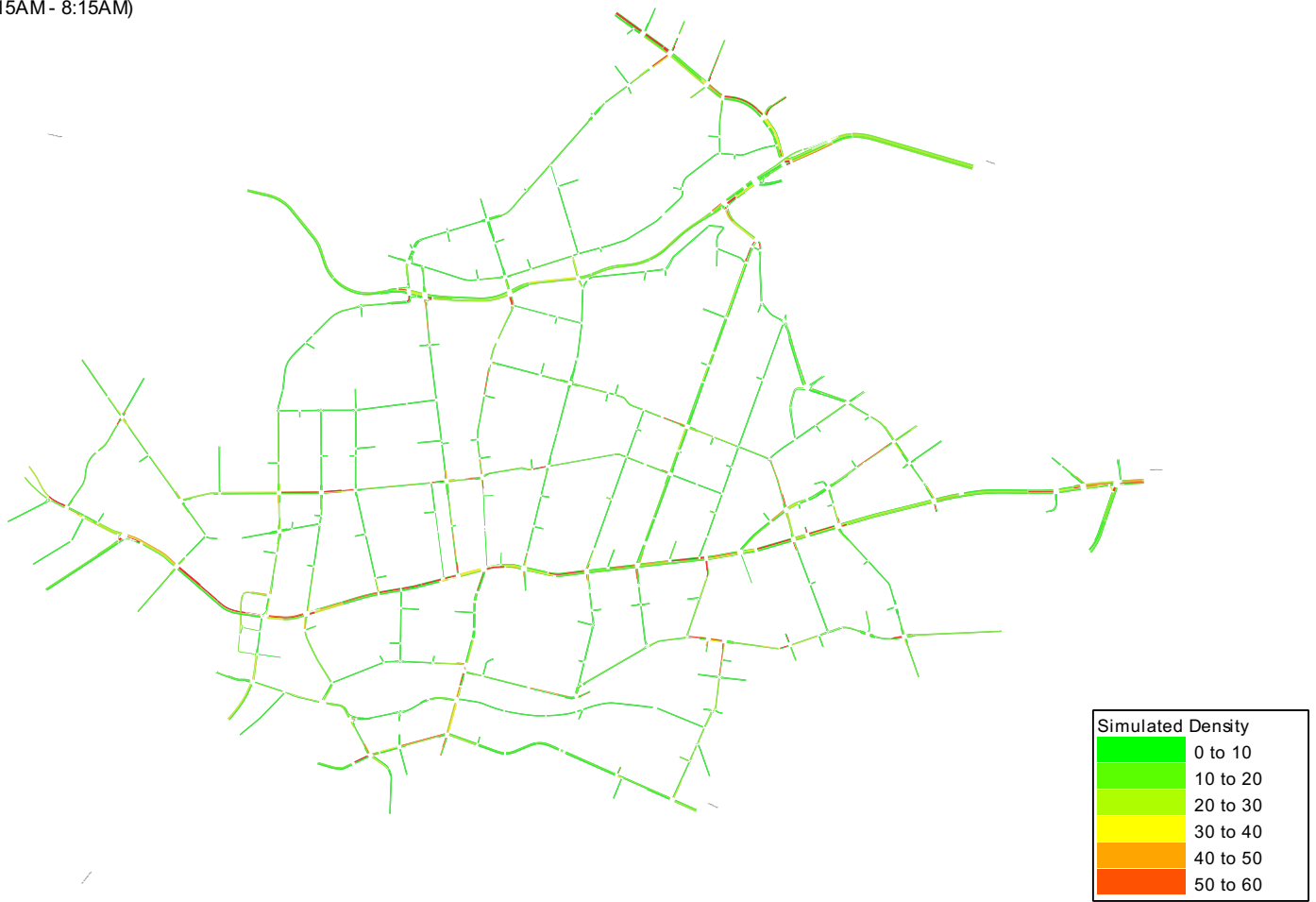
Simulated Density
0 to 10
10 to 20
20 to 30
30 to 40
40 to 50
50 to 60

Parramatta Road Corridor Urban Transformation Strategy
2018 Base Model
Simulated Density
AM Peak (8:15AM - 9:15AM)
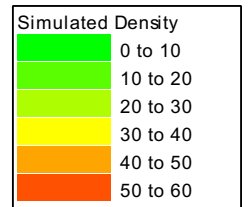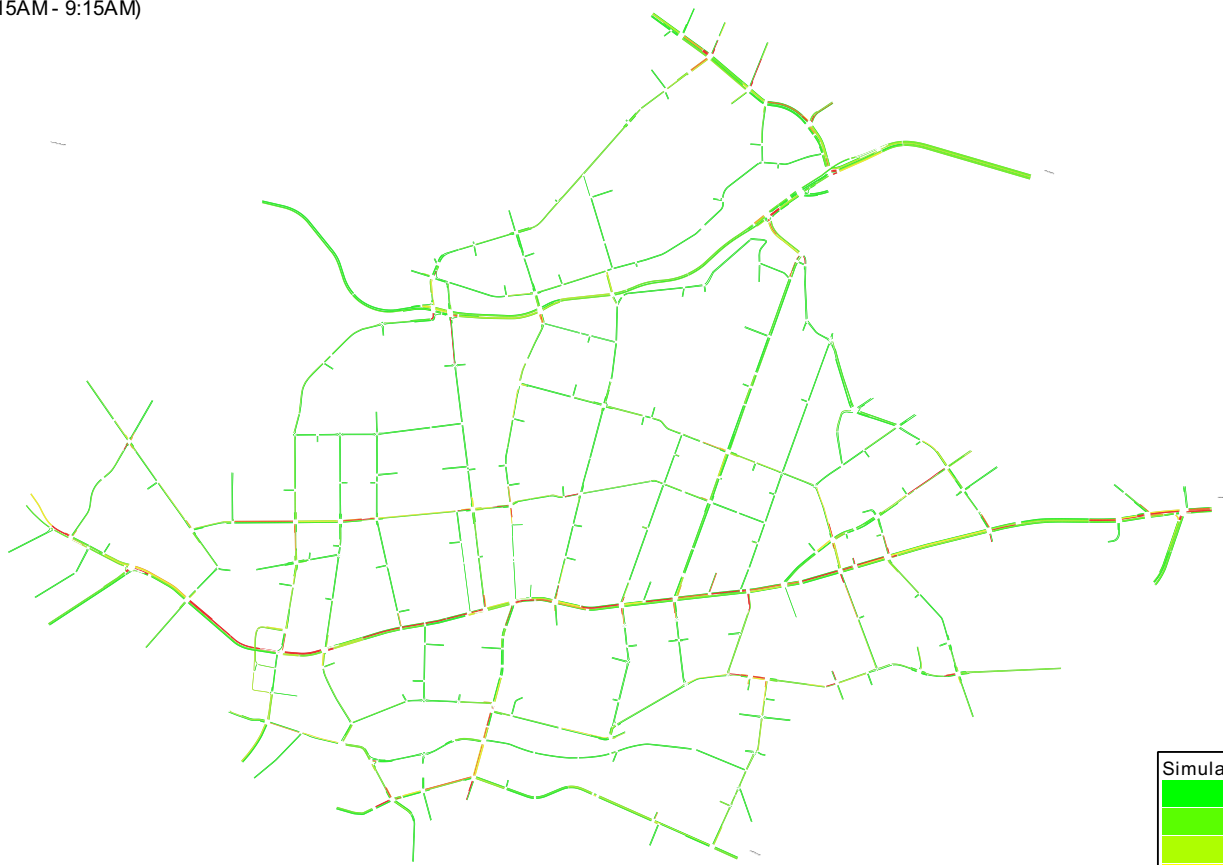
Simulated Density	
	0 to 10
	10 to 20
	20 to 30
	30 to 40
	40 to 50
	50 to 60

Parramatta Road Corridor Urban Transformation Strategy
2018 Base Model
Simulated Density
PM Peak (4:30PM - 5:30PM)

Simulated Density	
	0 to 10
	10 to 20
	20 to 30
	30 to 40
	40 to 50
	50 to 60

Parramatta Road Corridor Urban Transformation Strategy
2018 Base Model
Simulated Density
PM Peak (5:30PM - 6:30PM)

Simulated Density	
	0 to 10
	10 to 20
	20 to 30
	30 to 40
	40 to 50
	50 to 60
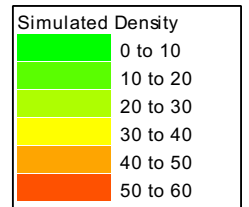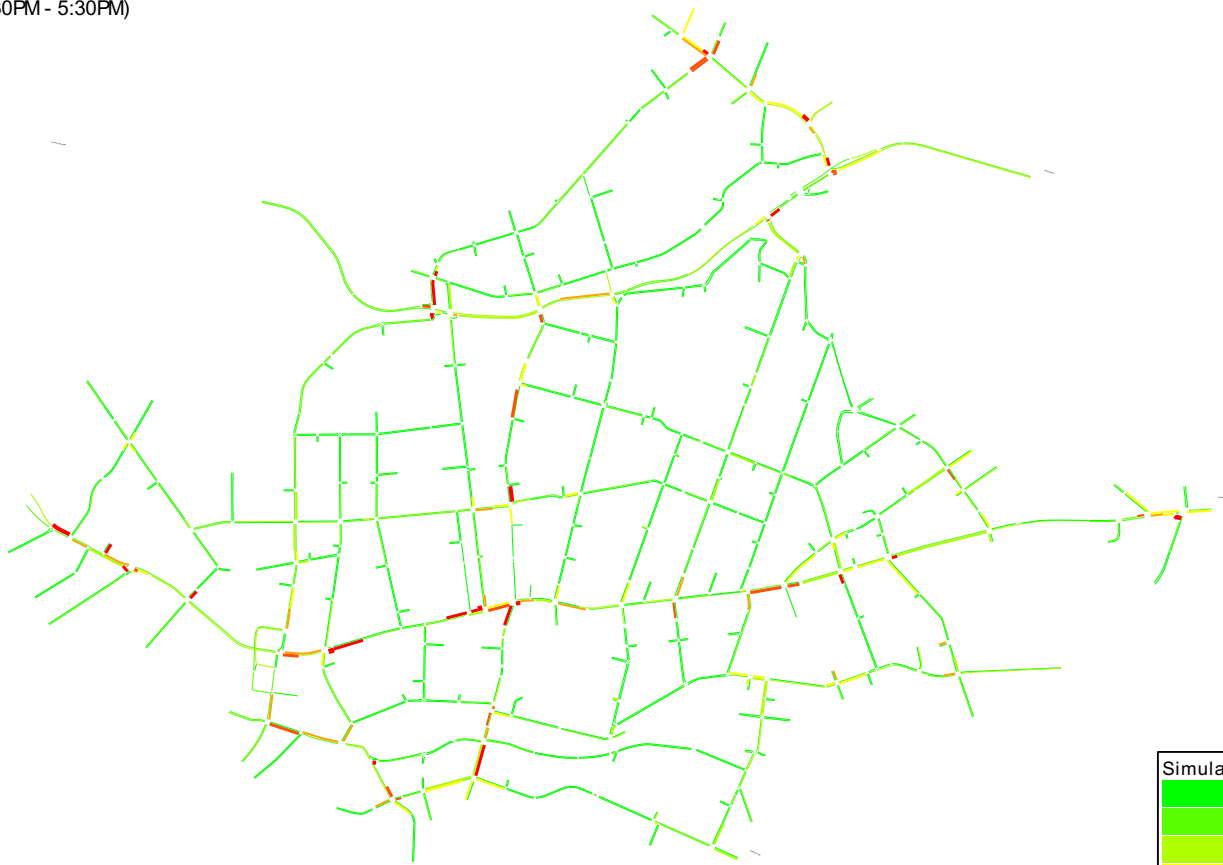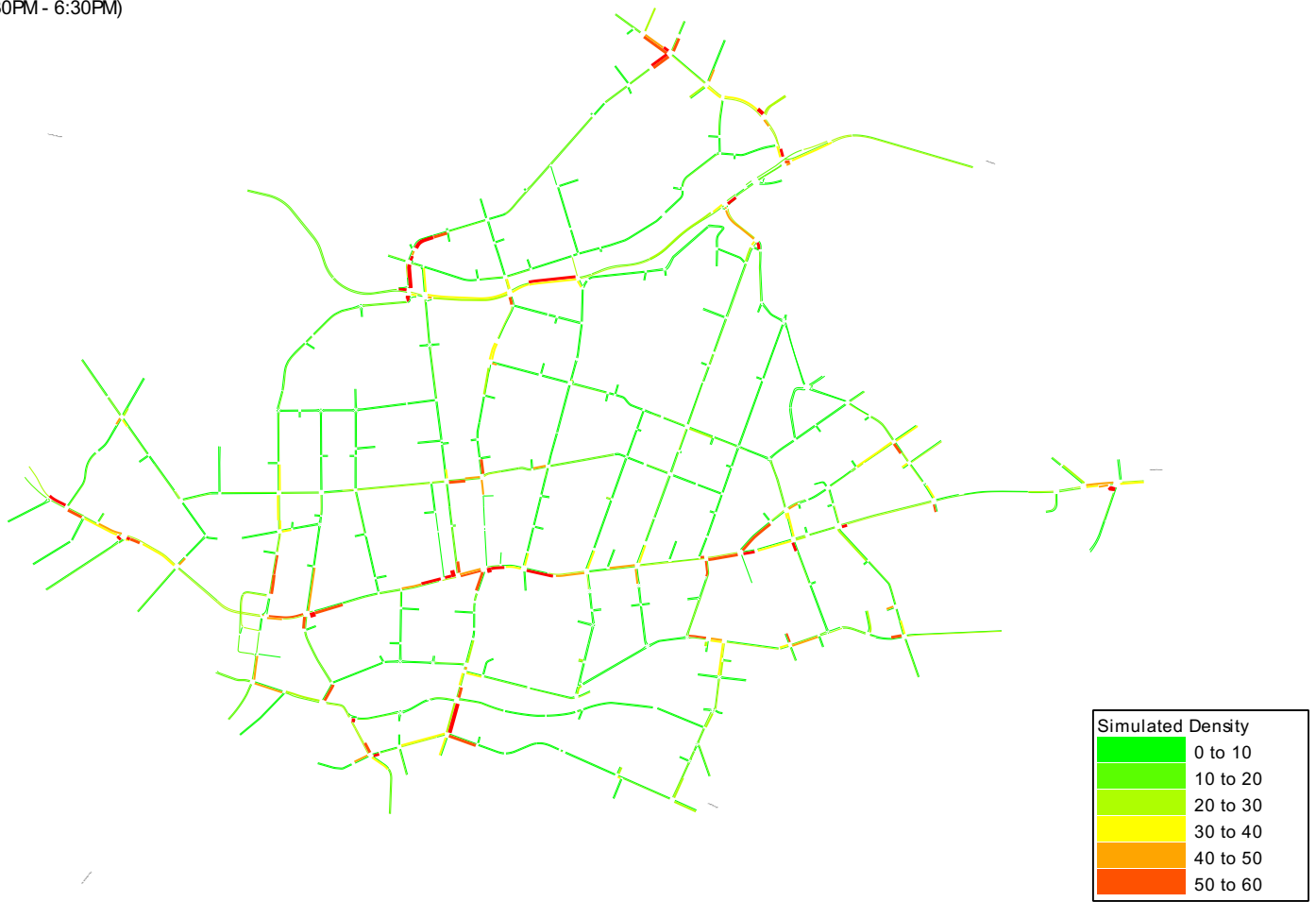
APPENDIX

B

BASE MODEL PEER REVIEW (ARUP, MARCH 2020)

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File Note

ARUP

Project title	Parramatta Road Urban Transformation Corridor	Job number
		274030-00
cc	Navdeep Hanjra (DP&E) Kris Walsh (DP&E)	File reference
		TN01
Prepared by	Hamid Safi	Date
		18 March 2020
Subject	Base Model Peer Review	

1 Introduction

Arup has been engaged by the Department of Planning and Environment (DP&E) to undertake an independent model review of the Parramatta Road Corridor Urban Transformation Transport Study (PRCUTS), within the Inner West Council (IWC) local government area, Aimsun model. DP&E, through their consultants, have prepared an Aimsun model of the Parramatta Road Urban Transformation Corridor.

This technical note summarises the findings of this review, which has been undertaken to assess whether the model developed provides an accurate reflection of base year conditions and will ultimately provide a robust basis from which to forecast future year performance and identify appropriate road infrastructure requirements to support planned urban growth.

The Parramatta Road Urban Transformation Corridor model file that was reviewed was named:

- 20190412 - PRRP Base Model V1.0.ang

The model review process set out in this note is in accordance with key model development items defined in Roads and Maritime Service's (RMS) modelling guidelines. The structure of this note is outlined below:

- Model development

- Demand development

- Key modelling parameters and assumptions

- Intersections and signalisation

- Public transport inputs

- Active transport and pedestrians

- Assignment and convergence

- Calibration and validation

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2   Model development

The Parramatta Road Corridor hybrid (microscopic and mesoscopic) model was developed using the Aimsun software package to address the following needs:

1.   To evaluate the impacts of future infrastructure upgrades of the study area

2.   To investigate future developments and land use changes in the study area for the horizon years

3.   To assess the maximum road network capacity and recommended public transport mode shift

4.   To investigate the optimal configuration of intersection improvements at key intersections.

The network coding of this model was mainly based on inputs from the Parramatta Road Reconfiguration Program (PRRP) model. The road network was further refined to reflect the latest network geometry properties of the study area. These refinements were mainly related to changes to sections' capacities and speed limits, geometry alignments, lane and parking restrictions and public transport routes. A slope model was applied in the network coding of the model to better replicate the performance of road traffic, mainly heavy vehicles. This model was based on inputs received from Department of Finance, Services and Innovation Spatial Services.

The Sydney Strategic Travel Model (STM) was considered as the reference point in this project for demand adjustment. A subarea cordon was established from the STM based on the extent of the modelled network. This was used to interrogate the STM to extract the 2016 travel demands.

For the purpose of this project, a classified intersection counts data collection was conducted at 83 important intersections within the study area. This data was mainly used for demand adjustment and model calibration. Moreover, in order to validate the performance of the model, the travel time data of eight major routes through the study area were collected and processed from the TomTom database for a four-week period. Three modes of vehicle (light vehicles, heavy vehicles and buses) were included in the development of this Aimsun model.

School zones within the study area were identified, and appropriate rules were defined in the model to restrict the maximum speed of related sections to 40 km/hr during school hours (8:00–9:30AM and 2:30pm–4:00PM).

Accordingly, a hybrid (microscopic and mesoscopic) model was developed for two two-hour weekday peak periods (7:15am–9:15am and 4:30pm–6:30pm). For each peak period, a "warm-up" period of 60 minutes was also included.

2.1   Review findings

The overall structure and model development requirements of the Parramatta Road Corridor model were reviewed, and main findings are summarised in Table 1.

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Table 1: Main findings of the model development review

#	Item	Status	Finding
1	**Model Development**		
1.1	Aimsun Version	No issue	Aimsun Next 8.2.3 (R54491)
1.2	Methodology - Network coding	No issue	Generally acceptable
1.3	Methodology - Demand processing	No issue	Generally acceptable
1.4	Database definition and connection	Minor issue	Database of the model was not defined correctly. PM assignment results are not existing in the model.
1.5	Data collection	No issue	Acceptable coverage
1.6	Model dimensions / scale	No issue	Model determined to be correct scale based on spot checks
1.7	Layers	No issue	Checked
1.8	Background image file	No issue	Not available
1.9	Background coordinate system	No issue	No issues identified
1.10	Model Time Periods	No issue	Checked. Well supported
1.11	Pre-Peak Warm-Up	No issue	Included
1.12	Model Layout and Configuration	No issue	No issues identified
1.13	Vehicle Types	No issue	Checked. Well documented
1.14	Road and Lane Types	No issue	Reviewed. No issues identified

3   Demand development

The strategic-level demand data was adjusted based on actual turn movement data, introduced to the model as RDS files. The matrix adjustment tool within Aimsun (static OD adjustment) was used for this analysis. Matrix adjustment is a procedure for adjusting a prior OD matrix, using observed traffic data. The goal of the procedure is to reduce the least squares error between observed traffic data and traffic flows assigned by the model.

Key aspects of the demand development process for the PRCUTS base year model are summarised as follows:

- The starting point of demand calibration was a subarea model, which was defined on Sydney Strategic Travel Model (STM) – 2016 base case scenario

- The traversal demand matrices of the resulting cordon model, which included 96 centroids, was imported into Aimsun

- The collected turn movement data was processed and imported into the model for demand adjustment

- The strategic level demand matrices were adjusted using the Static OD adjustment tool based on the imported RDS files

- Resulting matrices were adjusted manually to improve calibration results, as required

- Adjusted demand matrices were profiled based on observed traffic data (RDS files) using the Static departure adjustment tool.

- 2-hour OD matrices for the AM peak (7:15-9:15AM) and PM peak (4:30-6:30PM) were generated based on traffic survey data;

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- o A "warm-up" period of 60 minutes was included in the model to populate the road network;
- o Demands were split into 15-minute time slices and added to the model as an additional set of matrices

3.1 Review findings

The procedure of demand development for the Parramatta Road Corridor model was reviewed based on coded tools in the model and the provided report. Main findings are summarised below:

3.1.1 Zoning refinement

Considering the level of detail incorporated in a mesoscopic/microscopic model compared to a strategic model, it was expected that a refinement of the zoning system would have been required within the model to better replicate the behaviour of trip generators of the study area. No evidence was found in the report or the model in this regard.

3.1.2 Static OD adjustment – Sanity check

As a sanity check, Arup re-ran the existing model's "static OD adjustment" tool for AM peak period, using the provided strategic-level demand matrices and RDS files. This resulted in two relatively different matrices. Table 2 compares the total demand of cars and trucks in the existing and new matrices. It should also be noted that the resulting trip length distribution of the new run was slightly different compared to the existing run retrieved from the model.

Table 2: Comparison of existing and new OD adjustment results

	Existing matrices	New matrices	Diff	Diff (%)
Car - AM	63,217	65,944	2,727	4.3%
Truck - AM	2,870	2,572	- 298	-10.4%

3.1.3 PM peak-related assignments

Arup was unable to check the validity of PM assignment results in the model, as the received model did not include assignment/adjustment results for PM peak.

Due to an issue noticed in the defined public transport routes of the PM scenario, it was not possible to run the PM peak adjustment tools of the model. This issue is discussed further in Section 6.

3.1.4 Static departure adjustment

Inspection of the existing tools defined in the model showed that a warm-up period of 60 minutes was defined for the "static departure adjustment" tool in both the AM and PM periods. The "static departure adjustment" tool considers the simulated travel time of the network for profiling the demand for each origin-destination pair crossing an observation point. In other words, having realistic travel times form each origin to an observed point is crucial for an accurate demand profiling. Since this tool starts from an empty network, appropriate warm-up time is required to load the network sufficiently. This time for the PRCUTS model is around 60 minutes. In addition to the normal warm-up period, the "static departure adjustment" tool requires the network to work under a fully-loaded condition for some intervals to report realistic travel times for the crossing

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origin-destination pairs. Due to the extent of the model, 60 minutes is an insufficient warm-up duration for a "static OD departure adjustment, and it is recommended to increase this interval.

3.1.5   Dynamic OD adjustment

An overall view of the implemented demand adjustment procedure was provided in Figure 3-3 of the PRCUTS Base Model Development Report. This figure states that Aimsun's "dynamic OD adjustment" tool was used for demand calibration, however no evidence of this was found in the model.

3.1.6   Findings summary

Review findings regarding the demand development are summarised in Table 3.

Table 3: Main findings of the demand development review

#	Item	Status	Finding
2	**Demand Development**		
2.1	Centroid Configuration	Minor issue	A zoning system refinement was expected considering the nature of the area
2.2	Centroid Configuration Name	No issue	No issues identified
2.3	Real Data Sets	No issue	Reviewed. No issues identified
2.4	Unavailable PM results	Moderate issue	No assignment results were existing in the database for PM period
2.5	Traffic Demands matrices	No issue	Reviewed. No issues identified
2.6	Origin - Destination Matrices	No issue	Reviewed. No issues identified
2.7	Origin - Destination Matrix Names	No issue	Reviewed. No issues identified
2.8	Traffic Demand Names	No issue	Reviewed. No issues identified
2.9	Static OD Adjustment	Major issue	Results of a re-run showed relatively different results
2.10	Static Departure Adjustment	Minor issue	Insufficient warm-up duration was considered in the model
2.11	Dynamic OD adjustment	Major issue	No evidence found in the model for this step
2.12	Path Assignment Names	No issue	Reviewed. No issues identified
2.13	Documentation of assumptions	No issue	Reviewed. No issues identified

4   Key modelling parameters and assumptions

As an operational traffic model, the Parramatta Road Corridor model consists of a significant number of parameters and assumptions. Based on extensive research and experience from other projects, Aimsun suggests default values for each of these parameters. Technically, any change to these default values needs to be recorded and justified. This section documents those important parameters that were changed from default values without appropriate justification.

4.1   Variation from software defaults

Based on observation of the model, a minimal intervention approach has been taken during the model development with most driver behaviour parameters were retained at the software default settings with the exceptions discussed below.

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4.1.1   Reaction times

"Reaction Time at Stop" and "Reaction Time at Signals" were changed in the model without any justification:

- Reaction Time (mesoscopic) = 1.30 sec (default = 1.20 sec)

- Reaction Time at Traffic Light (mesoscopic) = 1.70 sec (default = 1.60 sec)

Additionally, "reaction time at stop" and "reaction time at signals" values used for turns in the Stochastic Route Choice (SRC) assignments are not consistent with similar factors for Dynamic User Equilibrium (DUE) assignments for both AM and PM periods.

4.1.2   Attractiveness weight

The "attractiveness weight" factor is an import parameter in dynamic route choice calculations, as it considers the importance of road hierarchy for users. This factor is useful for controlling rat-running on local streets, especially when the arterial network becomes congested. The Parramatta Road Corridor model has used an attractiveness factor of zero, which means the model does not differentiate between local and arterial roads in the route choice of users other than through travel speed and delays.

It is not apparent from the model results if rat-running is an issue in the base year model. However, this could become an issue in future year scenarios. Therefore, it is recommended that the modeller consider using the attractiveness weight factor in the dynamic assignment.

4.1.3   Give-way time

"Give-way time factor (mesoscopic)" for roundabout turns was increased from 1 to 2. Justification for this change was not included in reporting.

4.1.4   Queue discharge acceleration

The "queue discharge acceleration factor" was reduced from 1.0 to 0.5 for the "Paramatta Rd" and "City-West Link Rd" sections without justification.

4.1.5   Additional reaction time at stop and traffic light

"Additional reaction time at stop" and "additional reaction time at traffic light" are two local attributes which are sometimes used to calibrate the simulated traffic flow and right of way of intersections. The default value of these attributes is zero. Increasing this value for a turning movement means users will perform that movement with extra caution. It has been observed in the model that negative values were allocated for the "Additional reaction time at stop" and "Additional reaction time at traffic light" of the approaching section of the "City Rd" to "Parramatta Rd", while negative values for "Additional reaction time at stop" and "Additional reaction time at traffic light" are not justifiable.

4.1.6   Lane changing cooperation

"Lane changing cooperation" values for the sections listed in Table 4 were changed from 50% without justification. The increase of "lane changing cooperation" attributes for a section means vehicles will support each other for easier lane changing. The modification of this attribute requires justification.

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Table 4: Lane changing cooperation variations

Name	Section name	Lane-Changing Cooperation
N13701_N11731	WB approach of Parramatta Rd & Sloane St intersection	100
N10601_N12028	WB approach of Anzac Bridge & Victoria Rd intersection	70
N12026_N12025	SB approach of Victoria Rd & Anzac Bridge intersection	70
N12026_N12025	SB approach of Victoria Rd & Anzac Bridge intersection	70
N16236_N10601	WB approach of Parramatta Rd & Sloane St intersection	60
N12028_N12026	SB approach of Victoria Rd & Anzac Bridge intersection	60

4.1.7   Acceleration factor

As shown in Figure 1, varying acceleration factors have been applied to sections within the network. No logic was identified for this allocation of acceleration factors.

Figure 1: Acceleration factor visualisation of the road network

Increasing an acceleration factor means faster reaction of users, indirectly increasing the capacity of a section. Reduction of an acceleration factor has the inverse effect on capacity.

4.2   Review findings

Main findings regarding general modelling parameters and assumptions are summarised in Table 5.

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Table 5: Review findings of general modelling parameters and assumptions

#	Item	Status	Finding
3.1	**Modelling parameters and assumptions - General**		
3.1.1	Arrival Type	No issue	Reviewed. No issues identified
3.1.2	Attractiveness weight	Minor issue	It is recommended to increase this weight (from zero) to be able to consider the impact of road hierarchy in the route choice decisions of vehicles. The value of zero means that there is no difference between local and arterial roads for route choice of users
3.1.3	Reaction Time at Stop	Major issue	Inconsistent values used for turns in SRC and DUE assignments for both AM and PM periods
3.1.4	Reaction Time at Signals	Major issue	Inconsistent values used for turns in SRC and DUE assignments for both AM and PM periods
3.1.5	Dynamic Cost Functions	No issue	Reviewed. No issues identified

Main findings regarding those modelling parameters and assumptions related to turns are summarised in Table 6.

Table 6: Review findings of modelling parameters and assumptions related to turns

#	Item	Status	Finding
3.2	**Modelling parameters and assumptions - Turns**		
3.2.1	Speeds	No issue	Reviewed. No issues identified
3.2.2	Yellow Box Speeds	No issue	Reviewed. No issues identified
3.2.3	Give Way Time Factor(s)	Minor issue	Give-way Time Factor (Meso) for roundabout turns increased to 2, while not reported

Main findings regarding modelling parameters and assumptions related to sections are summarised in Table 7.

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Table 7: Review findings of modelling parameters and assumptions related to sections

#	Item	Status	Finding
3.3	**Modelling parameters and assumptions - Sections**		
3.3.1	Road Type	No issue	Reviewed. No issues identified
3.3.2	Speed	No issue	Reviewed. No issues identified
3.3.3	Additional reaction time at stop	Moderate issue	Negative values allocated to this attribute for the approaching section of the "City Rd" to "Parramatta Rd", which is not justifiable
3.3.4	Additional reaction time at traffic light	Moderate issue	Negative values allocated to this attribute for the approaching section of the "City Rd" to "Parramatta Rd", which is not justifiable
3.3.5	Capacity	No issue	Reviewed. No issues identified
3.3.6	Lane changing cooperation	Moderate issue	Lane changing cooperation of six sections increased from 50% without justification
3.3.7	Queue discharge acceleration factor	Moderate issue	This factor was reduced from 1.0 to 0.5 for Paramatta Rd" and "City-West Link Rd" sections, without justification
3.3.8	Acceleration factor	Major issue	No logic identified in the allocation of acceleration factor to road sections (See Figure 1)

5   Intersections and signalisation

There are of 50 intersections within the study area which are signal controlled. Key aspects of the modelled signal operations are summarised as follows:

- Traffic signal data was sourced from the same day as the surveys and provided in the form of intersection diagnostic monitor (IDM) data;

- Roads and Maritime SCATS system was engaged to extract the intersection diagnostic monitor data;

   o   It is noted that the modelled signal operations are fixed-time based;

   o   Conversion of in-situ actuated signals to fixed time signals, using the average behaviour of the actuated signals within each hour of the two-hour peaks;

- A standard inter-green time of 6 seconds was applied, incorporating 4 seconds of amber time and 2 seconds of all-red time; and

- The LX Data was interpreted to inform the co-ordination between signals by including signal offsets.

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5.1   Review findings

Review findings regarding intersections and signalisation are summarised in Table 8.

Table 8: Review findings of intersections and signalisation

#	Item	Status	Finding
4	**Intersections and signalisation**		
4.1	Control Type	No issue	Reviewed. No issues identified
4.2	Yellow Time	No issue	Reviewed. No issues identified
4.3	Red Percentage	No issue	Reviewed. No issues identified
4.4	Phases	Moderate issue	Node 82756 does not have any movement allocated to third phase. Phasing of the "N4528 SITE 47 – Parramatta Rd & Old Canterbury Rd & Tebbutt St" intersection appears to be incorrect – only one phase of movement defined (minor movements don't have any phase) Phasing of External ID 17437 appears to be incorrect
4.5	Fixed time	No issue	All signalised intersections are modelled as fixed time based, due to the complexity of the network
4.6	Permitted Movements	Moderate issue	Time allocated for pedestrian crossings at signals appear to be too high (assumed 16 seconds in every 80 sec) - (External IDs: 13124, 13604337, 22438)
4.7	Sequences	Minor issue	Phasing of "N4528 SITE 86 - Parramatta Rd & Renwick St & Railway St" intersection appears to be incorrect – only one phase of movement defined (minor movements do not have any phase)

6   Public transport inputs

Key aspects of the public transport modelling are summarised as follows:

- Bus route and timetable information was derived and imported using the General Transit Specification Feed (GTFS);
- Bus dwell time at all stations are defined as below (based on GTFS inputs):
  - Mean = 30 seconds; and
  - Standard deviation = 10 seconds.
- Train services were not modelled since all road-rail junctions in the study area are grade-separated; and
- Light rail services were not modelled since all road-rail junctions in the study area are grade-separated.

6.1   Review findings

Review findings regarding the public transport inputs are summarised in Table 9.

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Table 9: Review findings of the public transport inputs

#	Item	Status	Finding
5	**Public Transport Inputs**		
5.1	Public Transport Plans /Lines	Moderate issue	44 bus routes are not connected for the PM peak model. It is caused because of a new section added to the model, but not updated in the routes of these PT lines
5.2	Rail Routes and Stations	No issue	Not existing
5.3	Light Rail Routes and Stops	No issue	Not existing
5.4	Public Transport Stops	No issue	Reviewed. No issues identified

7   Active transport and pedestrians

Pedestrians have not been directly modelled and cyclist volumes and infrastructure were not considered in the PRCUTS Study base year model (PRCUTS Base Model Development Report, pg. 31). The review has concluded that at signalised intersections containing a pedestrian crossing, signal timings have included a phase which holds back left turns to mimic delays experienced by vehicles.

Existing traffic signal timings used for the base year modelling consider the probability of vehicular delay caused by pedestrian crossings. This results in pedestrian phase times which are lower than minimum requirements for pedestrian crossings. Analysis has been undertaken on the signal timing and .lx files received from Roads and Maritime to derive averaged pedestrian crossing timing of three seconds or more. It is noted that traffic signal timings assume that pedestrian crossings are always activated, thus considered a conservative assumption.

Active transport and pedestrian activities on mid-blocks and for walking destinations were not completely coded in the model due to the lack of information.

7.1   Review findings

Review findings regarding active transport and pedestrian inputs to the model are summarised in Table 10.

Table 10: Review findings of active transport and pedestrian inputs

#	Item	Status	Finding
6	**Active transport and pedestrians**		
6.1	Pedestrian crossings at intersections	Minor issue	Mostly coded correctly (with some minor issues, such as Node IDs N_13124, 13604337, N_22438, where inappropriate pedestrian phase durations were defined in the model)
6.2	Allocating required time (intersections)	No issue	A conservative approach was chosen for coding the signal times
6.3	Pedestrian crossings on mid-blocks	No issue	Not coded completely due to the lack of information on mid-block pedestrian paths and walking destinations
6.4	Allocating required movement and time	Minor issue	Mostly coded correctly (with some minor issues, such as N4528 SITE 47, N_17437 and N4528 SITE 86, where phases without any movement were observed)

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8   Assignment and convergence

Three different levels of assignment were used to replicate the traffic assignment performance of the network. These assignments were performed in the order shown below and the output of each step was used as the input of the next step. These assignment steps were:

- Static (Frank & Wolfe) assignment at macro level,
- Dynamic User Equilibrium (DUE) assignment at hybrid level,
- Stochastic Route Choice (SRC) assignment at hybrid level

User route choice was first recorded in the path file generated by the static level traffic assignment. This routing was subsequently used as the starting point for the DUE traffic assignment. Static assignment convergence settings were targeted to achieve a 0.10% relative gap within 50 iterations in each peak period.

According to the implemented methodology, the next step was a DUE assignment. In this type of traffic assignment, it is assumed that all the users of a transportation network are familiar with the network and always seeking to minimize their travel time/cost from origins to their respective destinations. At the end of this type of assignment:

- The journey times of all used routes (for any pair of origin-destination) are equal, and less than those which would be experienced by a single vehicle on any unused route (user optimisation)
- The average journey time of the network is minimized (system optimisation)

The model achieves convergence when the relative gap in route costs between successive iterations reduces to below a user-defined threshold. Hybrid DUE convergence outputs show that the models were set to target a convergence of a 3.00% relative gap within 20 iterations in each peak period. In order to accelerate the convergence procedure and reduce the number of possible paths in each iteration, it was defined in the assignment settings to ignore paths containing less than 5% of the total demand for any origin-destination pair.

In the next step, the path file of the DUE assignment at hybrid level was used as the input for a series of SRC assignments. Since operational assignment models (microscopic and mesoscopic) dynamically simulate the traffic interaction and driver behaviour in a stochastic way, small changes on a network element can have significant cumulative impacts upon congestion and delays. To address the stochasticity impact of operational assignment models, the RMS Traffic Modelling Guidelines provides a list of random seed values to be used in SRC assignments to produce small levels of variability, reflecting behaviours exhibited in the real world. In accordance with this, each scenario was simulated using five different seed values to test model stability. The random seed that results in the median level of total vehicle hours travelled (VHT) should be used for model calibration and validation, as well as all future scenario analysis.

8.1   Review findings

Review findings regarding the employed assumptions for assignments and convergence criteria are summarised in the following sections.

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8.1.1   Static assignment convergence

Static assignment does not achieve convergence for the AM period based on the 'Relative Gap' of 0.5 per cent (as specified in the tool). It achieved the relative gap of 0.91 after 50 iterations. Considering the importance of the static path file in this model, it is recommended to achieve the specified level of convergence by increasing the number of iterations.

- Convergence is a key modelling target, especially when the resulting path file is used as the main input for DUE and then SRC assignments at hybrid level. Since the calculation of additional path is disabled in the DUE assignment a high level of confidence in the resulting path file of the static assignment is desirable.

8.1.2   Dynamic User Equilibrium (DUE) convergence criteria

Dynamic User Equilibrium (DUE) convergence criteria is relatively loose:

- Relative Gap = 3.00% (default = 0.50%)

- Do Not Consider Paths with a Percentage Below = 5.00% (default = 1.00%)

8.1.3   Calculate additional path for hybrid DUE

The calculation of additional path for Hybrid DUE is disabled for both peak periods. It means that the DUE assignment will only use routes shortlisted in the static assignment results (maximum 3 routes for each origin-destination) and cannot add (or check) new routes.

Static assignment is a relatively inaccurate type of assignment, as it cannot directly consider the impact of signal controls or traffic congestion in route choice.

- As the AM period static assignment was not converged, disabling the calculation of additional paths for DUE could lead to significant shortcomings in the resultant assignment results.

To test the significance of this assumption, the AM and PM hybrid DUE models were re-run as part of the model review with the calculation of additional paths enabled. The resulting convergence graphs for these runs are compared to the original models in Figure 2.

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AM period convergence graphs
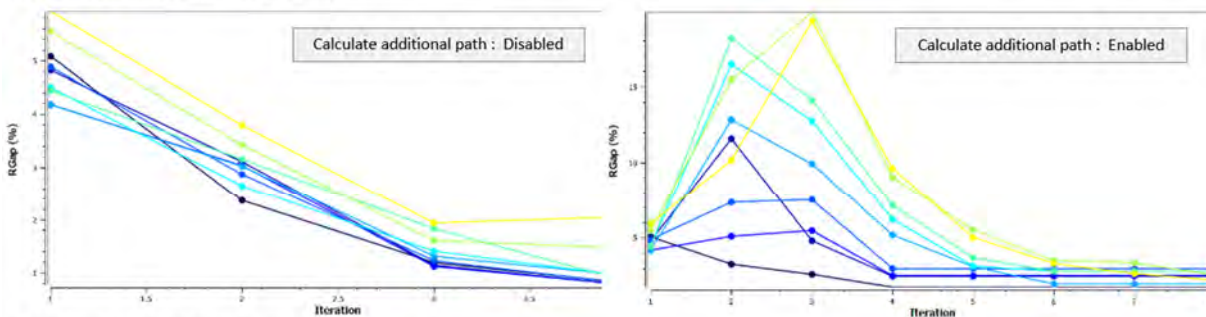
PM period convergence graphs
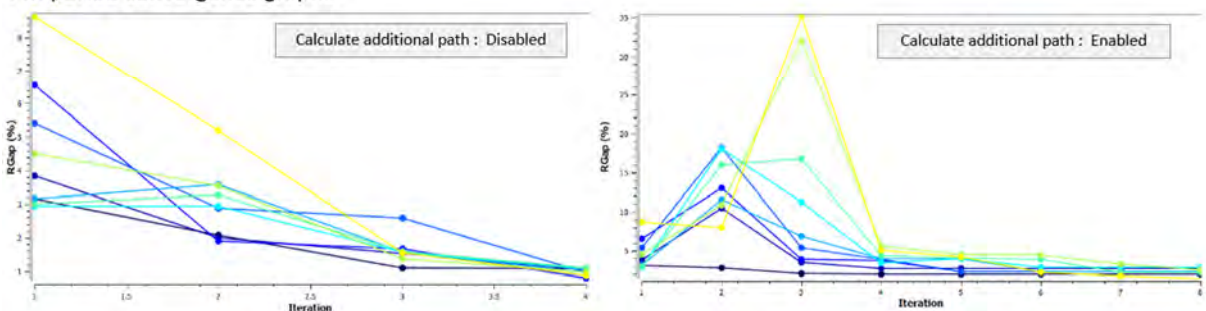
Figure 2: Convergence graphs of DUE hybrid assignments for AM and PM (with and without calculating additional path)

Figure 2 shows convergence graphs with and without calculating additional path have completely different behaviours, which indicates that the network is not under equilibrium condition when the possibility of calculating additional path is disabled.

As presented in Table 11, the comparison of modelling results with and without calculating additional path showed that performance through the model improved. In general, the use of static path file for DUE (without allowing adding new path) will cause more congestion on major roads and lead to:

- Higher delay times
- Lower speeds
- Higher total travel time

Table 11: Model results comparison (updated DUE parameters)

Peak period	Attribute	Unit	Additional Paths Enabled	Additional Paths Disabled	Diff	Diff (%)
AM Peak	Delay time	sec/km	75.75	86.38	10.63	14.0%
	Speed	km/h	27.07	25.89	- 1.18	-4.4%
	VHT	h	6,766	7,091	324.51	4.8%
	VKT	km	165,848	162,216	- 3,632.20	-2.2%
PM Peak	Delay time	sec/km	71.42	82.18	10.76	15.1%
	Speed	km/h	27.64	26.04	- 1.60	-5.8%
	VHT	h	7,089	7,835	746.84	10.5%
	VKT	km/h	183,901	181,934	- 1,966.67	-1.1%

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8.1.4   SRC assignments - Seed numbers

The RMS Traffic Modelling Guidelines provides a list of random seed values to be used in SRC assignments and produce small levels of variability to reflect behaviours exhibited in the real world.

* One of the seed values which was supposed to be used in the model is 86524, while 86264 was used instead.

8.1.5   SRC assignments - Route choice variability

There are three different sets of SRC runs in the model for the AM peak period. Their difference is related to the share of users that can choose their route based on cost of each route.

* While three different shares (0%, 10% and 20%) were tested for the AM peak, only one value (0%) was tested for the PM peak

* It is not clear which share was used for the AM peak modelling results.

8.1.6   SRC assignments – Median or average

In figure 3-3 of the PRCUTS Base Model Development Report, it is stated that the median seed for each peak period was used for model calibration and reporting, but no evidence of this approach was found in the report.

8.1.7   Findings summary

Main findings of our review on the employed assumptions for assignments and convergence criteria are summarised Table 12.

Table 12: Review findings on the employed assumptions for assignments and convergence criteria

#	Item	Status	Finding
7	**Assignment and convergence**		
7.1	Assignment Type	No issue	Reviewed. No issues identified
7-2	Assignment convergence - Static	Major issue	Static assignment does not achieve convergence after 50 iterations for the AM period
7.3	Assignment convergence - Hybrid	Moderate issue	Dynamic User Equilibrium (DUE) convergence criteria is relatively loose: • Relative Gap = 3.00% (default = 0.50%) • Do Not Consider Paths with a Percentage Below = 5.00% (default = 1.00%)
7.4	Route Choice	Major issue	Calculation of additional path for Hybrid DUE was disabled
7.5	Path Files	Minor issue	Only a sub-path of static assignment was used as inputs for DUE assignment
7.6	Replication Seeds (SRC runs)	Minor issue	Five replications were developed, but no evidence found in the report for using the results of the median seed for reporting
7.7	Seed Values	Minor issue	Instead of the recommended value by RMS guidelines (86524), 86264 was used as the seed number
7.8	Route Choice Variability	Moderate issue	It is recommended to consider some level of variability in the route choice of SRC runs, but it is not considered for PM peak SRC runs

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9   Calibration and validation

The PRCUTS model was developed as a Hybrid (microscopic/mesoscopic) model and it is stated in the base year model development report that the procedure of calibration and validation was according to the principles outlined in:

* Traffic Modelling Guideline (Roads and Maritime, 2013),

* Mesoscopic Network Representation – Protocols for Model Handling (TfNSW, 2016), and

* Mesoscopic Network Representation – Aimsun Network Coding Guidelines (TfNSW, 2016).

9.1   Model calibration

A comparison of assigned turning movement volumes against observed turning movement traffic count data was used to check the level of model calibration (PRCUTS Base Model Development Report, pg. 35). Table 11.1 of the RMS Traffic Modelling Guideline was referenced for checking the calibration of the PRCUTS model, for both the mesoscopic and microscopic sections of the model.

According to the criteria listed in Table 11.1 of the RMS guideline, the GEH value of at least 85% of turns should be less than 5 and justification is required for any turn with GEH greater than 10. However, revised criteria were agreed in a meeting with Department of Planning and Environment and Inner West Council on March 15th 2019, specifying that a GEH of less than 5 should be achieved for at least 75% of sites, and that a GEH of less than 10 should be achieved at 95% of sites (PRCUTS Base Model Development Report, pg. 35).

9.2   Model validation

Travel time data on eight major corridors of the study area was extracted and processed from the TomTom database for a four-week period. Table 11.5 of the RMS Traffic Modelling Guideline was referenced for checking the validity of the developed PRCUTS model. Accordingly, modelled and observed travel times along key routes should be within 15 per cent or one minute (whichever is greater) of the average observed travel time for the full length of the route for at least 95 per cent of observed travel time routes (PRCUTS Base Model Development Report, pg. 41).

9.3   Review findings

9.3.1   Core area calibration criteria

Although PRCUTS model was developed as a hybrid model, the calibration criteria for the "core area" (Table 11.2 of the RMS Traffic Modelling Guideline) was not checked for the microsimulation area of the model. The criteria used for checking microsimulation core area is based on comparison of flow differences rather than GEH.

Since the microsimulation area of the model is defined as the core area of the model, it is expected that the level of calibration of the model for this area be checked based on the criteria listed in Table 11.2 of the RMS guideline. However, only the "network wide" criteria from Table 11.1 of the RMS Traffic Modelling Guideline was used.

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9.3.2   Adjusted criteria was not met

Based on the calibration results presented in the Table 4-3 of the PRCUTS base-year model development report, the developed model did not satisfy the adjusted criteria for one hour of the simulation period (5:30-6:30 PM). The statement provided in the report regarding this was that "this is attributed to the impacts of peak spreading for the PM peak hour and the dispersion of traffic from Parramatta Road to the surrounding road network due to congestions along the corridor." (PRCUTS Base Model Development Report, pg. 36). This is not considered to be an acceptable justification for the calibration results.

9.3.1   Reporting

According to Table 11.1 of the RMS Traffic Modelling Guideline, GEH =5 tolerance limits should be included in the plots of observed vs modelled hourly flows. These lines were not provided in the relevant figures in reporting (figures 4-1 to 4-8 of the PRCUTS base-year model development report).

According to Table 11.5 of the RMS Traffic Modelling Guideline, average and 95 per cent confidence intervals are to be plotted for observed and modelled travel times for each journey time route. These figures are missing in the report.

9.3.2   Validation criteria was not met

Sufficient information to justify the validation of travel times was not provided for this model. Based on RMS guidelines, the cumulative graph of travel time along each route should be created and observed and modelled results for each segment should be compared separately. These plots were not provided in reporting.

The processing of simulated travel time data for major routes of the study area showed that some key routes did not achieve the validation criteria:

- AM Peak period: The review of the modelled travel time outputs showed that the travel time criteria were not met for the WB direction of Route #4 (Booth Street and Moore Street between Paramatta Road and Catherine Street).

- PM Peak period: The validation criteria were not met for the EB direction of Route #5 (Collins Street and Marion Street between Johnston and Ramsay Streets) and the EB direction of Route #6 (Paramatta Road between Orrington Street and Princes Highway). It means that only 88% observed travel time routes met the criteria (which is less than 95%).

9.3.3   Stability check

As traffic simulation models are stochastic in nature, small changes in demand or supply can have significant cumulative impacts on modelling results. A sensitivity analysis must be undertaken to compare the relative performance of a model for a number of recommended seed values to evaluate the stability of modelling results. Section 11.7 of the RMS Modelling guidelines (RMS, 2013) provide guidance on model stability. No evidence of a stability check was found in the report.

9.3.4   Findings summary

The main findings of the review of calibration and validation results are summarised Table 13.

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Table 13: Review findings on calibration and validation results

#	Item	Status	Finding
8	**Model Calibration and Validation**		
8.1	Model Calibration Check	Major issue	Calibration criteria for the "Core" area were not reported. Locations with GEH greater than 10 were not discussed.
8.2	Model Validation Check	Major issue	Sufficient information to justify the validation of travel times was not reported. It is noted that key routes did not achieve the validation criteria.
8.3	Model Stability Check	Major issue	Not provided
8.4	Reporting	Major issue	GEH =5 tolerance lines are missing in observed vs modelled hourly flow plots. Average and 95 percent confidence plots for observed and modelled travel times for each route is missing

10 Conclusion and recommendations

The review of the Parramatta Road Corridor Urban Transformation Transport Study base year model has shown that many aspects of the model should be updated to ensure it provides a robust basis from which to forecast future year performance and identify appropriate road infrastructure requirements to support planned urban growth.

We recommend the base model be revised primarily to address issues identified in the assignment process. The calibration results should also be revised and further information on validation checks are needed to ensure the model provides a suitable baseline representation of traffic movements on the network during both the AM and PM peak periods.

The main findings of the review are summarised in Table 14.

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Table 14: Findings Summary

#	Item	Status	Finding
1	**Model Development**		
1.1	Aimsun Version	No issue	Aimsun Next 8.2.3 (R54491)
1.2	Methodology - Network coding	No issue	Generally acceptable
1.3	Methodology - Demand processing	No issue	Generally acceptable
1.4	Database definition and connection	Minor issue	Database of the model was not defined correctly. PM assignment results are not existing in the model.
1.5	Data collection	No issue	Acceptable coverage
1.6	Model dimensions / scale	No issue	Model determined to be correct scale based on spot checks
1.7	Layers	No issue	Checked
1.8	Background image file	No issue	Not available
1.9	Background coordinate system	No issue	No issues identified
1.10	Model Time Periods	No issue	Checked. Well supported
1.11	Pre-Peak Warm-Up	No issue	Included
1.12	Model Layout and Configuration	No issue	No issues identified
1.13	Vehicle Types	No issue	Checked. Well documented
1.14	Road and Lane Types	No issue	Reviewed. No issues identified
2	**Demand Development**		
2.1	Centroid Configuration	Minor issue	A zoning system refinement was expected considering the nature of the area
2.2	Centroid Configuration Name	No issue	No issues identified
2.3	Real Data Sets	No issue	Reviewed. No issues identified
2.4	Unavailable PM results	Moderate issue	No assignment results were existing in the database for PM period
2.5	Traffic Demands matrices	No issue	Reviewed. No issues identified
2.6	Origin - Destination Matrices	No issue	Reviewed. No issues identified
2.7	Origin - Destination Matrix Names	No issue	Reviewed. No issues identified
2.8	Traffic Demand Names	No issue	Reviewed. No issues identified
2.9	Static OD Adjustment	Major issue	Results of a re-run showed relatively different results
2.10	Static Departure Adjustment	Minor issue	Insufficient warm-up duration was considered in the model
2.11	Dynamic OD adjustment	Major issue	No evidence found in the model for this step
2.12	Path Assignment Names	No issue	Reviewed. No issues identified
2.13	Documentation of assumptions	No issue	Reviewed. No issues identified
3.1	**Modelling parameters and assumptions - General**		
3.1.1	Arrival Type	No issue	Reviewed. No issues identified
3.1.2	Attractiveness weight	Minor issue	It is recommended to increase this weight (from zero) to be able to consider the impact of road hierarchy in the route choice decisions of vehicles. The value of zero means that there is no difference between local and arterial roads for route choice of users
3.1.3	Reaction Time at Stop	Major issue	Inconsistent values used for turns in SRC and DUE assignments for both AM and PM periods
3.1.4	Reaction Time at Signals	Major issue	Inconsistent values used for turns in SRC and DUE assignments for both AM and PM periods

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#	Item	Status	Finding
3.1.5	Dynamic Cost Functions	No issue	Reviewed. No issues identified
3.2	**Modelling parameters and assumptions - Turns**		
3.2.1	Speeds	No issue	Reviewed. No issues identified
3.2.2	Yellow Box Speeds	No issue	Reviewed. No issues identified
3.2.3	Give Way Time Factor(s)	Minor issue	Give-way Time Factor (Meso) for roundabout turns increased to 2, while not reported
3.3	**Modelling parameters and assumptions - Sections**		
3.3.1	Road Type	No issue	Reviewed. No issues identified
3.3.2	Speed	No issue	Reviewed. No issues identified
3.3.3	Additional reaction time at stop	Moderate issue	Negative values allocated to this attribute for the approaching section of the "City Rd" to "Parramatta Rd", which is not justifiable
3.3.4	Additional reaction time at traffic light	Moderate issue	Negative values allocated to this attribute for the approaching section of the "City Rd" to "Parramatta Rd", which is not justifiable
3.3.5	Capacity	No issue	Reviewed. No issues identified
3.3.6	Lane changing cooperation	Moderate issue	Lane changing cooperation of six sections increased from 50% without justification
3.3.7	Queue discharge acceleration factor	Moderate issue	This factor was reduced from 1.0 to 0.5 for Paramatta Rd" and "City-West Link Rd" sections, without justification
3.3.8	Acceleration factor	Major issue	No logic identified in the allocation of acceleration factor to road sections (See Figure 1)
4	**Intersections and signalisation**		
4.1	Control Type	No issue	Reviewed. No issues identified
4.2	Yellow Time	No issue	Reviewed. No issues identified
4.3	Red Percentage	No issue	Reviewed. No issues identified
4.4	Phases	Moderate issue	Node 82756 does not have any movement allocated to third phase. Phasing of the "N4528 SITE 47 – Parramatta Rd & Old Canterbury Rd & Tebbutt St" intersection appears to be incorrect – only one phase of movement defined (minor movements don't have any phase) Phasing of External ID 17437 appears to be incorrect
4.5	Fixed time	No issue	All signalised intersections are modelled as fixed time based, due to the complexity of the network
4.6	Permitted Movements	Moderate issue	Time allocated for pedestrian crossings at signals appear to be too high (assumed 16 seconds in every 80 sec) - (External IDs: 13124, 13604337, 22438)
4.7	Sequences	Minor issue	Phasing of "N4528 SITE 86 - Parramatta Rd & Renwick St & Railway St" intersection appears to be incorrect – only one phase of movement defined (minor movements do not have any phase)
5	**Public Transport Inputs**		
5.1	Public Transport Plans /Lines	Moderate issue	44 bus routes are not connected for the PM peak model. It is caused because of a new section added to the model, but not updated in the routes of these PT lines
5.2	Rail Routes and Stations	No issue	Not existing

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#	Item	Status	Finding
5.3	Light Rail Routes and Stops	No issue	Not existing
5.4	Public Transport Stops	No issue	Reviewed. No issues identified
6	**Active transport and pedestrians**		
6.1	Pedestrian crossings at intersections	Minor issue	Mostly coded correctly (with some minor issues, such as Node IDs N_13124, 13604337, N_22438, where inappropriate pedestrian phase durations were defined in the model)
6.2	Allocating required time (intersections)	No issue	A conservative approach was chosen for coding the signal times
6.3	Pedestrian crossings on mid-blocks	No issue	Not coded completely due to the lack of information on mid-block pedestrian paths and walking destinations
6.4	Allocating required time (mid-blocks)	Minor issue	Mostly coded correctly (with some minor issues, such as N4528 SITE 47, N_17437 and N4528 SITE 86, where phases without any movement were observed)
7	**Assignment and convergence**		
7.1	Assignment Type	No issue	Reviewed. No issues identified
7-2	Assignment convergence - Static	Major issue	Static assignment does not achieve convergence after 50 iterations for the AM period
7.3	Assignment convergence - Hybrid	Moderate issue	Dynamic User Equilibrium (DUE) convergence criteria is relatively loose:
7.4	Route Choice	Major issue	• Relative Gap = 3.00% (default = 0.50%)
7.5	Path Files	Minor issue	• Do Not Consider Paths with a Percentage Below = 5.00% (default = 1.00%)
7.6	Replication Seeds (SRC runs)	Minor issue	Calculation of additional path for Hybrid DUE was disabled
7.7	Seed Values	Minor issue	Only a sub-path of static assignment was used as inputs for DUE assignment
7.8	Route Choice Variability	Moderate issue	Five replications were developed, but no evidence found in the report for using the results of the median seed for reporting
8	**Model Calibration and Validation**		
8.1	Model Calibration Check	Major issue	Calibration criteria for the "Core" area were not reported. Locations with GEH greater than 10 were not discussed.
8.2	Model Validation Check	Major issue	Sufficient information to justify the validation of travel times was not reported. It is noted that key routes did not achieve the validation criteria.
8.3	Model Stability Check	Major issue	Not provided
8.4	Reporting	Major issue	GEH =5 tolerance lines are missing in observed vs modelled hourly flow plots. Average and 95 percent confidence plots for observed and modelled travel times for each route is missing

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	Prepared by	Checked by	Approved by
Name	Hamid Safi	Roland Cathcart	Roland Cathcart
Signature			

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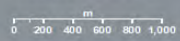
No	Project	Program	Status	Description	Source	Coded in model	New data received? I.e. dwg/ signal data.
1	Parramatta Road public transport improvements	Future Transport 56	Planning	Planning and considerations. Note, there is nothing to be incorporated into modelling at this stage.	https://future.transport.nsw.gov.au/delivering-future-transport-2056#greater-sydney https://www.infrastructureaustralia.gov.au/map/public-transport-capacity-parramatta-road-and-victoria-road-corridors	Nothing to be incorporated into the model	
2	Western Harbour Tunnel and Beaches Link		Planning	The Western Harbour Tunnel will connect to WestConnex at the Rozelle Interchange, cross under Sydney Harbour between the Birchgrove and Waverton areas and connect with the Warringah Freeway at North Sydney.	https://www.rms.nsw.gov.au/projects/index.html	✓	
3	WestConnex	WestConnex	In construction	The WestConnex M4 Tunnels opened to traffic in July 2019. WestConnex M4 (the New M4 Tunnels and the Widened M4), includes 5.5km tunnels and around 7.5km of surface roads. The WestConnex M4 links to the M4 at Parramatta in the west, and Wattle Street and Parramatta Road at Haberfield to the east. The WestConnex M4 will also connect to the M4-M5 Link Tunnels and Rozelle Interchange in 2023. The M4-M5 Link Tunnels project is the final and most critical component of WestConnex, featuring twin tunnels between the New M4 Tunnels at Haberfield and the M8 at St Peters. Each tunnel will be approximately 7.5km long and able to accommodate up to four lanes of traffic in each direction.	https://www.westconnex.com.au/explore-westconnex/interactive-map/	✓	
4	Intersection improvements at Parramatta Road and Shaftesbury Road, Concord	Pinch Point Program	In construction	Roads and Maritime Services is upgrading the intersection of Parramatta Road and Shaftesbury Road, Concord. The improvements will reduce congestion and improvement travel times on Parramatta Road, and increase the capacity for vehicles turning right into Shaftesbury Road.	https://www.rms.nsw.gov.au/projects/parramatta-rd-shaftesbury-rd-concord/index.html	Outside study area	
5	Arlington Street, Croydon Road and Parramatta Road intersection improvements (BPIP)	BPIP	Completed (Dec 2020)	In December 2020 work at the intersection of Parramatta Road, Arlington Street and Croydon Road, Five Dock and Croydon was completed.	https://www.rms.nsw.gov.au/projects/arlington-st-croydon-rd-parramatta-rd/index.html	Outside model area	
6	Sydney Metro West	Sydney Metro	Planning	The Sydney Metro West project will support a growing city and deliver world-class metro services to more communities. This new underground railway will connect Greater Parramatta and the Sydney CBD.	https://www.sydneymetro.info/west/project-overview	No road geometry changes	
7	City West Link, Dobroyd Parade and Wattle Street - Victoria Road, Rozelle to Parramatta Road, Ashfield	Sydney Clearways Strategy	Completed	New and extended clearways on City West Link, Dobroyd Parade and Wattle Street between Victoria Road, Rozelle and Parramatta Road, Ashfield.	https://www.rms.nsw.gov.au/projects/index.html	No road geometry changes	
8	City West Link improvement work		Completed	Roads and Maritime Services has completed the improvement of City West Link between Haberfield and Leichhardt in March 2019. An additional eastbound lane was opened to traffic in December 2018.	https://www.rms.nsw.gov.au/projects/city-west-link/index.html	✓	
9	Parramatta Road improvement work, Leichhardt		Completed	Improving traffic flow along Parramatta Road between Rofe Street and Cannon Street, Leichhardt to make your journey easier, faster and safer. (Lengthen right turn lane into Crystal Street).	https://www.rms.nsw.gov.au/projects/parramatta-road-improvement-work-leichhardt/index.html	✓	
10	Parramatta Road improvement work, Taverners Hill		Completed	Improving traffic flow and travel time reliability by adding a third lane on Parramatta Road	https://www.rms.nsw.gov.au/projects/parramatta-road-taverners-hill/index.html	✓	

Legend

- Study Area
- ● BPIP Program - intersection improvement
- ● Pinch Point Program - Intersection improvement
- — Sydney Metro West Alignment
- — WestConnex Alignment
- — Western Harbour Tunnel Alignment

1:28,000 Scale at A3

m
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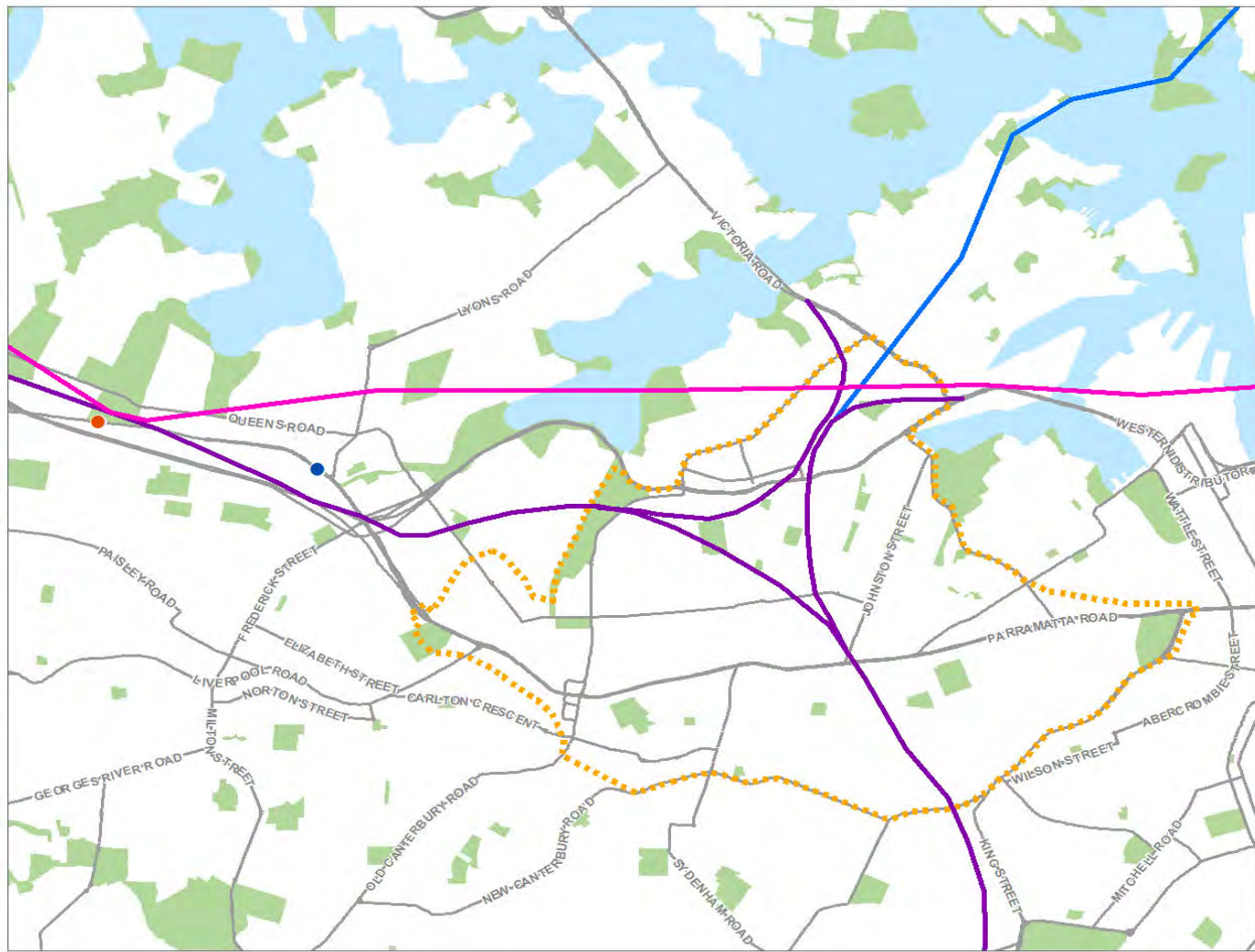
APPENDIX

D

STRATEGIC TRANSPORT MODELLING INTERFACE
METHODOLOGY (VIAE CONSULTING, OCTOBER 2020)

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Memorandum

VIAE
CONSULTING

Subject	**Strategic transport modelling interface methodology**
Project	Parramatta Road Corridor Urban Transformation Strategy – Transport Modelling
Project No	VC015
Prepared by	Iwan Smith
To	James Hall

File	VC010M01_Scoping report review.docx
Phone No	0407 439 100
Copies to	Malcolm Bradley

1.   Introduction

This memorandum outlines the proposed methodology for interfacing strategic transport modelling associated with Parramatta Road Corridor Urban Transformation Strategy (PRCUTS) with simulation traffic modelling being undertaken for each precinct by Local Government.

This memorandum covers the following components of this interface:

- Land use assumptions
- Public Transport Project Model (PTPM) Precinct Parking Module (PPM)
- Identification of nominal road network capacity

2. Land use assumptions

Land use assumptions have been adopted for the following precincts within the PRCUTS study area base on forecast population and employment from Councils:

- Granville (Cumberland Council and City of Parramatta Council)
- Auburn (Cumberland Council and City of Parramatta Council)
- Homebush (Canada Bay Council, Strathfield Council and Burwood Council)
- Burwood (Canada Bay Council and Burwood Council)
- Kings Bay (Canada Bay Council and Inner West Council)
- Taverners Hill (Inner West Council)
- Leichhardt (Inner West Council)
- Camperdown (Inner West Council)

These land use assumptions have been combined with the standard land use scenario (TZP2016) to form the basis of the forecast land use that will be used to assess the transport impacts of the changes in land use proposed as part of the PRCUTS.

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3. Public Transport Project Model

The Public Transport Project Model (PTPM) has been run with the land use and travel demand from STM as noted in Section 2. The purpose of the PTPM for the PRCUTS transport modelling is to refine the multi-modal assignment of travel demand, in particular to generate traffic demand forecasts that are more accurately matched to the capacity of the road network as it would exist in future forecast years. This will be achieved through use of the Precinct Parking Module, which applied additional travel costs to the private vehicle mode to reduce the utility of private vehicle travel and reflect capacity constraints that would otherwise not be accounted for.

It is noted that PTPM only models the morning peak period and that additional pivoting of PTPM demand is required to generate evening peak traffic volume forecasts.

The key challenge in applying the PPM for the purposes of forecasting future traffic demand is to select a defensible value for the additional cost penalty used to suppress private car demand. Ideally, the penalty value would be applied globally across the GMA and the selection of the penalty value would be based on a comparison of the resulting traffic volumes from PTPM against an appropriate estimate of network traffic capacity. Identifying the network capacity to select the appropriate penalty value is the primary focus of this document.

To date, PTPM has been run with the following values for PPM penalty (on a global basis)

- No penalty
- 15-minute penalty
- 30-minute penalty
- 45-minute penalty
- 60-minute penalty

4. Identification of network capacity

The primary challenge of interfacing PTPM forecast traffic demand with more detailed simulation modelling is identifying the practical capacity of the road network under future traffic conditions. Two key considerations must be resolved to be able to select an appropriate penalty for car travel in PPM:

- Identifying the point at which a traffic network is at or close to capacity
- Matching the forecast traffic capacity in the simulation model with a forecast demand and accompanying PPM penalty in PTPM.

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4.1. Identifying network traffic capacity

The practical capacity of the road network can be characterised as the point at which the delay experienced by vehicles making a trip during the peak period exceeds the utility that the vehicle gains by making the trip. This breakpoint is difficult to assess on a trip-by-trip basis within a model, however broader network-wide metrics can be used as a proxy to determine when the network capacity is exceeded:

1. Individual average trip speeds drop below a set level (say 10km/hr)
2. Unreleased vehicles exceed a given level (say more than 5% of total demand at aggregate level and more than 10% at the zone level))
3. Network throughput remains consistent across the modelled peak period.

For wide-area simulation models in urban environments, the primary model of failure when demand exceeds capacity is usually the result of network gridlock where vehicles become stuck in stationary queues and block throughput in the rest of the model.

This blocked state can be identified by plotting total vehicle throughput in the model over the modelled period, as shown in Figure 1.
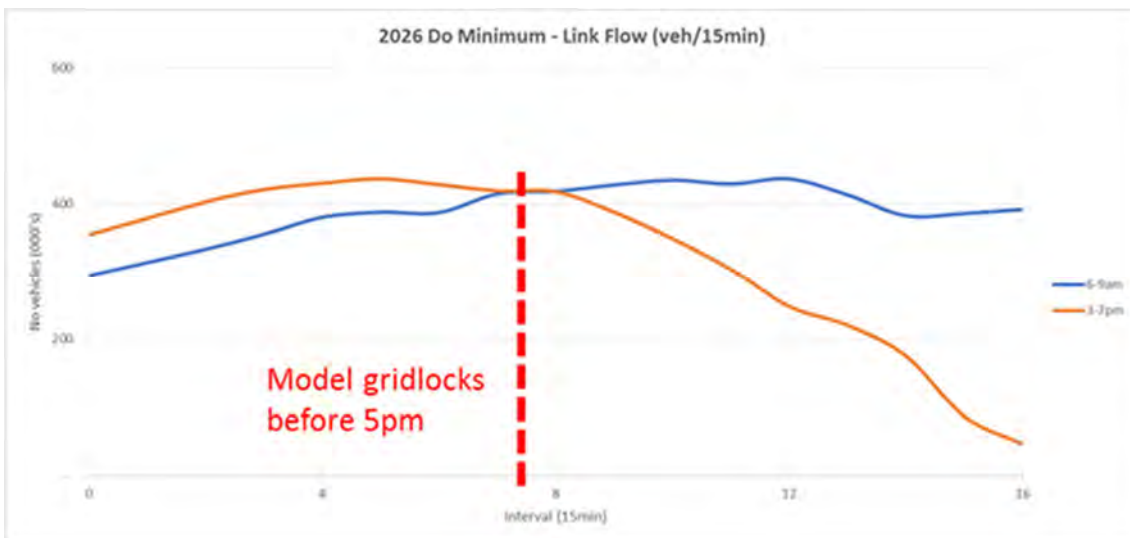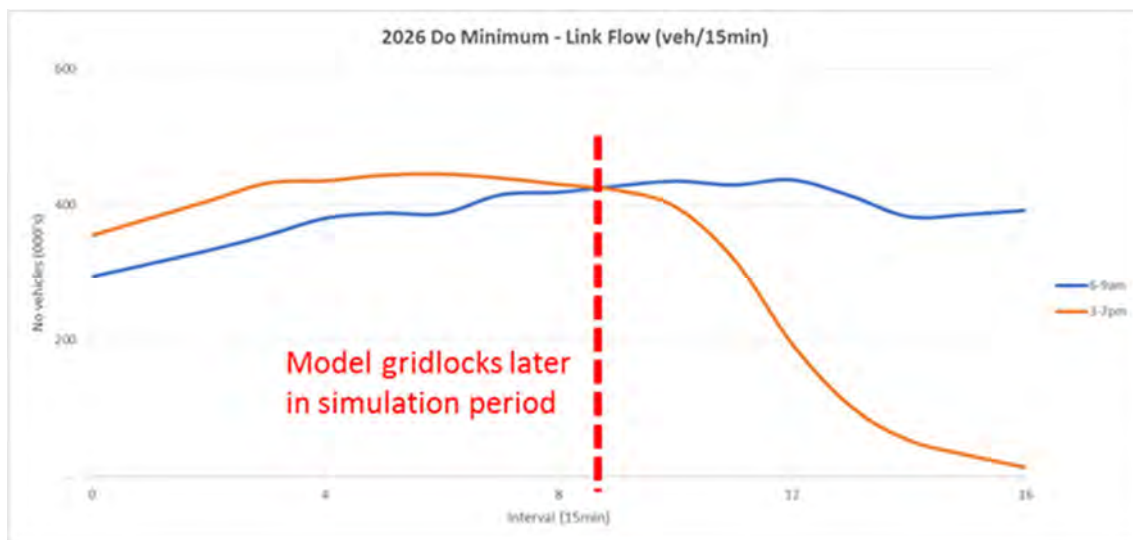
Figure 1 – Example of identification of network gridlock

Ideally, the network traffic capacity should correspond to the highest traffic demand that can be accommodated on the network during the peak period prior to the network reaching a "blocked" state, with throughput remaining relatively constant through the peak period as shown in Figure 2.
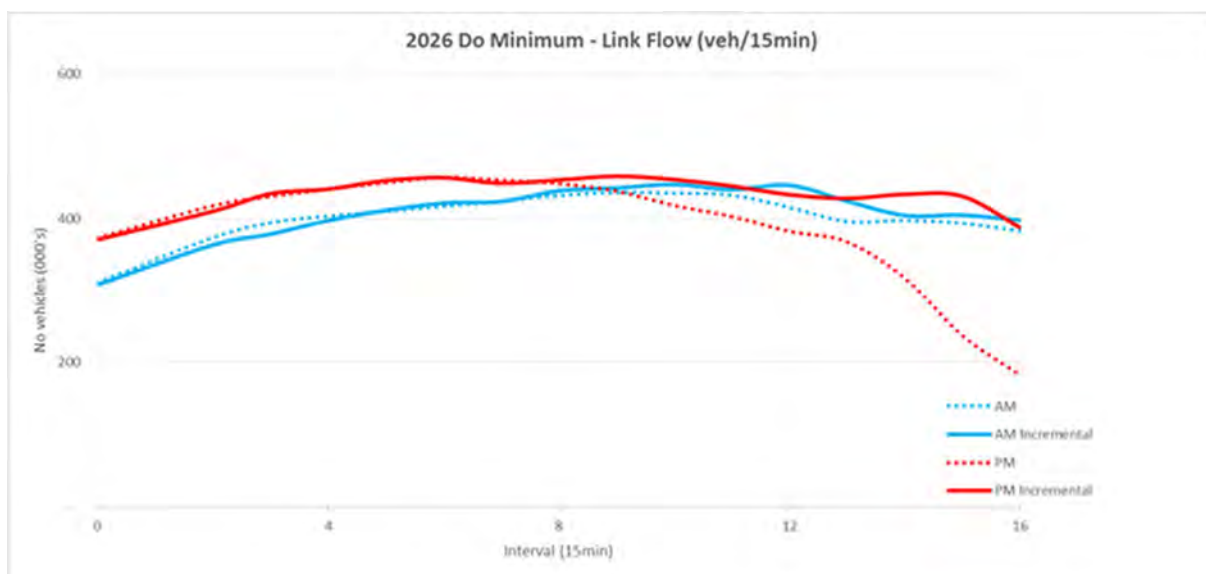
Figure 2 – Example of modelled throughput for a network at capacity

4.2.   Matching network capacity between models

Once a practical peak period capacity has been identified, a metric is required to match the assigned traffic volume from PTPM with the identified network capacity from the simulation model. Metrics that would be candidates for this would be:

1. **Traffic volumes on specific links within the study area**: may be problematic due to differences in the detail of network and assignment between models
2. **Overall traffic demand or traffic growth within the study area**: may be problematic due to the differences in base travel demand and resolution of travel zones between models
3. **Cumulative VKT across the study area**: may be problematic to compare VKT directly, but equivalent proportional change in VKT may be a good metric.

To best account for the differences in model coverage, zonal resolution, base matrices and volume delay response, Option 3 (cumulative VKT) is considered the best candidate for matching equivalent demand scenarios between mesoscopic and strategic models.

5. Proposed strategic modelling interface

A summary of the proposed transport model interface is shown in Figure 3. This workflow describes the relationship of PTPM and mesoscopic model streams and process for selection and finalisation of treated demand is STFM as well as follow-up PTPM modelling to identify additional service requirements that may be required to support the modelled shift from private vehicle to other modes.
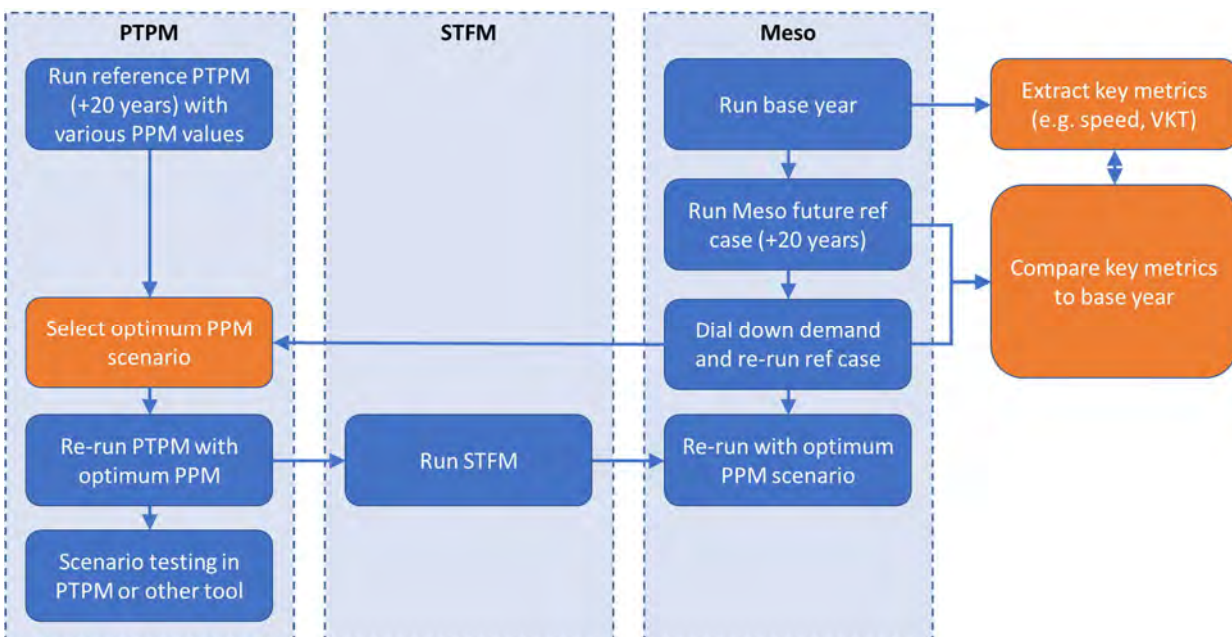
Figure 3 – Proposed strategic model interface

APPENDIX

E

PRCUTS TRANSPORT MODEL UPDATE
RECOMMENDATIONS ACTION PLAN (PWC, JUNE 2021)

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Parramatta Road Corridor Urban Transformation Strategy Transport Model Update Action Plan Delivery Technical Note

To: Planning Delivery Unit, Department of Planning, Industry and Environment
From: PricewaterhouseCoopers
Date: 24 June 2021
Subject: **Parramatta Road Corridor Urban Transformation Strategy (PRCUTS) Transport Model Update Action Plan Delivery Technical Note**

PwC was commissioned by the Department of Planning, Industry and Environment ("DPIE") to undertake a review of the Parramatta Road Corridor Urban Transformation Strategy ("PRCUTS") Inner West AIMSUN hybrid model and the methodology applied to estimate forecast traffic growth, put forward recommendations and develop an Action Plan to deliver those.

This technical note provides a summary of the delivery of the Action Plan which covers the following activities:
1. Land use redistribution (undertaken by Transport for NSW ("TfNSW").
2. Sydney Strategic Travel Model ("STM"), Public Transport Project Model ("PTPM") and Parking Precinct Module ("PPM") runs (undertaken by TfNSW).
3. Provision of PTPM car demand matrices in Travel Zone 2016 ("TZ16") format for morning ("AM") peak period (undertaken by TfNSW).
4. Application of RAND method growth in Sydney Strategic Traffic Forecasting Model ("STFM") to be in line with PTPM growth for cars (undertaken by PwC).
5. Extract cordon matrices and produce volume plots from STFM models for each of the PRCUTS traffic study teams (undertaken by PwC).
6. Test the updated growth matrices for the 2026 AM and evening ("PM") peak period without development scenarios for the Inner West City Council study area in AIMSUN (undertaken by PwC).

1. Land use redistribution (undertaken by TfNSW)

Individual PRCUTS teams provided land use information for their respective PRCUTS study area:
1. Inner West (growth provided by SGS and applied by PwC).
2. Canada Bay, Burwood and Strathfield (provided by Bitzios).
3. Parramatta and Cumberland (provided by GTA).

The following land use scenarios were modelled:
1. 2026 without development.
2. 2026 with development.
3. 2036 without development.
4. 2036 with development.

Population and employment forecasts from each of the three study areas were collated to modelling scenarios

and redistributed by TfNSW across the whole of Sydney Greater Metropolitan Area ("GMA"). Table 1 and Table 2 below provide population and employment totals respectively, together with annual linear growth summary by study area.

Table 1: Population by PRCUTS study area with and without development.

Study Area	Population					Linear annual growth			
	STM Base	Without Development		With Development		Without Development		With Development	
	2016	2026	2036	2026	2036	2026	2036	2026	2036
Parramatta, Cumberland	17,936	28,278	30,441	34,029	48,574	6%	3%	9%	9%
Canada Bay, Burwood and Strathfield	34,896	36,369	36,369	62,088	94,250	0%	0%	8%	9%
Inner West	91,207	99,398	101,725	103,050	108,144	1%	1%	1%	1%

Table 2: Employment by PRCUTS study area with and without development.

Study Area	Employment					Linear annual growth			
	STM Base	Without Development		With Development		Without Development		With Development	
	2016	2026	2036	2026	2036	2026	2036	2026	2036
Parramatta, Cumberland	15,661	21,142	28,844	20,911	31,311	3%	4%	3%	5%
Canada Bay, Burwood and Strathfield	23,307	23,588	23,588	27,274	34,032	0%	0%	2%	2%
Inner West	48,133	55,454	66,702	62,033	74,115	2%	2%	3%	3%

2. STM, PTPM and PPM runs (undertaken by TfNSW)

TfNSW ran the STM with the updated land use. The STM mechanised demand was fed into the PTPM with the PPM applied.

3. Provision of PTPM car demand matrices in TZ16 format for AM peak (undertaken by TfNSW)

TfNSW extracted the AM car matrices from PTPM. The AM PTPM matrices were then transposed by TfNSW to serve as PM car matrices.

Light commercial vehicles ("LCV") and heavy vehicles ("HV") were sourced from the STM.

4. Application of RAND method growth in STFM to be in line with PTPM growth for car (undertaken by PwC)

The STFM is an all-vehicle model. PwC has segmented the STFM assignment from one user class into the following three user classes:
1. Car.
2. LCV.
3. HV.

This segmentation allows for the application of growth inline with how it is applied in the STM. The RAND method was applied to car vehicles only. The LCV growth is based on the Light Commercial Vehicle Model ("LCVM") and HV growth is based on the Freight Movement Model ("FMM").

Table 3 provides a summary of car growth in PTPM and STFM in the Inner West Council PRCUTS study area.

Table 3: Comparison of PTPM and STFM trip growth in 2-hour AM peak (Inner West Council area zones).

From 2019 to 2026	Growth (Absolute)			Growth (%)		
	Population	**Employment**	**Population + Employment**	**Population**	**Employment**	**Population + Employment**
Population and Employment forecasting (Internal Zones)						
PRCUTS Zones	3,855	5,414	9,269	15.60%	21.90%	20.70%
Other Zones	2,056	2,438	4,493	5.77%	6.84%	8.39%
Total	5,911	7,851	13,762	9.80%	13.01%	13.99%
From 2019 to 2026	**Origin**	**Destination**	**Origin + Destination**	**Origin**	**Destination**	**Origin + Destination**
PTPM AM 2-hour demand forecasting						
PRCUTS Zones	1,182	2,143	3,325	9.13%	25.28%	15.52%
Other Zones	424	169	593	5.45%	1.63%	3.26%
Total	1,606	2,312	3,918	7.75%	12.26%	9.89%
STFM AM 2-hour demand forecasting						
PRCUTS Zones	829	1,836	2,665	16.21%	30.78%	24.06%
Other Zones	-18	84	66	-0.25%	1.42%	0.50%
Total	811	1920	2731	6.60%	16.17%	11.30%

5. Extract cordon matrices and produce volume plots from STFM models for each of the PRCUTS traffic study teams (undertaken by PwC)

2-hour AM and PM peak STFM all-vehicle volume plots and cordon matrices by user class have been extracted by study area.

Figure 1 compares the original STFM 2026 AM Low scenario (based on previous land use and without negative growth application) with the updated STFM 2026 AM scenario without development. The

comparison plot shows a reduction of up to 800 vehicles in a 2-hour peak on Parramatta Road.

Figure 1: 2-hour traffic volume difference between STFM 2026 AM Low scenario and the updated STFM 2026 AM scenario without development.
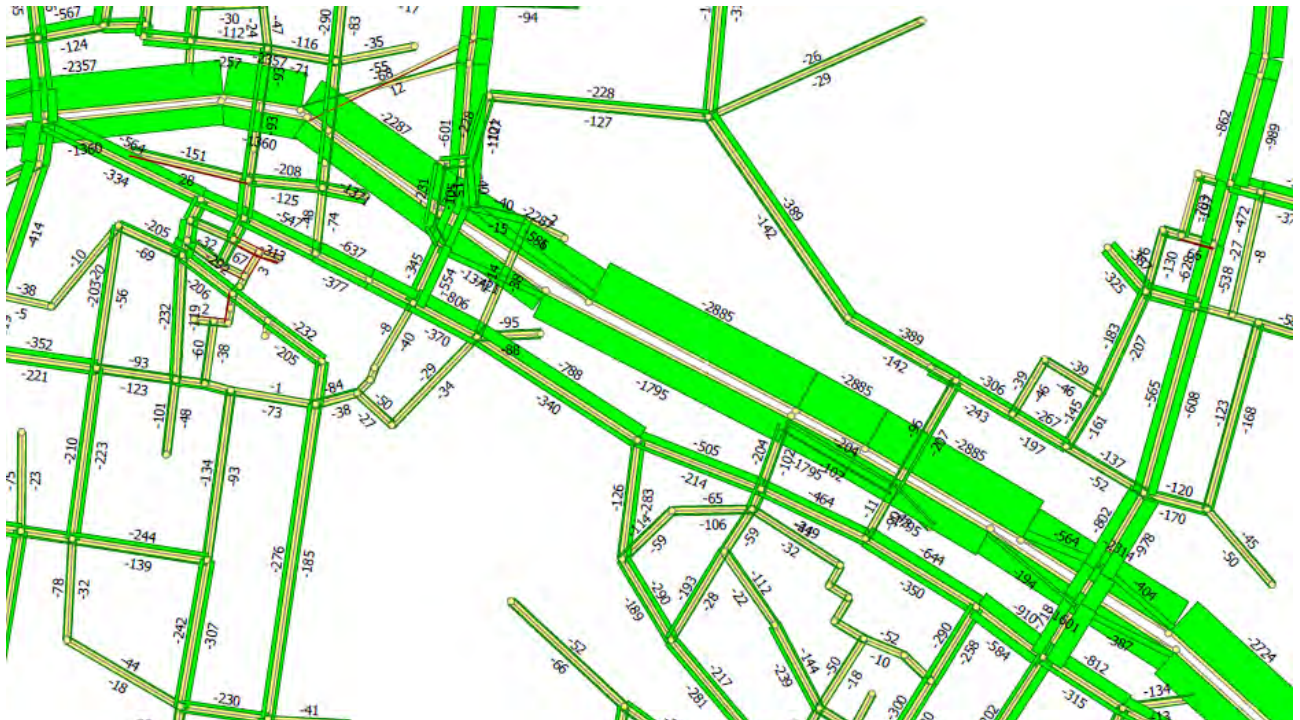
Note: *Green indicates a reduction and red indicates an increase in the updated STFM 2026 AM scenario without development.*

6. Test the updated growth matrices for the 2026 AM and PM without development scenario for the Inner West City Council study area in AIMSUN (undertaken by PwC).

PwC has applied the absolute STFM growth to the AIMSUN base matrix to test the performance of the model. Table 4 shows the growth within the PRCUTS Inner West City Council study for the AIMSUN model is up to 7% points higher than the STFM demand in the 2026 AM and PM peak Without Development scenario. Table 5 shows that the network statistics and unreleased vehicles in 2026 are within an acceptable range and additional treatment of demand growth in AIMSUN is therefore not required.

Table 4: Inner West Council study area traffic growth between 2018 and 2026 without development scenarios in AIMSUN and STFM.

2026-2018	Without Development	
	AM	PM
AIMSUN Growth (veh)	18,973	20,289
AIMSUN Growth (%)	28%	27%
STFM Growth (veh)	14,758	16,274
STFM Growth (%)	22%	20%

Table 5: Inner West Council AIMSUN network statistics for 2018 Base and 2026 without development AM and PM peak scenarios.

Network Statistics	2018 Base		2026 Without Development	
	AM	PM	AM	PM
Demand	68,594	75,141	87,567	95,430
Total Distance Travelled - All	168,922	188,415	195,206	207,381
Total Travel Time - All	6,718	6,988	8,532	9,392
Vehicles Waiting to Enter - All	4	3	14	1,854
Total Number of Stops - All	113,316	101,730	110,256	106,004
Average Speed (km/h)	25.1	27.0	22.9	22.1

APPENDIX

F

PTPM CORDONS

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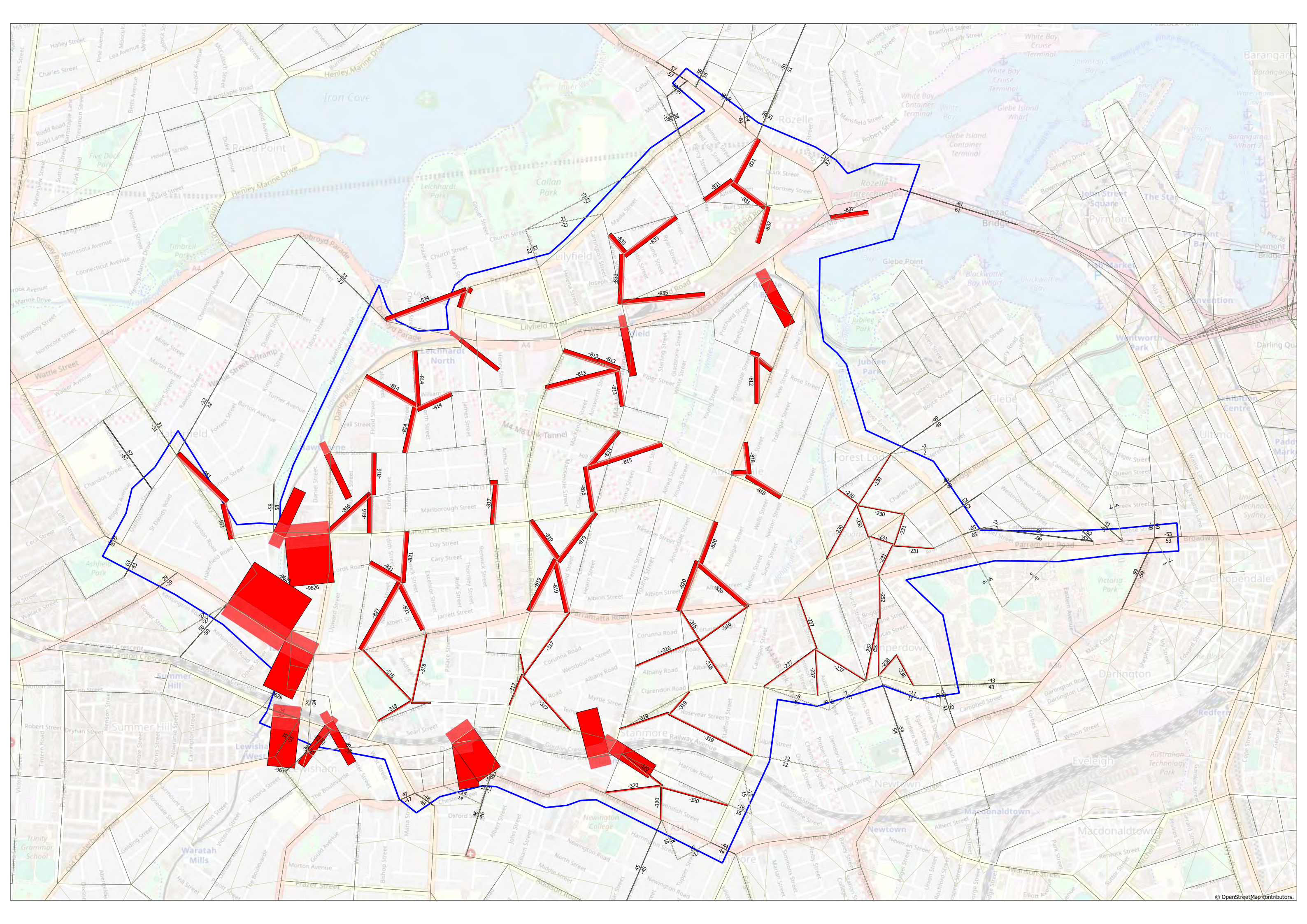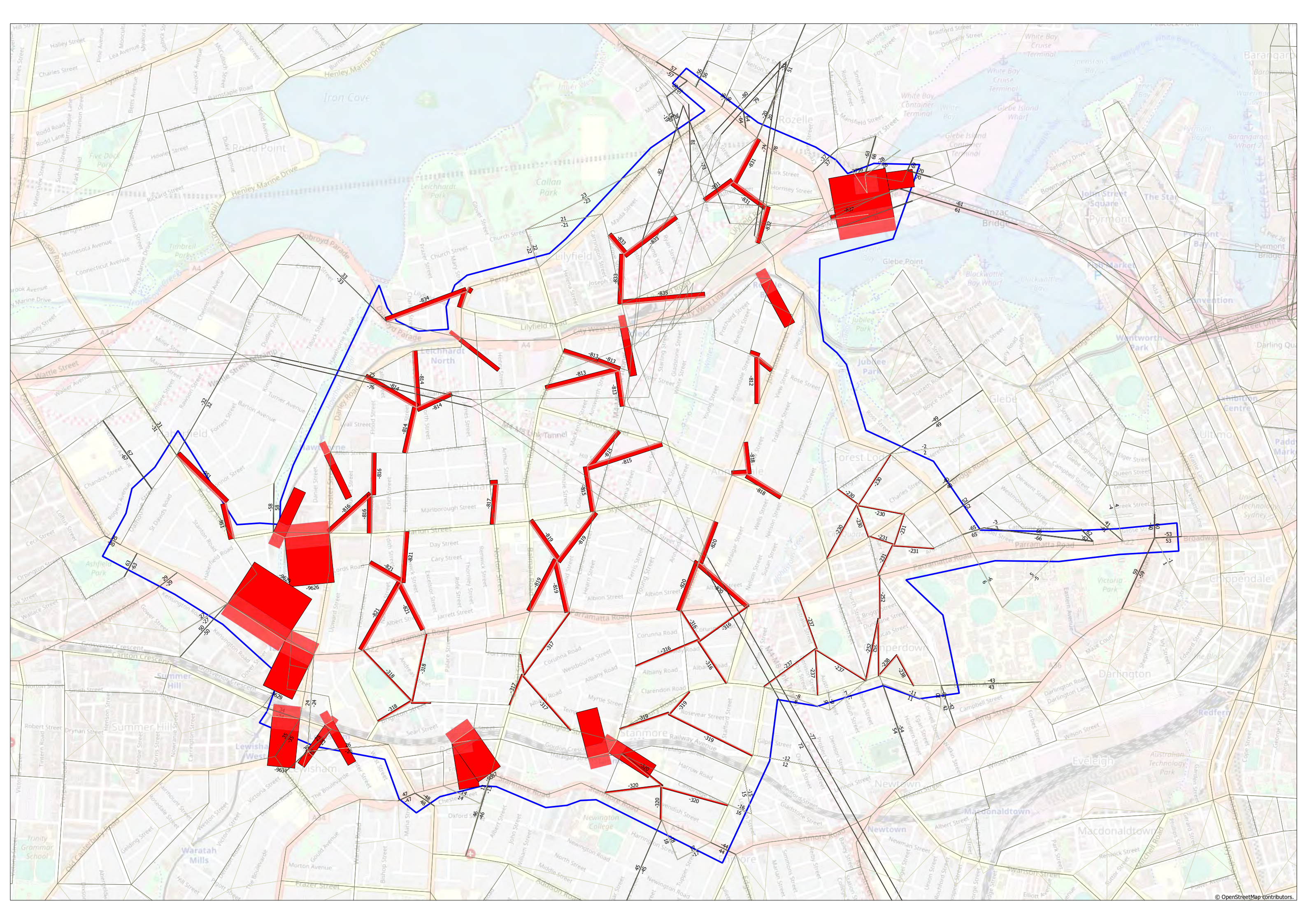
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G

STFM CORDONS
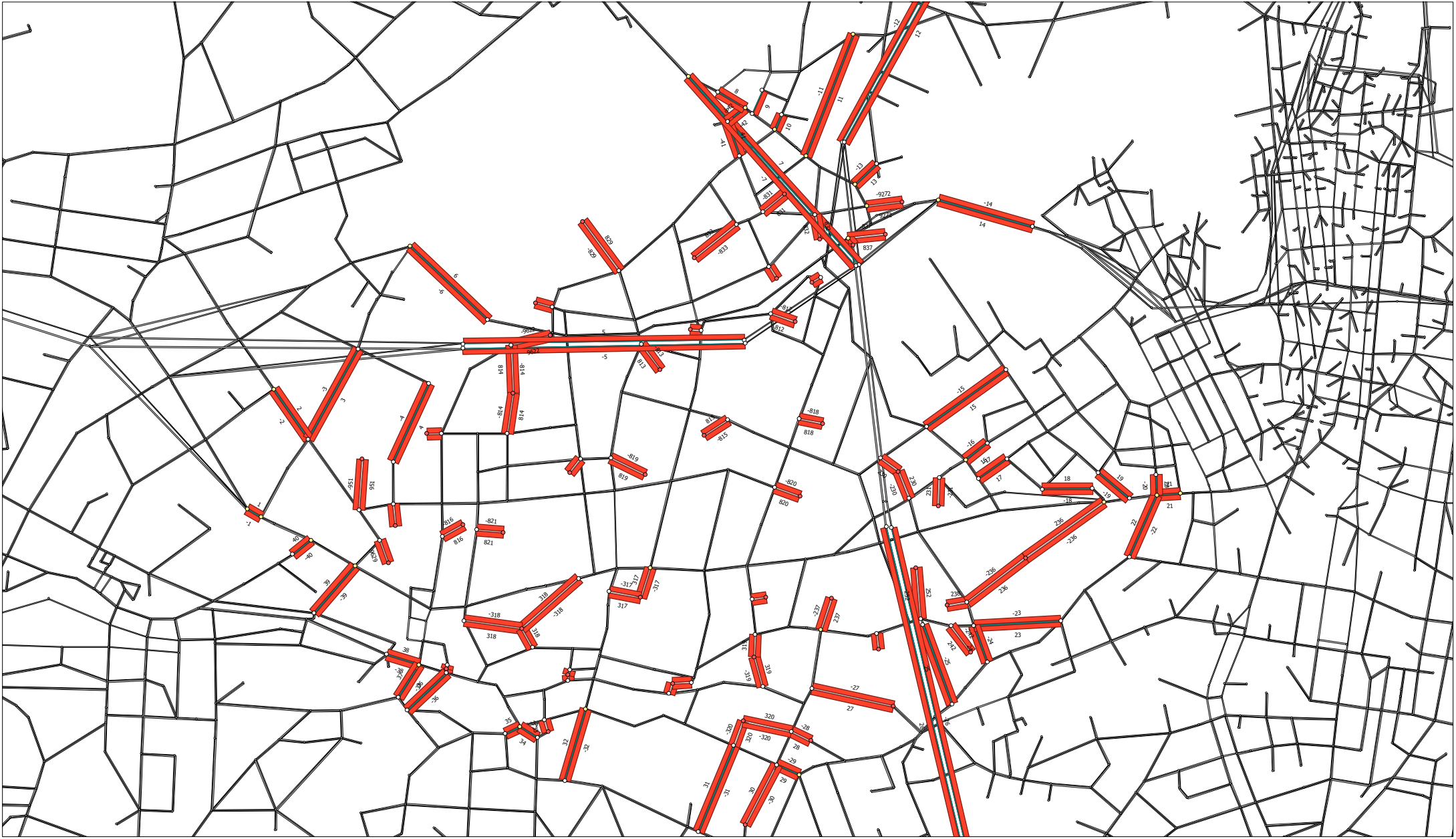
APPENDIX

H

INTERSECTION PERFORMANCE

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#	Intersection	Type	App.	Approach name	Turn	7:15AM - 8:15AM			8:15AM - 9:15AM		
						Volume (veh)	Delay (s)	LOS	Volume (veh)	Delay (s)	LOS
1	Victoria Rd / Darling St	S	N	Darling St	L	226	72.1	F	197	83.5	F
					T	243	89.9	F	234	104.0	F
			E	Victoria Rd	L	57	38.4	C	61	42.9	D
					T	1247	36.1	C	998	33.2	C
					R	144	32.1	C	128	25.9	B
			S	Darling St	L	248	84.2	F	251	85.0	F
					T	218	115.4	F	200	115.0	F
			W	Victoria Rd	L	21	54.2	D	26	47.2	D
					T	2228	51.9	D	1833	43.0	D
					R	154	89.9	F	197	50.4	D
			Total			4786	55.7	D	1833	51.9	D
2	Victoria Road / Evans Street	S	N	Evans St	L	300	94.6	F	283	81.4	F
					T	124	91.3	F	108	88.5	F
					R	56	105.0	F	40	86.2	F
			E	Victoria Rd	L	10	9.6	A	8	9.2	A
					T	1369	4.8	A	1154	3.0	A
			S	Evans St	L	8	77.4	F	10	42.3	C
					T	113	53.2	D	115	52.6	D
			W	Victoria Rd	L	0			2	6.4	A
					T	2517	10.2	A	2053	7.5	A
			Total			4497	18.8	B	3773	16.3	B
3	Victoria Road / Robert Street	S	N	Victoria Rd	L	20	45.6	D	18	15.9	B
					T	2972	33.2	C	2502	33.7	C
			E	Robert St	L	704	72.3	F	695	51.1	D
					R	0			0		
			S	Victoria Rd	T	1339	4.2	A	1146	3.4	A
					R	591	22.4	B	553	28.0	B
			Total			5626	30.1	C	4914	28.4	B
5	Balmain Road / Lilyfield Road	S	N	Balmain Rd	L	67	6.6	A	60	7.2	A
					T	145	5.2	A	134	5.5	A
			E	Lilyfield Rd	L	8	31.1	C	17	25.7	B
					T	3	14.7	B	2	16.1	B
					R	3	37.6	C	4	19.6	B
			S	Balmain Rd	L	42	9.1	A	42	7.7	A
					T	323	10.0	A	291	8.4	A
					R	417	14.0	A	371	11.2	A
			W	Lilyfield Rd	L	0			0		
					T	97	16.3	B	92	25.0	B
					R	1	36.1	C	6	37.9	C
			Total			1106	11.5	A	1019	11.0	A
6	The Crescent / Victoria Road	S	N	Victoria Rd	L	2888	5.9	A	2458	5.4	A
					R	697	29.0	C	708	24.6	B
			E		T	1386	73.2	F	1304	55.8	D
					R	1490	48.3	D	1329	42.5	D
			W	The Crescent	L	612	8.9	A	567	7.9	A
			Total			7073	30.5	C	6366	25.9	B

#	Intersection	Type	App.	Approach name	Turn	7:15AM - 8:15AM			8:15AM - 9:15AM		
						Volume (veh)	Delay (s)	LOS	Volume (veh)	Delay (s)	LOS
7	Balmain Road / Perry Street / Wharf Road	S	N	Wharf Rd	L	0			0		
					T	0			0		
					R	0			0		
			E	Balmain Rd	L	199	5.0	A	186	6.6	A
					T	215	4.9	A	273	6.1	A
					R	7	5.4	A	18	6.2	A
			S		L	20	2.4	A	15	3.7	A
					T	24	2.9	A	24	4.8	A
					R	238	4.0	A	219	5.6	A
			W	Perry St	L	15	4.6	A	15	12.0	A
					T	258	10.0	A	292	9.8	A
					R	3	8.8	A	3	9.3	A
			Total			**979**	**5.9**	**A**	**1045**	**7.2**	**A**
8	City-West Link Road / The Crescent	S	E	The Crescent	L	763	5.8	A	777	4.1	A
					T	1309	53.6	D	1223	49.2	D
			S		L	75	34.8	C	72	32.7	C
					R	1095	60.3	E	1020	64.1	E
			W	City-West Link Rd	T	1718	32.8	C	1241	24.8	B
					R	71	99.3	F	91	98.4	F
			Total			**5031**	**41.1**	**C**	**4424**	**38.6**	**C**
9	City-West Link Road / Norton Street	S	N	Norton St	L	9	59.0	E	1	1.6	A
					T	96	57.7	E	112	65.1	E
			E	City-West Link Rd	L	94	24.7	B	90	28.6	C
					T	1476	61.3	E	1409	55.7	D
					R	19	51.6	D	30	39.4	C
			S	Norton St	L	56	80.5	F	53	95.5	F
					T	186	105.2	F	206	112.6	F
					R	154	106.5	F	108	124.0	F
			W	City-West Link Rd	L	0			0		
					T	1519	8.3	A	1118	11.4	A
					R	107	59.4	E	107	64.0	E
			Total			**3716**	**42.8**	**D**	**3234**	**46.6**	**D**
10	City-West Link Road / Brenan Street / Balmain Road	S	N	Balmain Rd	L	69	45.0	D	47	39.0	C
					T	115	18.3	B	120	21.3	B
					R	31	21.5	B	31	48.7	D
			E	City-West Link Rd	L	41	7.0	A	26	13.7	A
					T	1474	8.0	A	1412	15.3	B
					R	127	22.6	B	91	22.5	B
			S	Balmain Rd	L	32	178.6	F	40	81.3	F
					T	336	183.2	F	314	71.4	F
					R	129	185.0	F	129	48.2	D
			W	City-West Link Rd	L	308	12.1	A	288	19.7	B
					T	1372	27.2	B	955	30.5	C
			Total			**4034**	**37.9**	**C**	**3453**	**28.0**	**B**

#	Intersection	Type	App.	Approach name	Turn	7:15AM - 8:15AM			8:15AM - 9:15AM		
						Volume (veh)	Delay (s)	LOS	Volume (veh)	Delay (s)	LOS
11	City-West Link Road / Brenan Street / Catherine Street	S	N	Catherine St	L	194	45.7	D	190	47.6	D
					T	294	36.5	C	281	37.5	C
					R	99	43.5	D	110	46.6	D
			E	City-West Link Rd	T	1389	16.9	B	1304	17.0	B
			S	Catherine St	L	59	35.9	C	30	40.2	C
			W	City-West Link Rd	T	1591	26.6	B	1143	26.9	B
			Total			3626	25.3	B	3058	25.8	B
13	Catherine Street / Moore Street	S	N	Catherine St	L	177	4.3	A	181	3.1	A
					T	114	35.3	C	121	31.4	C
					R	0			0		
			E	Moore St	L	0			2	1.5	A
					T	148	12.1	A	172	13.4	A
					R	103	15.5	B	76	15.1	B
			S	Catherine St	L	43	30.7	C	54	31.2	C
					T	71	28.1	B	78	34.3	C
					R	39	32.8	C	54	33.2	C
			W	Moore St	L	2	27.7	B	1	44.2	D
					T	142	19.5	B	109	20.7	B
			Total			839	18.6	B	848	19.2	B
14	Styles Street / Catherine Street	S	N	Catherine St	L	16	18.3	B	17	18.7	B
					T	106	25.0	B	108	19.4	B
					R	42	21.0	B	31	16.9	B
			E	Styles St	L	13	12.0	A	14	6.7	A
					T	152	10.3	A	147	9.0	A
					R	5	20.9	B	0		
			S	Catherine St	L	66	20.9	B	60	22.1	B
					T	57	26.0	B	71	22.7	B
					R	5	20.8	B	3	30.6	C
			W	Styles St	L	91	21.2	B	113	24.5	B
					T	538	20.5	B	537	23.9	B
					R	20	22.4	B	18	26.4	B
			Total			1111	19.8	B	1119	21.0	B
19	Marion Street / Norton Street	S	N	Norton St	L	70	39.9	C	103	32.7	C
					T	179	41.8	C	190	32.5	C
					R	33	35.7	C	32	29.6	C
			E	Marion St	L	93	25.4	B	97	27.1	B
					T	295	16.2	B	267	23.0	B
					R	3	25.4	B	6	36.9	C
			S	Norton St	L	30	31.0	C	38	22.2	B
					T	95	34.5	C	87	32.4	C
					R	7	29.9	C	5	46.2	D
			W	Marion St	L	49	33.9	C	43	23.3	B
					T	745	26.3	B	690	26.4	B
					R	154	30.5	C	160	29.2	C
			Total			1753	28.0	B	1718	27.5	B

#	Intersection	Type	App.	Approach name	Turn	7:15AM - 8:15AM			8:15AM - 9:15AM		
						Volume (veh)	Delay (s)	LOS	Volume (veh)	Delay (s)	LOS
20	Marion Street / Leichhardt Street / Balmain Road	S	N	Balmain Rd	L	25	73.8	F	30	84.6	F
					R	135	97.1	F	124	72.3	F
			E	Leichhardt St	T	234	13.2	A	219	12.9	A
					R	23	19.7	B	23	23.2	B
			S	Balmain Rd	L	13	125.0	F	10	85.3	F
					T	198	111.7	F	173	115.0	F
					R	3	115.8	F	1	133.2	F
			W	Marion St	L	266	27.8	B	245	31.0	C
					T	714	23.7	B	720	28.1	B
			Total			1611	41.5	C	1545	41.1	C
22	Johnston Street / Collins Street	S	N	Johnston St	L	150	8.7	A	123	7.5	A
					T	244	16.2	B	237	13.6	A
					R	73	21.9	B	64	19.5	B
			E	Collins St	L	60	18.5	B	45	16.8	B
			S	Johnston St	L	92	31.6	C	86	37.9	C
					T	452	37.5	C	415	34.3	C
			W	Collins St	L	374	20.7	B	394	15.9	B
					R	185	20.9	B	182	16.3	B
			Total			1630	24.2	B	1546	21.3	B
23	Johnston Street / Booth Street	S	N	Johnston St	L	44	53.0	D	50	57.4	E
					T	214	56.0	D	199	59.3	E
					R	65	53.6	D	91	63.2	E
			E	Booth St	L	23	17.2	B	15	9.9	A
					T	245	22.3	B	261	26.7	B
					R	36	41.2	C	22	25.0	B
			S	Johnston St	L	1	50.2	D	3	39.1	C
					T	520	37.3	C	481	38.0	C
					R	284	21.9	B	310	26.7	B
			W	Booth St	L	74	36.6	C	61	30.3	C
					T	377	50.4	D	412	37.0	C
					R	137	56.3	D	108	41.3	C
			Total			2020	39.7	C	2013	37.9	C
27	Booth Street / Wigram Road	RB	N	Wigram Rd	L	62	2.2	A	40	2.2	A
					R	55	2.0	A	47	1.7	A
			E	Booth St	T	260	2.8	A	233	3.0	A
					R	128	2.8	A	94	2.4	A
			W		L	226	1.8	A	230	1.6	A
					T	482	2.0	A	510	1.8	A
			Total			1213	2.8	A	1154	3.0	A

#	Intersection	Type	App.	Approach name	Turn	7:15AM - 8:15AM			8:15AM - 9:15AM		
						Volume (veh)	Delay (s)	LOS	Volume (veh)	Delay (s)	LOS
28	Minogue Crescent / Wigram Road	S	N	Minogue Cres	L	66	15.5	B	69	13.3	A
					T	344	20.9	B	416	20.1	B
					R	6	13.9	A	2	17.0	B
			E	Wigram Rd	L	13	26.1	B	18	30.9	C
					T	132	22.0	B	92	22.3	B
					R	35	23.1	B	23	24.2	B
			S	Minogue Cres	L	2	17.6	B	6	33.0	C
					T	138	26.0	B	128	25.4	B
					R	29	10.5	A	20	24.7	B
			W	Wigram Rd	L	5	18.9	B	3	13.9	A
					T	223	25.1	B	215	26.0	B
					R	0			0		
			Total			993	22.1	B	992	22.2	B
29	Ross Street / Bridge Road	S	N	Ross St	L	49	29.3	C	54	27.3	B
					T	289	46.3	D	351	38.4	C
			E	Bridge Rd	L	65	14.1	A	55	17.8	B
					T	419	13.3	A	414	15.5	B
					R	43	14.1	A	28	30.6	C
			S	Ross St	L	151	56.5	D	106	49.4	D
					T	143	57.4	E	142	47.4	D
			W	Bridge Rd	L	30	43.2	D	33	52.0	D
					T	811	39.9	C	833	56.8	E
					R	18	20.9	B	8	30.9	C
			Total			2018	36.0	C	2024	41.7	C
30	Pyrmont Bridge Road / Booth Street / Mallett Street	S	N	Booth St	L	321	85.1	F	335	56.7	E
					T	386	68.1	E	357	45.0	D
			E	Pyrmont Bridge Rd	L	16	18.4	B	43	15.0	B
					T	234	22.5	B	207	12.7	A
					R	72	56.7	E	65	66.4	E
			S	Mallett St	L	22	26.3	B	9	36.3	C
					T	199	21.6	B	138	35.1	C
					R	96	33.6	C	115	45.2	D
			W	Pyrmont Bridge Rd	L	49	43.5	D	47	34.5	C
					T	388	44.9	D	374	30.1	C
			Total			1783	51.0	D	1690	39.0	C
34	Marion Street / Foster Street	S	N	Foster St	L	1	2.6	A	1	17.9	B
					T	111	31.1	C	91	24.3	B
					R	36	41.9	C	40	43.6	D
			E	Marion St	L	58	16.3	B	65	46.4	D
					T	267	21.1	B	223	36.2	C
			S	Foster St	L	83	26.1	B	92	32.5	C
					T	389	32.7	C	471	36.0	C
					R	111	36.6	C	88	36.9	C
			W	Marion St	L	282	26.3	B	305	48.9	D
					T	649	26.4	B	631	51.6	D
					R	94	26.7	B	101	59.1	E
			Total			2081	27.7	B	2108	43.5	D

#	Intersection	Type	App.	Approach name	Turn	7:15AM - 8:15AM			8:15AM - 9:15AM		
						Volume (veh)	Delay (s)	LOS	Volume (veh)	Delay (s)	LOS
35	Marion Street / Flood Street	S	N	Flood St	L	12	22.9	B	15	25.7	B
					T	96	26.5	B	73	19.5	B
					R	14	44.3	D	7	23.0	B
			E	Marion St	L	151	42.1	C	147	7.3	A
					T	249	27.6	B	218	15.6	B
					R	6	21.4	B	10	37.9	C
			S	Flood St	L	31	27.5	B	33	33.0	C
					T	75	29.4	C	110	13.0	A
					R	229	34.2	C	172	39.1	C
			W	Marion St	L	39	50.8	D	26	58.0	E
					T	951	66.5	E	891	69.6	E
					R	82	118.0	F	70	81.2	F
			Total			1935	53.0	D	1772	48.1	D
36	Marion Street / Ramsay Street	S	N	Ramsay St	L	797	19.5	B	766	17.3	B
					T	1	116.8	F	1	28.1	B
			E	Marion St	L	28	20.3	B	26	24.0	B
					R	279	14.6	B	224	11.9	A
			S	Ramsay St	T	103	29.0	C	100	29.9	C
					R	191	39.5	C	220	46.2	D
			Total			1399	22.0	B	1337	22.2	B
39	Parramatta Road / Liverpool Road (Hume Highway)	S	E	Parramatta Rd	L	375	2.5	A	367	2.7	A
					T	1232	59.8	E	1146	49.2	D
			S	Liverpool Rd	L	90	34.5	C	94	36.7	C
					R	793	51.9	D	693	62.5	E
			W	Parramatta Rd	T	1310	17.5	B	1477	15.9	B
					R	255	48.2	D	271	61.4	E
			Total			4055	38.0	C	4048	35.6	C
41	City-West Link Road / James Street	S	N	City-West Link Rd	L	7	50.5	D	11	97.0	F
					T	90	45.7	D	92	63.1	E
					R	89	46.9	D	122	78.8	F
			E	James St	L	255	0.8	A	249	0.8	A
					T	1277	3.8	A	1213	2.4	A
			S	City-West Link Rd	L	13	58.5	E	5	86.7	F
					T	177	55.8	D	205	57.4	E
					R	316	54.9	D	343	56.9	E
			W	James St	L	201	3.6	A	239	2.8	A
					T	1300	29.6	C	872	21.1	B
			Total			3725	21.7	B	3351	21.0	B

#	Intersection	Type	App.	Approach name	Turn	7:15AM - 8:15AM			8:15AM - 9:15AM		
						Volume (veh)	Delay (s)	LOS	Volume (veh)	Delay (s)	LOS
42	Tebbutt Street / Lords Road	S	N	Forster St	L	150	18.8	B	169	17.1	B
					T	366	10.9	A	327	13.0	A
			E	Lords Rd	L	39	23.4	B	33	24.8	B
					T	39	14.9	B	50	18.3	B
					R	20	11.7	A	21	31.2	C
			S	Tebbutt St	L	25	7.5	A	21	9.6	A
					T	489	8.0	A	550	12.5	A
					R	221	13.5	A	220	15.6	B
			W	Lords Rd	L	22	24.8	B	25	27.6	B
					T	53	23.7	B	56	33.0	C
					R	25	19.1	B	26	28.8	C
			Total			1449	12.4	A	1498	15.6	B
43	Lilyfield Road / James Street	S	N	Mary St	L	83	4.3	A	100	7.2	A
					T	148	35.9	C	193	56.3	D
					R	8	46.1	D	13	54.2	D
			E	Lilyfield Rd	L	1	3.1	A	3	2.9	A
					T	56	3.6	A	41	4.1	A
					R	1	20.8	B	0		
			S	James St	L	25	24.8	B	29	19.2	B
					T	263	25.7	B	328	20.9	B
					R	88	27.4	B	90	19.0	B
			W	Lilyfield Rd	L	9	19.8	B	10	29.2	C
					T	96	26.0	B	95	32.2	C
					R	30	26.6	B	24	23.7	B
			Total			808	24.2	B	926	27.6	B
44	Tebbutt Street / Hathern Street	S	N	Tebbutt St	T	67	9.1	A	65	16.3	B
					R	386	13.4	A	332	23.3	B
			S		L	85	4.9	A	128	5.1	A
					T	8	29.2	C	39	40.1	C
			W	Hathern St	L	776	24.1	B	817	19.2	B
					R	103	28.7	C	127	26.6	B
			Total			1425	19.7	B	1508	20.0	B
45	Parramatta Road / Sloane Street	S	N	Sloane St	L	0			12	59.4	E
					T	80	51.6	D	84	58.6	E
					R	30	80.5	F	27	61.8	E
			E	Parramatta Rd	L	9	5.8	A	14	11.7	A
					T	1540	4.5	A	1434	5.5	A
			S	Sloane St	L	47	65.6	E	38	57.1	E
					T	166	60.4	E	156	57.8	E
			W	Parramatta Rd	L	101	22.2	B	101	34.7	C
					T	2002	21.9	B	2027	37.8	C
			Total			3975	18.3	B	3893	27.4	B

#	Intersection	Type	App.	Approach name	Turn	7:15AM - 8:15AM			8:15AM - 9:15AM		
						Volume (veh)	Delay (s)	LOS	Volume (veh)	Delay (s)	LOS
47	Parramatta Road / Old Canterbury Road / Tebbutt Street	S	N	Tebbutt St	L	171	39.4	C	190	69.6	E
			E	Parramatta Rd	L	216	24.4	B	215	15.0	B
					T	1435	15.0	B	1340	10.7	A
			S	Old Canterbury Rd	L	91	15.8	B	107	12.4	A
			W	Parramatta Rd	T	1814	131.7	F	1911	142.1	F
			Total			3727	73.5	F	3763	80.7	F
49	Old Canterbury Road / Railway Terrace / Longport Street	S	N	Old Canterbury Rd	L	118	29.1	C	159	21.3	B
					T	585	24.8	B	506	20.8	B
			E	Railway Terrace	L	28	22.5	B	19	47.4	D
					T	412	21.7	B	456	38.1	C
			S	Old Canterbury Rd	L	47	29.4	C	58	26.1	B
					T	908	38.5	C	966	30.8	C
					R	0			0		
			W	Longport St	L	62	23.8	B	71	33.4	C
					T	368	24.4	B	388	32.5	C
			Total			2528	29.4	C	2623	29.9	C
50	Parramatta Road / Norton Street	S	N	Norton St	L	188	107.4	F	196	42.1	C
					R	57	189.2	F	68	59.0	E
			E	Parramatta Rd	T	1201	3.3	A	1125	3.3	A
					R	235	46.6	D	223	40.3	C
			W		L	4	0.7	A	35	8.3	A
					T	1600	21.7	B	1674	14.1	A
			Total			3285	24.6	B	3321	14.7	B
51	Parramatta Road / Flood Street / West Street	S	N	Flood St	L	4	54.8	D	1	94.9	F
					T	106	47.9	D	90	53.5	D
					R	13	101.0	F	9	53.2	D
			E	Parramatta Rd	L	7	64.5	E	11	94.3	F
					T	1154	52.6	D	1109	52.6	D
			S	West St	L	235	23.2	B	211	19.6	B
					T	184	42.4	C	160	42.2	C
					R	0			0		
			W	Parramatta Rd	L	74	38.8	C	92	40.0	C
					T	1401	37.5	C	1533	39.1	C
					R	470	147.5	F	456	148.5	F
			Total			3648	56.4	D	3672	56.4	D
52	Parramatta Road / Crystal Street / Balmain Road	S	E	Parramatta Rd	L	117	41.7	C	80	81.9	F
					T	1235	47.3	D	1150	88.8	F
			S	Crystal St	L	174	34.7	C	175	31.4	C
					T	203	86.3	F	185	90.9	F
					R	147	81.7	F	148	80.7	F
			W	Parramatta Rd	L	6	6.7	A	5	9.3	A
					T	1707	8.6	A	1774	5.8	A
					R	224	55.4	D	214	28.4	B
			Total			3813	33.1	C	3731	42.7	D

#	Intersection	Type	App.	Approach name	Turn	7:15AM - 8:15AM			8:15AM - 9:15AM		
						Volume (veh)	Delay (s)	LOS	Volume (veh)	Delay (s)	LOS
53	Parramatta Road / Catherine Street / Phillip Street	S	N	Catherine St	L	12	60.0	E	1	314.3	F
					T	48	60.4	E	31	231.3	F
					R	79	71.4	F	43	298.6	F
			E	Parramatta Rd	L	2	24.2	B	0		
					T	1212	21.5	B	1176	76.7	F
			S	Phillip St	L	24	41.9	C	31	52.3	D
					T	75	44.7	D	60	56.6	E
					R	18	66.5	E	26	74.2	F
			W	Parramatta Rd	L	55	11.4	A	75	17.1	B
					T	1780	4.2	A	1849	4.2	A
			Total			3305	14.9	B	3292	38.4	C
56	Crystal Street / Douglas Street / Brighton Street	S	N	Crystal St	L	66	103.1	F	60	97.9	F
					T	263	109.7	F	244	115.5	F
			E	Douglas St	L	146	10.0	A	160	8.8	A
					T	33	44.1	D	33	46.3	D
					R	0			5	70.5	F
			S	Crystal St	L	356	22.1	B	365	30.2	C
					T	516	23.8	B	499	24.8	B
					R	703	32.2	C	729	33.1	C
			W	Brighton St	L	32	48.3	D	37	30.3	C
					T	74	96.4	F	72	83.6	F
					R	144	123.8	F	130	108.3	F
			Total			2333	46.2	D	2334	45.4	D
57	Crystal Street / Trafalgar Street	S	N	Crystal St	L	40	8.6	A	60	17.6	B
					T	462	10.5	A	432	13.4	A
					R	88	26.4	B	91	26.0	B
			E	Trafalger St	L	9	69.4	E	13	38.1	C
					T	46	35.2	C	69	28.4	B
			S	Crystal St	L	23	14.9	B	27	27.4	B
					T	1377	19.1	B	1363	28.0	B
			W	Trafalger St	L	196	35.9	C	217	25.1	B
					T	180	26.9	B	213	33.1	C
			Total			2421	19.9	B	2485	25.4	B
58	New Canterbury Road / Stanmore Road / Crystal Street / Shaw Street	S	N	Crystal St	L	106	84.8	F	124	96.6	F
					T	257	82.5	F	211	98.1	F
					R	110	90.5	F	105	102.6	F
			E	Stanmore Rd	L	36	25.9	B	28	35.4	C
					T	372	32.3	C	380	36.8	C
					R	228	51.1	D	238	52.3	D
			S	Shaw St	L	2	19.3	B	2	49.3	D
					T	484	49.1	D	471	73.5	F
			W	New Canterbury Rd	L	679	46.2	D	688	45.6	D
					T	798	38.1	C	790	36.4	C
			Total			3072	48.9	D	3037	54.6	D

#	Intersection	Type	App.	Approach name	Turn	7:15AM - 8:15AM			8:15AM - 9:15AM		
						Volume (veh)	Delay (s)	LOS	Volume (veh)	Delay (s)	LOS
59	Gordon Street / Trafalgar Street	S	N	Gordon St	T	411	12.5	A	437	11.7	A
			E	Trafalger St	L	21	1.6	A	21	1.2	A
					R	227	22.1	B	268	29.5	C
			S	Gordon St	T	222	24.3	B	229	23.2	B
					R	375	35.1	C	349	27.7	B
				Total		1256	22.9	B	1304	21.5	B
60	New Canterbury Road / Gordon Street / Livingstone Road	S	N	Gordon St	L	118	43.0	D	102	48.3	D
					T	318	51.3	D	353	54.5	D
			E	New Canterbury Rd	L	20	29.5	C	15	22.4	B
					T	331	13.3	A	307	16.0	B
					R	159	30.6	C	184	30.3	C
			S	Livingstone Rd	L	21	34.5	C	21	45.3	D
					T	404	34.6	C	346	34.7	C
			W	New Canterbury Rd	L	36	41.8	C	46	33.8	C
					T	1344	35.4	C	1325	32.4	C
			Total			2751	34.6	C	2699	34.3	C
62	Ramsay Road / Dalhousie Street	S	N	Dalhousie St	L	269	36.4	C	170	34.3	C
					T	85	33.9	C	154	32.2	C
					R	24	31.0	C	20	36.7	C
			E	Ramsay St	L	85	23.7	B	64	46.0	D
					T	255	24.7	B	220	15.0	B
					R	29	33.5	C	24	36.3	C
			S	Dalhousie St	L	72	39.0	C	66	36.8	C
					T	211	38.2	C	206	39.5	C
					R	87	28.8	C	99	33.8	C
			W	Ramsay St	L	14	10.7	A	20	26.0	B
					T	502	19.0	B	535	18.6	B
					R	3	4.6	A	1	2.2	A
			Total			1636	28.0	B	1579	27.2	B
65	Stanmore Road / Liberty Street	S	N	Liberty St	L	326	33.2	C	319	30.0	C
					R	134	44.6	D	125	53.6	D
			E	Stanmore Rd	T	493	7.4	A	509	6.9	A
					R	365	18.8	B	326	16.0	B
			W		L	109	7.9	A	76	10.7	A
					T	864	18.4	B	859	33.8	C
			Total			2291	19.3	B	2214	24.8	B

#	Intersection	Type	App.	Approach name	Turn	7:15AM - 8:15AM			8:15AM - 9:15AM		
						Volume (veh)	Delay (s)	LOS	Volume (veh)	Delay (s)	LOS
66	Ross Street / St Johns Road	S	N	Ross St	L	129	12.9	A	137	16.9	B
					T	274	12.1	A	302	16.1	B
					R	16	17.3	B	17	19.5	B
			E	St Johns Rd	L	20	39.6	C	38	42.5	C
					T	10	43.4	D	9	33.7	C
					R	108	41.7	C	83	48.1	D
			S	Ross St	L	77	15.6	B	104	12.7	A
					T	168	17.2	B	130	14.5	A
					R	117	16.8	B	137	9.4	A
			W	St Johns Rd	L	14	67.2	E	26	62.1	E
					T	28	53.2	D	17	45.3	D
					R	3	87.2	F	2	56.1	D
			Total			964	20.5	B	1002	20.4	B
67	Parramatta Road / Young Street / Percival Road	S	N	Young St	L	31	43.5	D	24	66.6	E
					T	195	46.5	D	169	49.9	D
					R	0			0		
			E	Parramatta Rd	L	7	16.5	B	8	10.8	A
					T	1087	3.0	A	1098	2.3	A
			S	Percival Rd	L	35	54.1	D	25	75.5	F
					T	144	54.8	D	126	70.9	F
					R	106	71.0	F	104	91.8	F
			W	Parramatta Rd	L	4	30.4	C	6	41.7	C
					T	1824	33.0	C	1888	40.8	C
			Total			3433	26.6	B	3448	32.0	C
68	Parramatta Road /Northumberland Avenue / Johnston Street	S	N	Johnston St	L	251	49.8	D	231	57.7	E
					T	234	57.5	E	234	65.4	E
					R	0			0		
			E	Parramatta Rd	L	12	6.4	A	21	8.0	A
					T	1100	19.2	B	1094	14.1	A
					R	128	95.7	F	118	107.3	F
			S	Northumberland Dr	L	12	50.9	D	9	67.3	E
					T	342	54.9	D	332	52.0	D
					R	69	89.3	F	58	62.9	E
			W	Parramatta Rd	L	57	25.8	B	55	34.6	C
					T	1854	17.1	B	1898	27.9	B
			Total			4059	29.1	C	4050	32.9	C
69	Parramatta Road / Bridge Road	S	E	Parramatta Rd	L	156	23.5	B	158	22.7	B
					T	1195	16.3	B	1173	16.8	B
			S	Bridge Rd	L	0			0		
					R	488	74.6	F	446	61.9	E
			W	Parramatta Rd	T	1914	41.2	C	1984	54.4	D
					R	211	62.6	E	170	83.3	F
			Total			3964	38.2	C	3931	44.0	D

#	Intersection	Type	App.	Approach name	Turn	7:15AM - 8:15AM			8:15AM - 9:15AM		
						Volume (veh)	Delay (s)	LOS	Volume (veh)	Delay (s)	LOS
70	Parramatta Road /Pyrmont Bridge Road / Denison Street	S	N	Pyrmont Bridge Rd	L	0			0		
					T	28	61.6	E	20	56.9	E
					R	215	60.6	E	201	45.8	D
			E	Parramatta Rd	L	34	15.9	B	30	24.4	B
					T	1121	3.0	A	1103	1.6	A
			W		L	508	9.8	A	511	10.1	A
					T	2054	13.4	A	2115	15.1	B
			Total			3960	12.9	A	3980	12.5	A
71	Parramatta Road / Mallett Street	S	N	Mallett St	L	130	38.6	C	122	50.7	D
					T	229	47.1	D	255	44.7	D
					R	63	56.3	D	33	71.8	F
			E	Parramatta Rd	L	31	15.1	B	36	9.0	A
					T	1055	4.8	A	1072	2.0	A
			S	Mallett St	L	18	42.9	D	24	70.0	E
					T	212	43.0	D	189	74.1	F
					R	65	48.3	D	80	149.8	F
			W	Parramatta Rd	L	49	25.3	B	14	34.0	C
					T	1998	44.4	D	2108	49.4	D
			Total			3850	33.2	C	3933	39.3	C
72	Parramatta Road / Ross Street / Western Avenue	S	N	Ross St	L	134	52.0	D	119	58.4	E
					T	54	61.8	E	68	64.9	E
					R	112	90.8	F	154	84.3	F
			E	Parramatta Rd	L	15	9.2	A	26	10.0	A
					T	974	7.4	A	979	11.8	A
					R	113	167.4	F	97	367.1	F
			S	Western Ave	L	10	227.4	F	13	105.9	F
					T	50	185.0	F	33	118.0	F
					R	29	159.5	F	33	128.4	F
			W	Parramatta Rd	L	192	33.4	C	248	40.9	C
					T	1930	18.2	B	2034	25.3	B
			Total			3613	28.9	C	3804	37.6	C
73	Great Western Highway / Glebe Point Road	S	N	Glebe Point Rd	L	312	31.0	C	343	35.2	C
					R	73	56.5	E	61	64.1	E
			E	Great Western Hwy	T	1085	5.7	A	1107	5.4	A
					R	224	85.1	F	227	89.5	F
			W		L	33	12.2	A	27	21.7	B
					T	2061	13.9	A	2084	33.6	C
			Total			3788	18.0	B	3849	29.3	C

#	Intersection	Type	App.	Approach name	Turn	7:15AM - 8:15AM			8:15AM - 9:15AM		
						Volume (veh)	Delay (s)	LOS	Volume (veh)	Delay (s)	LOS
74	Broadway / City Road (Princes Highway) / Bay Street	S	N	Bay St	L	24	15.3	B	29	21.2	B
			E	Broadway	L	381	16.0	B	375	12.6	A
					T	572	81.4	F	670	73.9	F
			S	City Rd	L	732	15.7	B	668	23.3	B
					T	187	43.9	D	187	53.4	D
					R	782	42.6	D	655	57.6	E
			W	Great Western Hwy	L	164	12.3	A	181	14.0	A
					T	1202	12.9	A	1284	17.4	B
					R	995	37.8	C	956	75.7	F
			Total			5039	32.0	C	5005	43.0	D
75	University Avenue / Parramatta Road / Derwent Street / Arundel Street	S	E	Parramatta Rd	L	95	2.1	A	89	2.0	A
					T	1098	1.9	A	1093	3.6	A
			S	University Ave	L	15	55.6	D	7	56.1	D
					R	9	78.5	F	12	194.8	F
			W	Parramatta Rd	T	2073	36.2	C	2147	48.7	D
			Total			3290	24.0	B	3348	33.3	C
79	Douglas Street / Percival Road	S	N	Percival Rd	L	54	30.5	C	41	28.3	B
					R	70	24.7	B	86	26.6	B
			E	Douglas St	T	78	42.6	D	109	26.9	B
					R	133	96.8	F	118	47.9	D
			W		L	654	34.7	C	644	24.2	B
					T	97	45.4	D	105	36.4	C
			Total			1086	43.0	D	1103	28.5	C
80	Railway Terrace / Victoria Street	P	E	Railway Terrace	L	7	1.4	A	13	1.5	A
					T	440	1.4	A	475	1.6	A
			S	Victoria St	L	71	2.8	A	67	2.7	A
					R	16	5.8	A	14	4.0	A
			W	Railway Terrace	T	489	1.5	A	546	1.6	A
			Total			1023	5.8	A	1115	4.0	A
81	Parramatta Road / Dalhousie Street	S	N	Dalhousie St	L	65	38.2	C	123	45.9	D
					R	125	69.6	E	106	66.5	E
			E	Parramatta Rd	T	1216	25.6	B	1122	12.5	A
					R	93	51.8	D	100	34.4	C
			W		L	94	39.3	C	113	50.2	D
					T	1521	36.8	C	1605	50.8	D
			Total			3114	34.3	C	3169	37.0	C

#	Intersection	Type	App.	Approach name	Turn	7:15AM - 8:15AM			8:15AM - 9:15AM		
						Volume (veh)	Delay (s)	LOS	Volume (veh)	Delay (s)	LOS
82	Carillon Avenue / Missenden Road	S	N	Missenden Rd	L	83	12.8	A	83	18.6	B
					T	156	26.1	B	163	19.7	B
					R	34	33.5	C	45	31.2	C
			E	Carillon Ave	L	16	42.2	C	34	45.5	D
					T	217	47.7	D	212	42.7	D
					R	60	42.3	C	61	39.1	C
			S	Missenden Rd	L	194	15.2	B	153	21.0	B
					T	184	35.0	C	188	35.0	C
					R	0			0		
			W	Carillon Ave	L	66	48.8	D	58	54.4	D
					T	447	44.2	D	398	44.7	D
					R	16	34.1	C	21	40.5	C
			Total			1473	35.8	C	1416	35.8	C
83	Parramatta Road / Missenden Avenue / Lyons Road	S	N	Lyons Rd	L	28	73.4	F	38	103.1	F
					T	120	48.2	D	107	106.1	F
					R	6	61.2	E	9	105.2	F
			E	Parramatta Rd	L	115	18.8	B	147	34.1	C
					T	974	54.9	D	1007	58.9	E
			S	Missenden Rd	L	80	28.8	C	67	38.3	C
					T	58	39.8	C	55	64.7	E
					R	30	41.9	C	48	81.3	F
			W	Parramatta Rd	L	26	36.5	C	30	38.3	C
					T	1864	28.7	C	2018	35.7	C
					R	154	84.5	F	150	109.9	F
			Total			3455	39.7	C	3676	49.0	D

#	Intersection	Type	App.	Approach name	Turn	7:15AM - 8:15AM			8:15AM - 9:15AM		
						Volume (veh)	Delay (s)	LOS	Volume (veh)	Delay (s)	LOS
1	Victoria Rd / Darling St	S	N	Darling St	L	125	48.9	D	138	47.5	D
					T	195	66.7	E	201	62.8	E
			E	Victoria Rd	L	64	18.5	B	70	28.1	B
					T	2276	16.4	B	2389	13.7	A
					R	115	45.1	D	122	48.5	D
			S	Darling St	L	286	69.2	E	297	85.3	F
					T	248	108.5	F	271	107.6	F
			W	Victoria Rd	L	80	43.5	D	93	43.1	D
					T	1978	42.2	C	2103	47.1	D
					R	445	38.9	C	435	46.0	D
			Total			5812	36.8	C	2389	38.8	C
2	Victoria Road / Evans Street	S	N	Evans St	L	74	59.8	E	64	62.9	E
					T	121	61.5	E	139	60.7	E
					R	51	62.1	E	56	62.5	E
			E	Victoria Rd	L	29	10.1	A	41	15.3	B
					T	2383	11.4	A	2498	9.4	A
			S	Evans St	L	21	51.9	D	39	51.9	D
					T	110	51.8	D	107	60.5	E
			W	Victoria Rd	L	20	2.9	A	23	2.7	A
					T	2083	3.1	A	2235	3.4	A
			Total			4892	11.4	A	5202	10.8	A
3	Victoria Road / Robert Street	S	N	Victoria Rd	L	28	15.5	B	48	15.2	B
					T	2207	56.0	D	2346	54.3	D
			E	Robert St	L	646	27.9	B	637	28.5	C
					R	21	81.5	F	15	107.9	F
			S	Victoria Rd	T	2345	9.9	A	2457	8.8	A
					R	903	52.2	D	961	48.4	D
			Total			6150	34.8	C	6464	33.4	C
5	Balmain Road / Lilyfield Road	S	N	Balmain Rd	L	60	6.1	A	64	8.6	A
					T	230	7.5	A	220	6.4	A
			E	Lilyfield Rd	L	48	25.2	B	28	36.8	C
					T	48	29.2	C	58	27.0	B
					R	6	21.8	B	3	31.2	C
			S	Balmain Rd	L	71	12.1	A	66	10.7	A
					T	302	11.0	A	304	10.4	A
					R	242	14.7	B	235	12.4	A
			W	Lilyfield Rd	L	0			0		
					T	1	1.6	A	6	35.0	C
					R	0			0		
			Total			1008	12.5	A	984	11.8	A
6	The Crescent / Victoria Road	S	N	Victoria Rd	L	2076	4.5	A	2155	4.8	A
					R	758	76.5	F	813	75.4	F
			E		T	1804	25.3	B	2039	24.6	B
					R	2898	33.6	C	3019	33.2	C
			W	The Crescent	L	733	18.4	B	814	16.6	B
			Total			8269	27.1	B	8840	26.7	B

#	Intersection	Type	App.	Approach name	Turn	7:15AM - 8:15AM			8:15AM - 9:15AM		
						Volume (veh)	Delay (s)	LOS	Volume (veh)	Delay (s)	LOS
7	Balmain Road / Perry Street / Wharf Road	S	N	Wharf Rd	L	10	1.7	A	17	1.7	A
					T	23	1.6	A	30	1.7	A
					R	5	1.8	A	1	1.9	A
			E	Balmain Rd	L	253	3.5	A	238	3.8	A
					T	442	4.0	A	467	4.2	A
					R	17	4.4	A	21	4.8	A
			S		L	15	2.7	A	16	2.0	A
					T	4	1.5	A	11	2.2	A
					R	204	3.1	A	203	3.2	A
			W	Perry St	L	8	2.7	A	9	2.8	A
					T	245	2.8	A	270	3.1	A
					R	0			0		
			Total			1226	3.4	A	1283	3.6	A
8	City-West Link Road / The Crescent	S	E	The Crescent	L	898	4.7	A	991	5.6	A
					T	1698	31.5	C	1872	28.2	B
			S		L	209	27.4	B	208	37.2	C
					R	792	67.5	E	881	78.0	F
			W	City-West Link Rd	T	1987	32.5	C	1965	43.1	D
					R	184	82.5	F	181	77.6	F
			Total			5768	34.1	C	6098	38.3	C
9	City-West Link Road / Norton Street	S	N	Norton St	L	18	66.6	E	21	70.3	E
					T	189	70.1	E	190	75.4	F
			E	City-West Link Rd	L	107	26.9	B	111	23.4	B
					T	2005	52.6	D	2082	48.3	D
					R	22	63.3	E	36	72.8	F
			S	Norton St	L	73	39.5	C	79	35.3	C
					T	160	58.0	E	148	61.1	E
					R	46	58.5	E	31	52.4	D
			W	City-West Link Rd	L	0			0		
					T	1891	4.2	A	1938	4.6	A
					R	121	48.6	D	136	50.5	D
			Total			4632	33.0	C	4772	31.6	C
10	City-West Link Road / Brenan Street / Balmain Road	S	N	Balmain Rd	L	126	44.8	D	120	38.5	C
					T	202	24.4	B	195	29.5	C
					R	96	31.5	C	81	24.6	B
			E	City-West Link Rd	L	162	16.2	B	148	28.6	C
					T	1863	16.7	B	2045	28.8	C
					R	85	23.5	B	88	32.4	C
			S	Balmain Rd	L	125	65.6	E	121	94.7	F
					T	361	64.2	E	346	85.8	F
					R	78	59.8	E	109	74.3	F
			W	City-West Link Rd	L	142	12.9	A	156	18.4	B
					T	1800	36.2	C	1834	52.8	D
			Total			5040	30.2	C	5243	43.3	D

#	Intersection	Type	App.	Approach name	Turn	7:15AM - 8:15AM			8:15AM - 9:15AM		
						Volume (veh)	Delay (s)	LOS	Volume (veh)	Delay (s)	LOS
11	City-West Link Road / Brenan Street / Catherine Street	S	N	Catherine St	L	64	53.1	D	62	57.9	E
					T	297	48.6	D	319	50.7	D
					R	58	57.4	E	62	44.3	D
			E	City-West Link Rd	T	1916	14.5	A	2072	19.9	B
			S	Catherine St	L	0			0		
			W	City-West Link Rd	T	2087	30.4	C	2090	40.9	C
			Total			4422	25.4	B	4605	32.4	C
13	Catherine Street / Moore Street	S	N	Catherine St	L	102	1.7	A	118	1.6	A
					T	92	30.6	C	95	34.7	C
					R	10	39.8	C	7	56.8	E
			E	Moore St	L	0			0		
					T	296	9.8	A	303	11.4	A
					R	2	8.4	A	7	10.9	A
			S	Catherine St	L	9	35.9	C	11	27.5	B
					T	113	34.7	C	87	35.0	C
					R	24	31.2	C	27	33.2	C
			W	Moore St	L	2	23.3	B	2	26.6	B
					T	124	16.6	B	103	17.0	B
			Total			774	17.3	B	760	17.7	B
14	Styles Street / Catherine Street	S	N	Catherine St	L	0			0		
					T	128	23.0	B	125	28.7	C
					R	34	23.8	B	32	29.4	C
			E	Styles St	L	25	10.2	A	30	5.7	A
					T	283	10.5	A	313	9.8	A
					R	2	13.0	A	3	5.4	A
			S	Catherine St	L	55	26.5	B	44	27.0	B
					T	25	26.2	B	25	21.9	B
					R	1	39.2	C	2	26.0	B
			W	Styles St	L	71	14.4	A	53	17.7	B
					T	392	16.6	B	402	19.0	B
					R	19	17.5	B	34	21.1	B
			Total			1035	16.4	B	1063	17.8	B
19	Marion Street / Norton Street	S	N	Norton St	L	61	42.7	D	63	30.9	C
					T	154	38.3	C	161	34.3	C
					R	33	42.8	D	56	38.6	C
			E	Marion St	L	149	34.9	C	173	41.0	C
					T	523	26.9	B	519	34.4	C
					R	48	24.9	B	50	32.8	C
			S	Norton St	L	44	30.5	C	37	25.5	B
					T	74	33.2	C	81	31.9	C
					R	0			0		
			W	Marion St	L	30	8.7	A	15	18.7	B
					T	403	9.0	A	379	11.9	A
					R	56	10.1	A	62	11.1	A
			Total			1575	24.5	B	1596	28.3	B

#	Intersection	Type	App.	Approach name	Turn	7:15AM - 8:15AM			8:15AM - 9:15AM		
						Volume (veh)	Delay (s)	LOS	Volume (veh)	Delay (s)	LOS
20	Marion Street / Leichhardt Street / Balmain Road	S	N	Balmain Rd	L	33	70.8	F	21	59.4	E
					R	262	70.8	F	242	52.8	D
			E	Leichhardt St	T	352	19.4	B	383	22.3	B
					R	40	26.0	B	26	33.9	C
			S	Balmain Rd	L	35	72.4	F	41	89.4	F
					T	132	82.2	F	144	85.2	F
					R	9	76.5	F	1	60.5	E
			W	Marion St	L	206	27.0	B	200	33.4	C
					T	387	27.4	B	383	36.4	C
			Total			1456	40.5	C	1441	41.7	C
22	Johnston Street / Collins Street	S	N	Johnston St	L	13	22.1	B	4	26.6	B
					T	418	46.9	D	414	19.5	B
					R	71	34.3	C	59	30.8	C
			E	Collins St	L	16	22.8	B	21	20.5	B
			S	Johnston St	L	215	37.3	C	245	42.0	C
					T	409	34.9	C	454	37.6	C
			W	Collins St	L	180	18.8	B	179	23.1	B
					R	91	19.6	B	110	19.4	B
			Total			1413	35.5	C	1486	29.7	C
23	Johnston Street / Booth Street	S	N	Johnston St	L	82	69.9	E	107	81.6	F
					T	445	68.7	E	445	68.2	E
					R	92	50.8	D	90	59.9	E
			E	Booth St	L	65	18.3	B	59	19.5	B
					T	272	28.5	C	281	28.6	C
					R	73	33.5	C	90	34.1	C
			S	Johnston St	L	0			0		
					T	407	17.4	B	460	55.1	D
					R	154	25.1	B	155	9.9	A
			W	Booth St	L	57	15.3	B	65	17.4	B
					T	144	25.7	B	108	25.6	B
					R	26	35.4	C	28	40.3	C
			Total			1817	37.9	C	1888	47.0	D
27	Booth Street / Wigram Road	RB	N	Wigram Rd	L	51	1.9	A	48	1.9	A
					R	107	1.5	A	94	1.4	A
			E	Booth St	T	285	2.8	A	316	3.2	A
					R	169	2.8	A	180	3.3	A
			W		L	143	1.5	A	116	1.5	A
					T	270	1.6	A	274	1.5	A
			Total			1025	2.8	A	1028	3.3	A

#	Intersection	Type	App.	Approach name	Turn	7:15AM - 8:15AM Volume (veh)	Delay (s)	LOS	8:15AM - 9:15AM Volume (veh)	Delay (s)	LOS
28	Minogue Crescent / Wigram Road	S	N	Minogue Cres	L	105	19.0	B	114	11.3	A
					T	219	20.5	B	245	13.6	A
					R	0			0		
			E	Wigram Rd	L	2	24.7	B	5	29.7	C
					T	135	24.0	B	117	22.4	B
					R	93	27.2	B	89	23.9	B
			S	Minogue Cres	L	42	6.1	A	48	7.4	A
					T	315	10.7	A	341	16.5	B
					R	62	10.7	A	92	11.8	A
			W	Wigram Rd	L	0			0		
					T	112	30.3	C	112	28.7	C
					R	44	29.0	C	32	22.9	B
			Total			1129	18.8	B	1195	17.2	B
29	Ross Street / Bridge Road	S	N	Ross St	L	59	20.6	B	66	23.8	B
					T	202	32.8	C	213	21.1	B
			E	Bridge Rd	L	35	21.7	B	25	24.5	B
					T	703	22.6	B	784	25.9	B
					R	106	27.3	B	108	28.0	B
			S	Ross St	L	217	44.9	D	259	46.6	D
					T	353	39.5	C	411	41.4	C
			W	Bridge Rd	L	83	35.2	C	86	27.6	B
					T	459	41.0	C	505	49.1	D
					R	0			0		
			Total			2217	32.8	C	2457	35.1	C
30	Pyrmont Bridge Road / Booth Street / Mallett Street	S	N	Booth St	L	174	24.2	B	196	21.7	B
					T	232	30.7	C	232	27.2	B
			E	Pyrmont Bridge Rd	L	108	12.1	A	117	17.6	B
					T	512	11.7	A	578	15.0	B
					R	138	41.5	C	158	43.1	D
			S	Mallett St	L	27	39.4	C	36	34.4	C
					T	146	30.6	C	155	30.8	C
					R	42	37.4	C	63	36.4	C
			W	Pyrmont Bridge Rd	L	49	34.6	C	65	37.7	C
					T	261	27.1	B	264	30.9	C
			Total			1689	23.8	B	1864	25.2	B
34	Marion Street / Foster Street	S	N	Foster St	L	24	27.0	B	19	26.7	B
					T	400	23.1	B	421	29.2	C
					R	80	28.9	C	61	36.2	C
			E	Marion St	L	122	50.4	D	130	40.4	C
					T	433	39.5	C	464	25.9	B
			S	Foster St	L	169	14.3	A	176	17.4	B
					T	433	20.1	B	442	25.1	B
					R	69	25.6	B	86	31.1	C
			W	Marion St	L	79	46.9	D	68	33.9	C
					T	293	43.8	D	316	28.4	B
					R	110	54.5	D	67	29.3	C
			Total			2212	32.0	C	2250	27.7	B

#	Intersection	Type	App.	Approach name	Turn	7:15AM - 8:15AM			8:15AM - 9:15AM		
						Volume (veh)	Delay (s)	LOS	Volume (veh)	Delay (s)	LOS
35	Marion Street / Flood Street	S	N	Flood St	L	0			1	18.0	B
					T	105	30.8	C	125	20.4	B
					R	11	34.3	C	18	27.8	B
			E	Marion St	L	239	10.6	A	279	14.3	A
					T	418	8.5	A	426	12.6	A
					R	24	9.7	A	23	5.2	A
			S	Flood St	L	95	41.4	C	121	40.5	C
					T	100	30.2	C	126	23.8	B
					R	163	47.2	D	130	38.8	C
			W	Marion St	L	12	19.3	B	14	24.9	B
					T	444	15.4	B	473	18.4	B
					R	34	25.2	B	40	32.2	C
			Total			1645	19.8	B	1776	20.2	B
36	Marion Street / Ramsay Street	S	N	Ramsay St	L	357	9.6	A	341	11.4	A
					T	70	47.6	D	69	41.3	C
			E	Marion St	L	103	10.6	A	99	10.6	A
					R	415	9.7	A	415	14.3	A
			S	Ramsay St	T	95	24.9	B	87	22.2	B
					R	150	30.3	C	138	21.8	B
			Total			1190	15.8	B	1149	16.2	B
39	Parramatta Road / Liverpool Road (Hume Highway)	S	E	Parramatta Rd	L	898	7.8	A	882	6.1	A
					T	1540	31.2	C	1570	61.6	E
			S	Liverpool Rd	L	154	24.2	B	171	26.2	B
					R	431	67.2	E	456	56.2	D
			W	Parramatta Rd	T	1228	10.4	A	1264	22.0	B
					R	333	159.2	F	328	126.2	F
			Total			4584	33.5	C	4671	43.1	D
41	City-West Link Road / James Street	S	N	City-West Link Rd	L	0			2	160.2	F
					T	265	87.9	F	290	117.7	F
					R	129	90.0	F	135	121.7	F
			E	James St	L	436	0.9	A	388	0.8	A
					T	1636	8.0	A	1772	6.9	A
			S	City-West Link Rd	L	24	62.0	E	36	49.6	D
					T	200	65.8	E	189	56.7	E
					R	330	57.1	E	322	51.9	D
			W	James St	L	182	4.2	A	179	6.1	A
					T	1672	29.9	C	1754	31.5	C
			Total			4874	27.2	B	5067	29.4	C

#	Intersection	Type	App.	Approach name	Turn	7:15AM - 8:15AM			8:15AM - 9:15AM		
						Volume (veh)	Delay (s)	LOS	Volume (veh)	Delay (s)	LOS
42	Tebbutt Street / Lords Road	S	N	Forster St	L	59	13.3	A	43	16.1	B
					T	703	17.5	B	721	16.7	B
			E	Lords Rd	L	23	27.7	B	20	30.0	C
					T	41	23.2	B	41	37.7	C
					R	118	25.7	B	145	27.8	B
			S	Tebbutt St	L	20	36.1	C	22	25.4	B
					T	490	6.9	A	477	6.6	A
					R	102	14.8	B	104	10.3	A
			W	Lords Rd	L	16	33.4	C	6	17.2	B
					T	51	27.7	B	43	33.7	C
					R	33	36.6	C	35	41.0	C
			Total			1656	16.0	B	1657	16.1	B
43	Lilyfield Road / James Street	S	N	Mary St	L	100	8.3	A	101	119.7	F
					T	317	96.5	F	342	259.4	F
					R	19	92.3	F	17	250.7	F
			E	Lilyfield Rd	L	0			0		
					T	32	48.6	D	48	30.1	C
					R	40	43.6	D	39	40.4	C
			S	James St	L	57	18.5	B	56	34.3	C
					T	278	21.1	B	286	23.5	B
					R	43	28.7	C	30	23.9	B
			W	Lilyfield Rd	L	32	48.5	D	40	41.6	C
					T	71	42.9	D	72	34.1	C
					R	60	42.9	D	56	37.1	C
			Total			1049	49.4	D	1087	113.7	F
44	Tebbutt Street / Hathern Street	S	N	Tebbutt St	T	36	26.9	B	38	50.3	D
					R	825	36.7	C	829	46.1	D
			S		L	188	11.1	A	184	9.0	A
					T	63	34.4	C	80	30.8	C
			W	Hathern St	L	579	12.7	A	554	12.6	A
					R	83	26.7	B	78	29.2	C
			Total			1774	25.4	B	1763	30.3	C
45	Parramatta Road / Sloane Street	S	N	Sloane St	L	27	75.4	F	22	70.6	F
					T	157	66.0	E	157	61.8	E
					R	73	95.3	F	73	64.7	E
			E	Parramatta Rd	L	32	18.6	B	26	27.9	B
					T	2313	20.5	B	2348	24.4	B
			S	Sloane St	L	48	63.2	E	52	56.5	E
					T	150	54.8	D	144	57.3	E
			W	Parramatta Rd	L	72	14.6	B	79	26.0	B
					T	1612	12.5	A	1688	25.1	B
			Total			4484	22.3	B	4589	28.3	B

#	Intersection	Type	App.	Approach name	Turn	Volume (veh) 7:15AM - 8:15AM	Delay (s) 7:15AM - 8:15AM	LOS 7:15AM - 8:15AM	Volume (veh) 8:15AM - 9:15AM	Delay (s) 8:15AM - 9:15AM	LOS 8:15AM - 9:15AM
47	Parramatta Road / Old Canterbury Road / Tebbutt Street	S	N	Tebbutt St	L	121	14.4	A	116	12.4	A
			E	Parramatta Rd	L	230	16.4	B	238	16.5	B
					T	2242	20.4	B	2304	15.9	B
			S	Old Canterbury Rd	L	107	11.9	A	97	12.6	A
			W	Parramatta Rd	T	1365	14.2	A	1462	19.9	B
			Total			4065	17.7	B	4217	17.1	B
49	Old Canterbury Road / Railway Terrace / Longport Street	S	N	Old Canterbury Rd	L	2	46.8	D	1	55.7	D
					T	1225	30.5	C	1220	31.9	C
			E	Railway Terrace	L	25	33.7	C	28	30.1	C
					T	683	35.3	C	701	26.9	B
			S	Old Canterbury Rd	L	85	31.6	C	94	30.8	C
					T	629	27.0	B	608	25.9	B
					R	0			0		
			W	Longport St	L	81	27.0	B	63	22.1	B
					T	484	25.7	B	469	26.8	B
			Total			3214	30.1	C	3184	28.7	C
50	Parramatta Road / Norton Street	S	N	Norton St	L	236	40.4	C	263	48.5	D
					R	101	65.9	E	99	68.1	E
			E	Parramatta Rd	T	1815	24.5	B	1849	20.8	B
					R	280	29.1	C	327	34.4	C
			W		L	79	34.3	C	79	12.4	A
					T	1084	40.3	C	1191	39.1	C
			Total			3595	32.0	C	3808	30.7	C
51	Parramatta Road / Flood Street / West Street	S	N	Flood St	L	3	56.5	E	6	31.8	C
					T	178	39.4	C	185	94.5	F
					R	77	49.6	D	93	162.4	F
			E	Parramatta Rd	L	8	66.0	E	12	68.7	E
					T	1812	73.1	F	1831	63.2	E
			S	West St	L	335	26.4	B	416	35.2	C
					T	184	35.3	C	206	45.2	D
					R	0			0		
			W	Parramatta Rd	L	93	30.8	C	139	30.4	C
					T	1069	36.6	C	1112	33.9	C
					R	289	131.3	F	339	125.3	F
			Total			4048	59.1	E	4339	59.4	E
52	Parramatta Road / Crystal Street / Balmain Road	S	E	Parramatta Rd	L	231	30.7	C	256	26.4	B
					T	1852	28.9	C	1907	25.5	B
			S	Crystal St	L	237	73.6	F	235	57.9	E
					T	134	146.1	F	150	102.4	F
					R	134	152.8	F	112	117.9	F
			W	Parramatta Rd	L	35	23.2	B	28	17.4	B
					T	1118	17.5	B	1225	17.2	B
					R	230	60.7	E	254	59.5	E
			Total			3971	38.4	C	4167	32.2	C

#	Intersection	Type	App.	Approach name	Turn	7:15AM - 8:15AM			8:15AM - 9:15AM		
						Volume (veh)	Delay (s)	LOS	Volume (veh)	Delay (s)	LOS
53	Parramatta Road / Catherine Street / Phillip Street	S	N	Catherine St	L	7	64.4	E	9	46.4	D
					T	22	86.9	F	35	46.6	D
					R	99	63.0	E	105	55.9	D
			E	Parramatta Rd	L	7	22.3	B	7	36.3	C
					T	1949	33.6	C	1996	41.0	C
			S	Phillip St	L	10	75.6	F	12	76.3	F
					T	63	48.0	D	60	36.7	C
					R	26	52.7	D	10	46.3	D
			W	Parramatta Rd	L	36	6.5	A	37	4.9	A
					T	1188	2.7	A	1271	2.9	A
			Total			3407	24.3	B	3542	27.5	B
56	Crystal Street / Douglas Street / Brighton Street	S	N	Crystal St	L	39	67.9	E	38	61.0	E
					T	410	70.8	F	450	81.7	F
			E	Douglas St	L	546	18.0	B	533	18.4	B
					T	37	65.7	E	42	44.9	D
					R	12	94.8	F	6	93.1	F
			S	Crystal St	L	301	26.7	B	286	16.7	B
					T	520	28.8	C	505	13.6	A
					R	297	28.4	B	304	16.8	B
			W	Brighton St	L	24	31.9	C	26	24.3	B
					T	17	86.9	F	17	81.7	F
					R	188	105.6	F	184	110.9	F
			Total			2391	41.3	C	2391	37.8	C
57	Crystal Street / Trafalgar Street	S	N	Crystal St	L	21	21.7	B	22	18.4	B
					T	938	18.4	B	968	18.3	B
					R	223	18.9	B	195	20.3	B
			E	Trafalger St	L	18	54.5	D	20	65.5	E
					T	128	60.6	E	140	54.3	D
			S	Crystal St	L	41	11.9	A	39	13.1	A
					T	957	24.7	B	962	23.9	B
			W	Trafalger St	L	160	30.4	C	128	32.0	C
					T	99	44.4	D	92	50.6	D
			Total			2585	24.8	B	2566	24.6	B
58	New Canterbury Road / Stanmore Road / Crystal Street / Shaw Street	S	N	Crystal St	L	139	58.3	E	155	69.7	E
					T	476	61.4	E	472	71.6	F
					R	352	88.2	F	385	110.2	F
			E	Stanmore Rd	L	15	33.1	C	26	35.9	C
					T	622	29.2	C	618	45.9	D
					R	336	42.5	C	332	63.7	E
			S	Shaw St	L	22	52.6	D	19	52.4	D
					T	362	47.0	D	372	51.8	D
			W	New Canterbury Rd	L	294	52.5	D	284	58.7	E
					T	509	44.5	D	535	51.9	D
			Total			3127	50.4	D	3198	63.2	E

#	Intersection	Type	App.	Approach name	Turn	7:15AM - 8:15AM			8:15AM - 9:15AM		
						Volume (veh)	Delay (s)	LOS	Volume (veh)	Delay (s)	LOS
59	Gordon Street / Trafalgar Street	S	N	Gordon St	T	595	8.2	A	653	7.8	A
			E	Trafalger St	L	25	1.1	A	24	1.1	A
					R	342	70.6	F	322	75.0	F
			S	Gordon St	T	342	20.0	B	302	18.0	B
					R	462	36.6	C	559	38.9	C
				Total		1766	29.9	C	1860	30.3	C
60	New Canterbury Road / Gordon Street / Livingstone Road	S	N	Gordon St	L	148	38.7	C	136	37.4	C
					T	475	47.9	D	529	48.1	D
			E	New Canterbury Rd	L	45	20.7	B	61	23.0	B
					T	878	15.2	B	879	19.4	B
					R	208	26.4	B	198	27.3	B
			S	Livingstone Rd	L	100	39.2	C	102	34.7	C
					T	559	36.6	C	621	36.1	C
			W	New Canterbury Rd	L	37	32.7	C	42	27.1	B
					T	665	31.2	C	683	31.0	C
			Total			3115	30.4	C	3251	31.6	C
62	Ramsay Road / Dalhousie Street	S	N	Dalhousie St	L	106	30.2	C	75	20.3	B
					T	165	24.8	B	165	23.2	B
					R	61	26.4	B	60	26.1	B
			E	Ramsay St	L	69	19.2	B	64	18.8	B
					T	308	21.3	B	324	19.0	B
					R	87	20.9	B	82	22.5	B
			S	Dalhousie St	L	107	30.0	C	128	33.9	C
					T	115	28.9	C	142	33.9	C
					R	46	30.5	C	36	27.8	B
			W	Ramsay St	L	55	19.5	B	66	17.9	B
					T	309	17.8	B	349	14.0	A
					R	23	15.1	B	42	18.8	B
			Total			1451	23.1	B	1533	21.6	B
65	Stanmore Road / Liberty Street	S	N	Liberty St	L	336	28.2	B	320	34.5	C
					R	207	47.7	D	216	42.6	D
			E	Stanmore Rd	T	854	13.6	A	837	12.3	A
					R	365	15.5	B	366	19.4	B
			W		L	124	29.2	C	148	16.6	B
					T	515	33.6	C	530	9.7	A
			Total			2401	24.0	B	2417	18.7	B

#	Intersection	Type	App.	Approach name	Turn	7:15AM - 8:15AM			8:15AM - 9:15AM		
						Volume (veh)	Delay (s)	LOS	Volume (veh)	Delay (s)	LOS
66	Ross Street / St Johns Road	S	N	Ross St	L	70	17.8	B	78	14.3	A
					T	271	25.5	B	275	24.3	B
					R	0			0		
			E	St Johns Rd	L	67	42.6	D	49	37.7	C
					T	13	38.4	C	13	30.7	C
					R	224	45.7	D	291	41.3	C
			S	Ross St	L	1	2.8	A	2	6.5	A
					T	275	18.2	B	312	21.8	B
					R	97	26.2	B	96	27.9	B
			W	St Johns Rd	L	70	63.2	E	72	61.8	E
					T	29	60.6	E	27	38.5	C
					R	6	65.0	E	9	72.9	F
			Total			1123	32.0	C	1224	30.8	C
67	Parramatta Road / Young Street / Percival Road	S	N	Young St	L	0			0		
					T	122	51.1	D	135	47.7	D
					R	0			0		
			E	Parramatta Rd	L	89	10.7	A	81	16.1	B
					T	1851	5.2	A	1891	7.4	A
			S	Percival Rd	L	29	43.0	D	31	48.9	D
					T	93	49.6	D	77	45.9	D
					R	56	57.8	E	60	50.5	D
			W	Parramatta Rd	L	20	29.3	C	19	26.7	B
					T	1208	26.0	B	1309	24.0	B
			Total			3468	16.7	B	3603	17.1	B
68	Parramatta Road /Northumberland Avenue / Johnston Street	S	N	Johnston St	L	120	45.6	D	146	39.8	C
					T	333	75.7	F	332	68.1	E
					R	82	106.8	F	81	106.3	F
			E	Parramatta Rd	L	89	12.6	A	100	18.3	B
					T	1795	11.1	A	1812	16.9	B
					R	248	75.3	F	256	82.3	F
			S	Northumberland Dr	L	70	50.4	D	83	42.4	C
					T	321	50.4	D	356	44.8	D
					R	23	56.9	E	28	50.2	D
			W	Parramatta Rd	L	62	17.8	B	57	29.0	C
					T	1144	17.6	B	1219	31.1	C
			Total			4287	28.3	B	4470	33.8	C
69	Parramatta Road / Bridge Road	S	E	Parramatta Rd	L	355	35.3	C	348	39.7	C
					T	2013	30.0	C	2020	33.0	C
			S	Bridge Rd	L	6	71.5	F	5	44.0	D
					R	198	56.5	D	236	56.9	E
			W	Parramatta Rd	T	1143	6.6	A	1235	10.1	A
					R	161	59.4	E	193	114.8	F
			Total			3876	26.2	B	4037	31.9	C

#	Intersection	Type	App.	Approach name	Turn	7:15AM - 8:15AM			8:15AM - 9:15AM		
						Volume (veh)	Delay (s)	LOS	Volume (veh)	Delay (s)	LOS
70	Parramatta Road /Pyrmont Bridge Road / Denison Street	S	N	Pyrmont Bridge Rd	L	0			0		
					T	43	92.8	F	59	113.6	F
					R	480	85.1	F	536	115.5	F
			E	Parramatta Rd	L	17	53.1	D	27	69.6	E
					T	1837	34.4	C	1823	60.6	E
			W		L	315	9.5	A	332	8.0	A
					T	1126	11.9	A	1214	12.1	A
			Total			3818	32.8	C	3991	49.7	D
71	Parramatta Road / Mallett Street	S	N	Mallett St	L	94	59.0	E	92	66.1	E
					T	215	58.1	E	222	69.1	E
					R	34	88.7	F	43	184.6	F
			E	Parramatta Rd	L	51	6.4	A	42	10.5	A
					T	1744	9.6	A	1773	9.2	A
			S	Mallett St	L	62	68.8	E	57	77.9	F
					T	135	65.0	E	129	77.6	F
					R	21	134.8	F	22	137.0	F
			W	Parramatta Rd	L	30	16.7	B	34	7.8	A
					T	1108	11.2	A	1180	4.7	A
			Total			3494	19.1	B	3594	19.3	B
72	Parramatta Road / Ross Street / Western Avenue	S	N	Ross St	L	160	37.0	C	135	39.8	C
					T	76	57.8	E	88	59.4	E
					R	106	48.8	D	112	61.8	E
			E	Parramatta Rd	L	9	40.7	C	9	27.2	B
					T	1576	40.0	C	1657	14.4	A
					R	214	79.0	F	247	82.0	F
			S	Western Ave	L	4	58.0	E	8	84.0	F
					T	63	47.6	D	74	65.5	E
					R	17	53.2	D	23	97.8	F
			W	Parramatta Rd	L	96	51.3	D	100	37.9	C
					T	998	52.6	D	1077	25.0	B
			Total			3319	47.4	D	3530	28.4	B
73	Great Western Highway / Glebe Point Road	S	N	Glebe Point Rd	L	293	24.6	B	319	23.1	B
					R	158	53.9	D	145	64.8	E
			E	Great Western Hwy	T	1657	22.6	B	1746	22.7	B
					R	216	54.6	D	217	37.0	C
			W		L	43	15.0	B	37	10.7	A
					T	1205	36.4	C	1242	12.1	A
			Total			3572	30.6	C	3706	21.5	B

#	Intersection	Type	App.	Approach name	Turn	7:15AM - 8:15AM			8:15AM - 9:15AM		
						Volume (veh)	Delay (s)	LOS	Volume (veh)	Delay (s)	LOS
74	Broadway / City Road (Princes Highway) / Bay Street	S	N	Bay St	L	45	10.4	A	47	6.3	A
			E	Broadway	L	630	11.3	A	624	11.1	A
					T	1158	38.4	C	1176	34.9	C
			S	City Rd	L	713	34.7	C	785	45.3	D
					T	182	53.0	D	181	63.4	E
					R	536	50.6	D	565	55.4	D
			W	Great Western Hwy	L	97	22.2	B	96	25.5	B
					T	786	19.4	B	801	27.1	B
					R	629	78.6	F	663	86.8	F
			Total			4776	37.8	C	4938	42.2	C
75	University Avenue / Parramatta Road / Derwent Street / Arundel Street	S	E	Parramatta Rd	L	77	5.0	A	58	6.1	A
					T	1746	2.8	A	1844	4.1	A
			S	University Ave	L	55	60.4	E	47	75.7	F
					R	48	68.0	E	54	64.8	E
			W	Parramatta Rd	T	1208	6.9	A	1218	23.7	B
			Total			3134	6.4	A	3221	13.6	A
79	Douglas Street / Percival Road	S	N	Percival Rd	L	36	17.4	B	40	19.8	B
					R	320	21.5	B	321	20.7	B
			E	Douglas St	T	64	35.1	C	76	38.8	C
					R	113	41.2	C	116	43.4	D
			W		L	269	9.7	A	274	11.0	A
					T	70	36.4	C	89	37.5	C
			Total			872	22.5	B	916	23.8	B
80	Railway Terrace / Victoria Street	P	E	Railway Terrace	L	74	1.4	A	51	1.7	A
					T	714	1.6	A	723	1.7	A
			S	Victoria St	L	5	5.0	A	9	3.9	A
					R	9	4.7	A	7	4.8	A
			W	Railway Terrace	T	481	1.5	A	472	1.5	A
			Total			1283	5.0	A	1262	4.8	A
81	Parramatta Road / Dalhousie Street	S	N	Dalhousie St	L	143	41.9	C	145	53.1	D
					R	118	93.5	F	128	81.7	F
			E	Parramatta Rd	T	1478	21.7	B	1542	28.6	C
					R	181	53.6	D	220	70.2	E
			W		L	72	39.1	C	79	33.6	C
					T	1559	41.1	C	1593	36.1	C
			Total			3551	35.4	C	3707	37.2	C

#	Intersection	Type	App.	Approach name	Turn	7:15AM - 8:15AM Volume (veh)	7:15AM - 8:15AM Delay (s)	7:15AM - 8:15AM LOS	8:15AM - 9:15AM Volume (veh)	8:15AM - 9:15AM Delay (s)	8:15AM - 9:15AM LOS
82	Carillon Avenue / Missenden Road	S	N	Missenden Rd	L	163	11.0	A	150	18.5	B
					T	170	27.2	B	174	25.9	B
					R	58	43.6	D	67	45.1	D
			E	Carillon Ave	L	36	46.7	D	39	39.8	C
					T	462	46.1	D	437	40.8	C
					R	106	42.0	C	101	37.7	C
			S	Missenden Rd	L	123	18.9	B	122	19.7	B
					T	188	30.8	C	212	33.9	C
					R	2	9.3	A	1	55.9	D
			W	Carillon Ave	L	45	47.6	D	56	59.5	E
					T	254	40.0	C	323	45.7	D
					R	40	52.1	D	41	57.4	E
			Total			1647	35.8	C	1723	36.9	C
83	Parramatta Road / Missenden Avenue / Lyons Road	S	N	Lyons Rd	L	24	42.9	D	25	57.5	E
					T	127	47.3	D	136	51.9	D
					R	0			0		
			E	Parramatta Rd	L	125	33.0	C	122	41.3	C
					T	1574	64.9	E	1645	43.6	D
			S	Missenden Rd	L	155	59.9	E	152	45.6	D
					T	133	65.3	E	153	63.7	E
					R	46	70.3	E	38	58.7	E
			W	Parramatta Rd	L	29	16.5	B	29	10.9	A
					T	1018	9.1	A	1098	12.4	A
					R	200	68.4	E	166	83.0	F
			Total			3431	46.0	D	3564	37.0	C

#	Intersection	Type	App.	Approach name	Turn	7:15AM - 8:15AM			8:15AM - 9:15AM		
						Volume (veh)	Delay (s)	LOS	Volume (veh)	Delay (s)	LOS
1	Victoria Rd / Darling St	S	N	Darling St	L	365	64.1	E	302	65.6	E
					T	173	84.4	F	196	88.3	F
			E	Victoria Rd	L	98	17.5	B	82	22.4	B
					T	120	16.3	B	128	17.4	B
					R	235	52.3	D	207	62.9	E
			S	Darling St	L	230	75.5	F	217	80.7	F
					T	194	114.1	F	197	122.3	F
			W	Victoria Rd	L	29	43.8	D	37	44.6	D
					T	385	26.9	B	287	24.0	B
					R	123	37.8	C	149	39.2	C
			Total			1952	56.2	D	302	61.1	E
2	Victoria Road / Evans Street	S	N	Evans St	L	313	55.4	D	300	53.2	D
					T	120	50.7	D	98	51.9	D
					R	27	48.3	D	46	58.2	E
			E	Victoria Rd	L	19	22.1	B	24	15.6	B
					T	401	9.2	A	345	13.0	A
			S	Evans St	L	26	55.8	D	22	40.4	C
					T	129	47.4	D	120	42.1	C
			W	Victoria Rd	L	4	1.6	A	0		
					T	811	14.7	B	618	13.9	A
			Total			1850	26.1	B	1573	27.4	B
3	Victoria Road / Robert Street	S	N	Victoria Rd	L	26	2.2	A	25	6.4	A
					T	1371	11.3	A	1193	11.9	A
			E	Robert St	L	798	54.0	D	781	50.7	D
					R	0			0		
			S	Victoria Rd	T	350	2.8	A	323	3.0	A
					R	628	34.3	C	535	55.9	D
			Total			3173	25.6	B	2857	29.7	C
5	Balmain Road / Lilyfield Road	S	N	Balmain Rd	L	72	3.0	A	52	6.0	A
					T	86	3.8	A	212	6.7	A
			E	Lilyfield Rd	L	9	28.9	C	54	28.4	B
					T	31	26.6	B	48	27.8	B
					R	6	22.8	B	20	22.0	B
			S	Balmain Rd	L	33	10.7	A	23	6.5	A
					T	227	6.7	A	250	4.8	A
					R	565	10.9	A	601	9.5	A
			W	Lilyfield Rd	L	45	34.2	C	5	34.1	C
					T	77	17.3	B	115	19.9	B
					R	2	29.4	C	7	23.7	B
			Total			1153	11.1	A	1387	10.6	A
6	The Crescent / Victoria Road	S	N	Victoria Rd	L	816	17.0	B	816	12.8	A
					R	1263	20.3	B	1114	14.0	A
			E		T	1470	62.2	E	1302	56.4	D
					R	401	44.1	D	348	44.0	D
			W	The Crescent	L	876	15.6	B	767	15.7	B
			Total			4826	33.7	C	4347	29.1	C

#	Intersection	Type	App.	Approach name	Turn	7:15AM - 8:15AM			8:15AM - 9:15AM		
						Volume (veh)	Delay (s)	LOS	Volume (veh)	Delay (s)	LOS
7	Balmain Road / Perry Street / Wharf Road	S	N	Wharf Rd	L	0			0		
					T	0			0		
					R	3	1.8	A	0		
			E	Balmain Rd	L	152	3.7	A	260	5.9	A
					T	207	4.8	A	120	5.7	A
					R	7	4.0	A	11	5.5	A
			S		L	19	2.6	A	15	3.5	A
					T	22	2.7	A	15	3.8	A
					R	200	3.6	A	211	5.0	A
			W	Perry St	L	12	6.8	A	13	9.7	A
					T	250	8.4	A	264	9.7	A
					R	20	5.9	A	11	12.6	A
			Total			892	5.3	A	920	6.8	A
8	City-West Link Road / The Crescent	S	E	The Crescent	L	824	14.1	A	785	17.7	B
					T	1828	6.5	A	1558	6.6	A
			S		L	46	47.3	D	49	36.0	C
					R	0	0.0	A	0	0.0	A
			W	City-West Link Rd	T	490	9.0	A	409	11.5	A
					R	250	89.8	F	280	84.0	F
			Total			3438	15.3	B	3081	17.6	B
9	City-West Link Road / Norton Street	S	N	Norton St	L	53	24.5	B	24	40.7	C
					T	97	55.1	D	73	60.7	E
			E	City-West Link Rd	L	308	25.8	B	342	22.9	B
					T	1700	57.7	E	1614	52.2	D
					R	3	113.0	F	4	39.1	C
			S	Norton St	L	63	183.7	F	55	251.1	F
					T	141	199.5	F	94	290.1	F
					R	237	201.7	F	230	273.3	F
			W	City-West Link Rd	L	3	2.7	A	4	5.2	A
					T	1424	14.1	A	1371	15.6	B
					R	205	70.7	F	181	78.2	F
			Total			4234	55.5	D	3992	59.4	E
10	City-West Link Road / Brenan Street / Balmain Road	S	N	Balmain Rd	L	48	31.3	C	41	36.2	C
					T	59	19.9	B	30	23.9	B
					R	47	32.5	C	256	21.4	B
			E	City-West Link Rd	L	58	7.1	A	51	15.5	B
					T	1884	7.9	A	1650	17.5	B
					R	152	19.8	B	170	27.4	B
			S	Balmain Rd	L	39	75.5	F	33	66.9	E
					T	155	57.0	E	165	60.1	E
					R	181	53.4	D	275	48.4	D
			W	City-West Link Rd	L	508	16.8	B	528	20.6	B
					T	1205	25.4	B	1114	33.1	C
			Total			4336	19.2	B	4313	26.7	B

#	Intersection	Type	App.	Approach name	Turn	7:15AM - 8:15AM			8:15AM - 9:15AM		
						Volume (veh)	Delay (s)	LOS	Volume (veh)	Delay (s)	LOS
11	City-West Link Road / Brenan Street / Catherine Street	S	N	Catherine St	L	204	43.1	D	142	44.8	D
					T	328	33.0	C	358	37.9	C
					R	87	32.9	C	46	39.2	C
			E	City-West Link Rd	T	1751	25.3	B	1547	26.5	B
			S	Catherine St	L	155	42.4	C	174	47.4	D
			W	City-West Link Rd	T	1444	19.3	B	1449	29.6	C
			Total			3969	25.5	B	3716	30.7	C
13	Catherine Street / Moore Street	S	N	Catherine St	L	216	18.0	B	272	78.3	F
					T	118	40.7	C	144	49.5	D
					R	1	2.1	A	5	55.5	D
			E	Moore St	L	21	8.7	A	21	12.8	A
					T	94	13.4	A	110	11.2	A
					R	182	15.6	B	188	14.1	A
			S	Catherine St	L	64	35.9	C	77	39.1	C
					T	141	34.8	C	231	43.5	D
					R	47	38.1	C	51	40.1	C
			W	Moore St	L	17	34.3	C	12	51.2	D
					T	145	28.1	B	143	34.1	C
			Total			1046	25.5	B	1254	42.6	D
14	Styles Street / Catherine Street	S	N	Catherine St	L	5	21.7	B	13	38.5	C
					T	133	59.9	E	156	60.6	E
					R	42	77.1	F	34	53.3	D
			E	Styles St	L	72	17.7	B	56	45.4	D
					T	175	17.8	B	115	27.9	B
					R	24	31.3	C	19	43.3	D
			S	Catherine St	L	50	39.2	C	48	33.3	C
					T	89	42.5	D	149	35.8	C
					R	11	36.9	C	15	45.2	D
			W	Styles St	L	111	26.3	B	168	77.1	F
					T	563	25.6	B	620	86.1	F
					R	33	24.3	B	46	82.9	F
			Total			1308	31.2	C	1439	66.8	E
19	Marion Street / Norton Street	S	N	Norton St	L	90	48.8	D	150	76.0	F
					T	253	46.0	D	262	51.4	D
					R	25	43.0	D	10	48.2	D
			E	Marion St	L	87	24.7	B	49	27.9	B
					T	254	18.4	B	241	20.0	B
					R	42	38.6	C	11	50.3	D
			S	Norton St	L	44	25.8	B	28	24.0	B
					T	94	37.5	C	71	32.5	C
					R	2	44.1	D	30	44.2	D
			W	Marion St	L	20	16.1	B	9	114.1	F
					T	762	20.8	B	702	91.4	F
					R	149	28.1	B	168	99.6	F
			Total			1822	27.8	B	1731	68.3	E

#	Intersection	Type	App.	Approach name	Turn	7:15AM - 8:15AM			8:15AM - 9:15AM		
						Volume (veh)	Delay (s)	LOS	Volume (veh)	Delay (s)	LOS
20	Marion Street / Leichhardt Street / Balmain Road	S	N	Balmain Rd	L	20	173.8	F	34	62.3	E
					R	83	110.1	F	53	58.7	E
			E	Leichhardt St	T	253	16.6	B	210	14.0	A
					R	20	44.8	D	8	28.2	B
			S	Balmain Rd	L	18	76.1	F	3	80.2	F
					T	101	68.1	E	115	80.8	F
					R	28	72.0	F	19	78.1	F
			W	Marion St	L	249	25.9	B	257	52.3	D
					T	771	25.3	B	828	55.2	D
			Total			1543	34.9	C	1527	51.4	D
22	Johnston Street / Collins Street	S	N	Johnston St	L	118	10.6	A	140	8.3	A
					T	339	20.0	B	268	20.6	B
					R	148	28.2	B	98	17.8	B
			E	Collins St	L	62	15.0	B	101	16.9	B
			S	Johnston St	L	89	101.5	F	66	36.5	C
					T	475	86.3	F	372	36.2	C
			W	Collins St	L	409	52.4	D	409	27.7	B
					R	204	58.5	E	268	29.8	C
			Total			1844	52.4	D	1722	26.3	B
23	Johnston Street / Booth Street	S	N	Johnston St	L	41	95.4	F	28	72.5	F
					T	343	65.5	E	211	64.5	E
					R	60	53.2	D	58	50.1	D
			E	Booth St	L	64	20.5	B	50	14.8	B
					T	279	30.6	C	280	27.4	B
					R	56	52.9	D	44	37.4	C
			S	Johnston St	L	7	121.4	F	10	66.5	E
					T	489	76.9	F	506	56.7	E
					R	316	122.8	F	302	63.3	E
			W	Booth St	L	31	153.4	F	31	226.6	F
					T	417	189.0	F	372	264.3	F
					R	121	222.9	F	190	274.9	F
			Total			2224	103.5	F	2082	112.7	F
27	Booth Street / Wigram Road	RB	N	Wigram Rd	L	85	32.8	C	118	82.8	F
					R	65	24.7	B	68	83.3	F
			E	Booth St	T	267	5.0	A	253	4.0	A
					R	237	3.5	A	276	3.6	A
			W		L	263	65.7	E	238	90.7	F
					T	505	74.0	F	421	96.3	F
			Total			1422	74.0	F	1374	96.3	F

#	Intersection	Type	App.	Approach name	Turn	Volume (veh)	Delay (s)	LOS	Volume (veh)	Delay (s)	LOS
						7:15AM - 8:15AM			**8:15AM - 9:15AM**		
28	Minogue Crescent / Wigram Road	S	N	Minogue Cres	L	68	20.1	B	72	13.4	A
					T	480	23.8	B	522	21.4	B
					R	9	22.8	B	52	28.8	C
			E	Wigram Rd	L	15	24.2	B	12	15.4	B
					T	142	17.2	B	128	21.9	B
					R	56	31.0	C	43	28.0	B
			S	Minogue Cres	L	19	20.9	B	24	17.0	B
					T	195	23.7	B	150	22.1	B
					R	22	24.3	B	23	25.4	B
			W	Wigram Rd	L	19	31.7	C	81	28.4	B
					T	216	23.4	B	225	30.1	C
					R	0			0		
			Total			**1241**	**23.2**	**B**	**1332**	**23.4**	**B**
29	Ross Street / Bridge Road	S	N	Ross St	L	43	54.7	D	112	37.2	C
					T	431	45.4	D	402	45.2	D
			E	Bridge Rd	L	43	10.5	A	69	13.6	A
					T	461	10.9	A	443	16.1	B
					R	48	15.0	B	47	17.9	B
			S	Ross St	L	130	50.0	D	117	38.1	C
					T	174	61.4	E	143	53.3	D
			W	Bridge Rd	L	67	35.1	C	52	54.7	D
					T	883	45.2	D	820	64.2	E
					R	23	35.4	C	13	41.8	C
			Total			**2303**	**38.4**	**C**	**2218**	**44.8**	**D**
30	Pyrmont Bridge Road / Booth Street / Mallett Street	S	N	Booth St	L	384	109.6	F	321	130.8	F
					T	492	106.4	F	503	131.2	F
			E	Pyrmont Bridge Rd	L	52	25.3	B	72	18.3	B
					T	214	24.4	B	236	13.6	A
					R	67	67.7	E	72	66.0	E
			S	Mallett St	L	13	7.9	A	23	27.1	B
					T	218	31.1	C	170	44.0	D
					R	119	51.5	D	76	56.3	D
			W	Pyrmont Bridge Rd	L	97	50.4	D	190	37.6	C
					T	390	43.2	D	446	35.8	C
			Total			**2046**	**68.5**	**E**	**2109**	**72.5**	**F**
34	Marion Street / Foster Street	S	N	Foster St	L	5	123.7	F	1	40.2	C
					T	273	90.3	F	297	41.9	C
					R	68	118.9	F	106	64.5	E
			E	Marion St	L	116	27.0	B	36	58.4	E
					T	271	28.2	B	251	54.5	D
			S	Foster St	L	91	63.2	E	107	28.8	C
					T	465	80.3	F	518	37.0	C
					R	73	105.9	F	69	41.0	C
			W	Marion St	L	423	21.1	B	352	72.7	F
					T	649	22.2	B	566	73.1	F
					R	134	27.0	B	105	74.2	F
			Total			**2568**	**47.5**	**D**	**2408**	**56.0**	**D**

#	Intersection	Type	App.	Approach name	Turn	7:15AM - 8:15AM Volume (veh)	7:15AM - 8:15AM Delay (s)	7:15AM - 8:15AM LOS	8:15AM - 9:15AM Volume (veh)	8:15AM - 9:15AM Delay (s)	8:15AM - 9:15AM LOS
35	Marion Street / Flood Street	S	N	Flood St	L	6	15.1	B	6	9.7	A
					T	212	30.7	C	190	19.4	B
					R	71	39.2	C	41	18.3	B
			E	Marion St	L	121	30.8	C	168	12.0	A
					T	247	28.0	B	182	11.1	A
					R	34	20.3	B	8	37.0	C
			S	Flood St	L	39	31.6	C	44	25.2	B
					T	223	31.9	C	271	19.4	B
					R	270	38.3	C	281	31.6	C
			W	Marion St	L	43	28.0	B	77	45.2	D
					T	851	32.5	C	727	54.1	D
					R	137	43.0	D	118	85.5	F
			Total			2254	32.9	C	2113	36.4	C
36	Marion Street / Ramsay Street	S	N	Ramsay St	L	822	21.9	B	755	18.1	B
					T	9	35.9	C	24	59.1	E
			E	Marion St	L	28	59.8	E	41	15.7	B
					R	301	81.0	F	354	20.5	B
			S	Ramsay St	T	242	7.5	A	208	24.5	B
					R	321	19.0	B	210	36.0	C
			Total			1723	30.4	C	1592	22.4	B
39	Parramatta Road / Liverpool Road (Hume Highway)	S	E	Parramatta Rd	L	337	5.4	A	414	3.5	A
					T	1214	59.4	E	1400	65.9	E
			S	Liverpool Rd	L	58	36.5	C	92	99.5	F
					R	986	55.6	D	956	131.0	F
			W	Parramatta Rd	T	1383	18.1	B	1243	14.3	A
					R	271	75.0	F	270	62.5	E
			Total			4249	41.5	C	4375	60.1	E
41	City-West Link Road / James Street	S	N	City-West Link Rd	L	8	48.2	D	2	98.2	F
					T	87	46.5	D	71	45.5	D
					R	77	50.4	D	51	47.5	D
			E	James St	L	445	1.0	A	417	1.0	A
					T	1320	4.4	A	1251	2.8	A
			S	City-West Link Rd	L	22	81.4	F	26	100.2	F
					T	222	80.6	F	237	114.8	F
					R	519	74.7	F	533	105.5	F
			W	James St	L	224	3.1	A	255	3.3	A
					T	1108	24.7	B	1024	18.8	B
			Total			4032	25.1	B	3867	30.0	C

#	Intersection	Type	App.	Approach name	Turn	7:15AM - 8:15AM			8:15AM - 9:15AM		
						Volume (veh)	Delay (s)	LOS	Volume (veh)	Delay (s)	LOS
42	Tebbutt Street / Lords Road	S	N	Forster St	L	187	20.0	B	174	18.6	B
					T	593	16.4	B	507	8.8	A
			E	Lords Rd	L	73	23.2	B	81	23.1	B
					T	50	22.9	B	49	14.7	B
					R	38	26.2	B	64	31.4	C
			S	Tebbutt St	L	26	45.0	D	22	17.5	B
					T	535	42.1	C	539	13.9	A
					R	264	60.7	E	260	22.9	B
			W	Lords Rd	L	17	22.2	B	35	26.4	B
					T	79	24.3	B	33	34.5	C
					R	26	18.9	B	33	35.4	C
			Total			1888	31.7	C	1797	16.3	B
43	Lilyfield Road / James Street	S	N	Mary St	L	82	8.1	A	49	8.1	A
					T	120	42.9	D	68	42.2	C
					R	7	49.5	D	6	50.6	D
			E	Lilyfield Rd	L	23	2.9	A	37	3.0	A
					T	55	5.0	A	52	9.1	A
					R	3	63.2	E	0		
			S	James St	L	18	26.9	B	31	19.1	B
					T	277	26.4	B	312	20.9	B
					R	150	30.6	C	148	20.7	B
			W	Lilyfield Rd	L	15	26.6	B	8	32.6	C
					T	85	27.2	B	99	30.5	C
					R	25	34.6	C	14	16.3	B
			Total			860	26.3	B	824	21.7	B
44	Tebbutt Street / Hathern Street	S	N	Tebbutt St	T	77	12.7	A	58	28.8	C
					R	619	19.1	B	569	28.5	C
			S		L	60	9.8	A	42	7.7	A
					T	31	26.8	B	23	29.6	C
			W	Hathern St	L	870	26.2	B	875	19.4	B
					R	184	32.4	C	211	27.9	B
			Total			1841	23.3	B	1778	23.5	B
45	Parramatta Road / Sloane Street	S	N	Sloane St	L	29	58.2	E	59	59.9	E
					T	102	53.4	D	92	65.5	E
					R	21	82.7	F	33	67.1	E
			E	Parramatta Rd	L	18	6.6	A	24	14.3	A
					T	1527	6.1	A	1736	10.0	A
			S	Sloane St	L	33	79.8	F	40	81.9	F
					T	273	62.1	E	227	63.1	E
			W	Parramatta Rd	L	251	22.9	B	170	23.2	B
					T	2215	17.5	B	2115	17.7	B
			Total			4469	18.4	B	4496	19.7	B

#	Intersection	Type	App.	Approach name	Turn	7:15AM - 8:15AM			8:15AM - 9:15AM		
						Volume (veh)	Delay (s)	LOS	Volume (veh)	Delay (s)	LOS
47	Parramatta Road / Old Canterbury Road / Tebbutt Street	S	N	Tebbutt St	L	261	31.4	C	279	28.3	B
			E	Parramatta Rd	L	236	32.5	C	296	26.2	B
					T	1402	17.5	B	1581	22.4	B
			S	Old Canterbury Rd	L	126	21.4	B	172	19.6	B
			W	Parramatta Rd	T	2155	35.0	C	2106	31.2	C
			Total			4180	28.4	B	4434	27.1	B
49	Old Canterbury Road / Railway Terrace / Longport Street	S	N	Old Canterbury Rd	L	92	21.2	B	72	16.1	B
					T	828	16.3	B	792	14.9	B
			E	Railway Terrace	L	33	63.1	E	16	83.5	F
					T	456	59.3	E	470	111.1	F
			S	Old Canterbury Rd	L	70	45.4	D	58	18.8	B
					T	1075	49.4	D	1098	30.9	C
					R	6	59.6	E	1	54.3	D
			W	Longport St	L	109	42.6	D	126	48.0	D
					T	519	47.1	D	438	49.7	D
			Total			3188	40.9	C	3071	42.1	C
50	Parramatta Road / Norton Street	S	N	Norton St	L	195	46.2	D	220	46.9	D
					R	78	61.4	E	78	49.2	D
			E	Parramatta Rd	T	1106	4.1	A	1320	2.7	A
					R	283	113.1	F	261	45.7	D
			W		L	35	19.4	B	31	15.9	B
					T	1780	17.8	B	1706	19.4	B
			Total			3477	23.8	B	3616	17.5	B
51	Parramatta Road / Flood Street / West Street	S	N	Flood St	L	13	139.8	F	2	437.8	F
					T	176	163.5	F	129	486.3	F
					R	20	242.5	F	13	1207.4	F
			E	Parramatta Rd	L	16	81.2	F	18	206.4	F
					T	1050	62.2	E	1293	221.2	F
			S	West St	L	342	49.4	D	339	41.7	C
					T	267	71.4	F	342	66.8	E
					R	6	54.2	D	1	94.6	F
			W	Parramatta Rd	L	153	33.0	C	140	29.0	C
					T	1673	33.0	C	1635	28.2	B
					R	588	81.5	F	607	89.7	F
			Total			4304	57.3	E	4519	113.0	F
52	Parramatta Road / Crystal Street / Balmain Road	S	E	Parramatta Rd	L	115	67.8	E	211	53.6	D
					T	1093	88.3	F	1346	52.3	D
			S	Crystal St	L	262	54.6	D	213	58.5	E
					T	146	116.4	F	134	181.9	F
					R	260	122.0	F	268	207.3	F
			W	Parramatta Rd	L	4	11.8	A	2	9.8	A
					T	1896	10.2	A	1867	10.1	A
					R	217	89.9	F	185	65.6	E
			Total			3993	51.6	D	4226	48.6	D

#	Intersection	Type	App.	Approach name	Turn	7:15AM - 8:15AM			8:15AM - 9:15AM		
						Volume (veh)	Delay (s)	LOS	Volume (veh)	Delay (s)	LOS
53	Parramatta Road / Catherine Street / Phillip Street	S	N	Catherine St	L	4	405.4	F	28	731.0	F
					T	30	661.8	F	64	888.2	F
					R	93	510.8	F	143	881.0	F
			E	Parramatta Rd	L	4	172.9	F	0		
					T	1083	140.9	F	1285	75.6	F
			S	Phillip St	L	26	39.9	C	32	38.5	C
					T	54	41.4	C	53	42.9	D
					R	21	43.6	D	23	48.4	D
			W	Parramatta Rd	L	110	30.8	C	175	20.4	B
					T	2030	16.2	B	1936	12.3	A
			Total			**3455**	**76.0**	**F**	**3739**	**88.9**	**F**
56	Crystal Street / Douglas Street / Brighton Street	S	N	Crystal St	L	64	65.1	E	65	88.5	F
					T	253	69.7	E	301	85.6	F
			E	Douglas St	L	249	22.3	B	247	16.2	B
					T	74	87.2	F	107	58.5	E
					R	2	76.4	F	7	65.1	E
			S	Crystal St	L	373	13.8	A	254	12.2	A
					T	683	15.3	B	627	11.8	A
					R	823	32.4	C	705	20.4	B
			W	Brighton St	L	38	28.5	C	25	21.7	B
					T	72	58.0	E	68	63.6	E
					R	132	103.2	F	80	96.3	F
			Total			**2763**	**34.4**	**C**	**2486**	**32.0**	**C**
57	Crystal Street / Trafalgar Street	S	N	Crystal St	L	85	23.9	B	162	50.5	D
					T	524	10.0	A	482	44.0	D
					R	73	30.5	C	70	43.5	D
			E	Trafalger St	L	26	38.5	C	69	44.2	D
					T	74	44.1	D	122	48.9	D
			S	Crystal St	L	114	29.7	C	155	36.0	C
					T	1668	33.2	C	1391	40.9	C
			W	Trafalger St	L	212	41.4	C	189	31.6	C
					T	390	45.7	D	480	35.5	C
			Total			**3166**	**31.3**	**C**	**3120**	**40.7**	**C**
58	New Canterbury Road / Stanmore Road / Crystal Street / Shaw Street	S	N	Crystal St	L	101	81.9	F	74	157.6	F
					T	299	82.1	F	316	166.1	F
					R	143	62.6	E	152	72.2	F
			E	Stanmore Rd	L	68	29.7	C	96	35.1	C
					T	556	41.9	C	582	47.4	D
					R	360	100.4	F	360	76.7	F
			S	Shaw St	L	9	90.6	F	64	103.6	F
					T	627	79.7	F	526	111.3	F
			W	New Canterbury Rd	L	794	53.3	D	670	42.9	D
					T	893	38.9	C	864	34.3	C
			Total			**3850**	**60.0**	**E**	**3704**	**69.4**	**E**

#	Intersection	Type	App.	Approach name	Turn	7:15AM - 8:15AM			8:15AM - 9:15AM		
						Volume (veh)	Delay (s)	LOS	Volume (veh)	Delay (s)	LOS
59	Gordon Street / Trafalgar Street	S	N	Gordon St	T	547	14.3	A	455	10.1	A
			E	Trafalger St	L	39	2.3	A	45	2.0	A
					R	282	34.9	C	261	35.5	C
			S	Gordon St	T	248	35.0	C	275	34.9	C
					R	568	58.8	E	662	52.7	D
				Total		1684	35.5	C	1698	34.4	C
60	New Canterbury Road / Gordon Street / Livingstone Road	S	N	Gordon St	L	214	52.4	D	173	43.7	D
					T	385	56.3	D	310	53.2	D
			E	New Canterbury Rd	L	9	25.1	B	8	16.9	B
					T	405	24.9	B	435	19.5	B
					R	290	79.8	F	400	86.4	F
			S	Livingstone Rd	L	41	30.8	C	45	38.1	C
					T	437	32.2	C	434	38.3	C
			W	New Canterbury Rd	L	91	50.5	D	106	41.7	C
					T	1470	48.4	D	1331	35.8	C
				Total		3342	47.1	D	3242	42.4	C
62	Ramsay Road / Dalhousie Street	S	N	Dalhousie St	L	279	38.1	C	238	40.4	C
					T	131	35.4	C	135	39.8	C
					R	45	43.6	D	49	38.6	C
			E	Ramsay St	L	99	27.9	B	132	23.3	B
					T	240	22.6	B	285	15.1	B
					R	43	38.5	C	18	31.4	C
			S	Dalhousie St	L	88	47.4	D	74	42.5	D
					T	182	41.1	C	202	37.3	C
					R	113	40.6	C	82	30.9	C
			W	Ramsay St	L	31	33.9	C	21	26.9	B
					T	540	35.0	C	514	23.9	B
					R	124	36.8	C	97	31.8	C
				Total		1915	35.4	C	1847	29.2	C
65	Stanmore Road / Liberty Street	S	N	Liberty St	L	297	27.6	B	382	26.5	B
					R	218	54.7	D	229	63.6	E
			E	Stanmore Rd	T	685	8.6	A	706	9.7	A
					R	441	26.3	B	449	23.5	B
			W		L	108	8.9	A	139	20.6	B
					T	963	24.8	B	881	36.5	C
				Total		2712	23.0	B	2786	27.7	B

#	Intersection	Type	App.	Approach name	Turn	7:15AM - 8:15AM Volume (veh)	Delay (s)	LOS	8:15AM - 9:15AM Volume (veh)	Delay (s)	LOS
66	Ross Street / St Johns Road	S	N	Ross St	L	170	13.5	A	135	17.2	B
					T	342	14.4	A	369	17.1	B
					R	22	20.3	B	19	25.1	B
			E	St Johns Rd	L	22	42.0	C	29	37.0	C
					T	15	42.2	C	24	44.8	D
					R	115	49.4	D	100	43.2	D
			S	Ross St	L	105	21.0	B	89	12.4	A
					T	166	22.9	B	139	13.5	A
					R	151	24.8	B	183	13.7	A
			W	St Johns Rd	L	23	64.7	E	15	72.0	F
					T	29	40.5	C	17	45.9	D
					R	5	12.2	A	9	58.0	E
			Total			1165	23.5	B	1128	20.8	B
67	Parramatta Road / Young Street / Percival Road	S	N	Young St	L	44	79.0	F	41	112.1	F
					T	142	88.7	F	204	102.1	F
					R	2	112.7	F	1	51.2	D
			E	Parramatta Rd	L	25	81.6	F	14	12.3	A
					T	1084	86.5	F	1129	12.0	A
			S	Percival Rd	L	14	65.4	E	11	95.5	F
					T	184	59.4	E	129	66.4	E
					R	117	67.6	E	114	106.8	F
			W	Parramatta Rd	L	40	45.3	D	11	54.3	D
					T	1992	42.8	D	2027	42.3	C
			Total			3644	60.1	E	3681	40.0	C
68	Parramatta Road /Northumberland Avenue / Johnston Street	S	N	Johnston St	L	267	65.6	E	397	154.8	F
					T	318	62.2	E	255	109.6	F
					R	0			0		
			E	Parramatta Rd	L	26	59.6	E	19	18.3	B
					T	1127	52.5	D	1094	12.5	A
					R	95	91.0	F	71	91.9	F
			S	Northumberland Dr	L	23	53.6	D	19	57.3	E
					T	323	53.7	D	225	60.1	E
					R	26	89.2	F	44	255.6	F
			W	Parramatta Rd	L	138	47.9	D	130	42.8	D
					T	1933	43.6	D	2003	41.3	C
			Total			4276	51.1	D	4257	52.6	D
69	Parramatta Road / Bridge Road	S	E	Parramatta Rd	L	205	19.9	B	195	18.7	B
					T	1194	15.8	B	1154	16.1	B
			S	Bridge Rd	L	18	167.1	F	15	98.9	F
					R	471	123.6	F	481	96.8	F
			W	Parramatta Rd	T	2045	52.5	D	2163	41.2	C
					R	145	74.3	F	235	59.6	E
			Total			4078	49.6	D	4243	40.9	C

#	Intersection	Type	App.	Approach name	Turn	7:15AM - 8:15AM Volume (veh)	Delay (s)	LOS	8:15AM - 9:15AM Volume (veh)	Delay (s)	LOS
70	Parramatta Road /Pyrmont Bridge Road / Denison Street	S	N	Pyrmont Bridge Rd	L	0			0		
					T	14	46.5	D	22	54.5	D
					R	207	55.5	D	239	59.5	E
			E	Parramatta Rd	L	32	20.5	B	26	17.1	B
					T	1159	3.1	A	1087	1.7	A
			W		L	583	11.6	A	733	5.9	A
					T	2175	13.6	A	2117	6.2	A
			Total			4170	12.6	A	4224	8.3	A
71	Parramatta Road / Mallett Street	S	N	Mallett St	L	103	38.7	C	86	45.7	D
					T	373	49.6	D	472	52.0	D
					R	90	142.5	F	50	58.6	E
			E	Parramatta Rd	L	80	10.9	A	70	9.2	A
					T	1065	4.8	A	1059	1.4	A
			S	Mallett St	L	22	172.5	F	13	279.8	F
					T	267	165.3	F	174	233.4	F
					R	144	224.0	F	106	374.8	F
			W	Parramatta Rd	L	27	39.2	C	59	22.9	B
					T	2131	46.3	D	2094	25.1	B
			Total			4302	51.4	D	4183	41.0	C
72	Parramatta Road / Ross Street / Western Avenue	S	N	Ross St	L	184	88.5	F	177	65.0	E
					T	87	91.2	F	95	68.2	E
					R	99	137.3	F	130	68.9	E
			E	Parramatta Rd	L	27	7.5	A	45	11.1	A
					T	1001	7.2	A	1041	8.2	A
					R	123	194.5	F	103	234.6	F
			S	Western Ave	L	16	311.3	F	15	206.8	F
					T	43	226.7	F	36	164.8	F
					R	19	240.0	F	27	170.5	F
			W	Parramatta Rd	L	248	38.5	C	279	42.2	C
					T	2049	21.9	B	1905	25.4	B
			Total			3896	36.7	C	3853	34.8	C
73	Great Western Highway / Glebe Point Road	S	N	Glebe Point Rd	L	257	30.8	C	244	33.9	C
					R	70	55.7	D	83	58.9	E
			E	Great Western Hwy	T	1114	5.5	A	1188	6.2	A
					R	253	92.9	F	212	76.9	F
			W		L	56	12.1	A	71	18.6	B
					T	2172	17.9	B	2053	25.2	B
			Total			3922	20.7	B	3851	23.3	B

#	Intersection	Type	App.	Approach name	Turn	7:15AM - 8:15AM			8:15AM - 9:15AM		
						Volume (veh)	Delay (s)	LOS	Volume (veh)	Delay (s)	LOS
74	Broadway / City Road (Princes Highway) / Bay Street	S	N	Bay St	L	37	21.3	B	16	18.3	B
			E	Broadway	L	412	14.3	A	402	14.4	A
					T	646	165.8	F	750	155.7	F
			S	City Rd	L	708	15.4	B	656	15.3	B
					T	120	47.2	D	120	42.7	D
					R	778	44.2	D	719	43.7	D
			W	Great Western Hwy	L	153	10.6	A	152	12.3	A
					T	1283	16.0	B	1212	14.7	B
					R	978	37.6	C	932	49.1	D
			Total			5115	43.7	D	4959	47.4	D
75	University Avenue / Parramatta Road / Derwent Street / Arundel Street	S	E	Parramatta Rd	L	109	2.1	A	114	3.2	A
					T	1121	2.1	A	1177	3.9	A
			S	University Ave	L	20	67.4	E	27	60.3	E
					R	12	68.1	E	13	106.1	F
			W	Parramatta Rd	T	2218	33.2	C	2113	34.7	C
			Total			3480	22.5	B	3444	23.6	B
79	Douglas Street / Percival Road	S	N	Percival Rd	L	49	25.1	B	60	25.6	B
					R	178	32.4	C	175	27.4	B
			E	Douglas St	T	112	102.7	F	131	22.5	B
					R	134	160.5	F	76	36.2	C
			W		L	739	66.3	E	611	20.7	B
					T	96	64.8	E	94	29.9	C
			Total			1308	72.8	F	1147	24.0	B
80	Railway Terrace / Victoria Street	P	E	Railway Terrace	L	30	2.8	A	33	24.4	B
					T	488	2.3	A	485	21.0	B
			S	Victoria St	L	77	2.6	A	71	12.9	A
					R	54	5.1	A	50	9.8	A
			W	Railway Terrace	T	617	2.1	A	510	1.6	A
			Total			1266	5.1	A	1149	24.4	B
81	Parramatta Road / Dalhousie Street	S	N	Dalhousie St	L	288	40.2	C	266	83.6	F
					R	96	68.5	E	119	135.5	F
			E	Parramatta Rd	T	1166	25.2	B	1355	16.4	B
					R	88	56.1	D	120	48.2	D
			W		L	109	35.0	C	84	36.4	C
					T	1564	34.4	C	1408	34.7	C
			Total			3311	33.3	C	3352	35.2	C

#	Intersection	Type	App.	Approach name	Turn	7:15AM - 8:15AM			8:15AM - 9:15AM		
						Volume (veh)	Delay (s)	LOS	Volume (veh)	Delay (s)	LOS
82	Carillon Avenue / Missenden Road	S	N	Missenden Rd	L	86	22.9	B	105	17.1	B
					T	165	31.3	C	164	24.5	B
					R	61	32.1	C	73	30.5	C
			E	Carillon Ave	L	19	64.0	E	25	55.6	D
					T	260	60.7	E	222	54.6	D
					R	72	57.6	E	90	52.7	D
			S	Missenden Rd	L	210	21.9	B	217	19.8	B
					T	221	39.4	C	213	37.8	C
					R	0			0		
			W	Carillon Ave	L	135	87.5	F	150	116.0	F
					T	454	84.6	F	425	120.3	F
					R	36	86.3	F	43	105.5	F
			Total			1719	56.3	D	1727	64.7	E
83	Parramatta Road / Missenden Avenue / Lyons Road	S	N	Lyons Rd	L	38	112.5	F	23	110.5	F
					T	174	101.5	F	143	98.6	F
					R	37	119.1	F	7	91.6	F
			E	Parramatta Rd	L	103	22.4	B	124	27.9	B
					T	1001	54.9	D	1059	58.9	E
			S	Missenden Rd	L	72	65.3	E	35	88.9	F
					T	110	82.5	F	136	95.5	F
					R	81	120.5	F	86	134.5	F
			W	Parramatta Rd	L	94	34.8	C	79	29.8	C
					T	2010	27.6	B	1873	30.8	C
					R	127	76.6	F	189	86.5	F
			Total			3847	45.6	D	3754	49.9	D

#	Intersection	Type	App.	Approach name	Turn	7:15AM - 8:15AM			8:15AM - 9:15AM		
						Volume (veh)	Delay (s)	LOS	Volume (veh)	Delay (s)	LOS
1	Victoria Rd / Darling St	S	N	Darling St	L	310	57.0	E	297	46.1	D
					T	138	75.1	F	129	74.4	F
			E	Victoria Rd	L	63	17.9	B	68	29.6	C
					T	362	5.8	A	382	7.1	A
					R	231	53.7	D	263	57.7	E
			S	Darling St	L	225	82.3	F	250	67.0	E
					T	240	129.6	F	228	106.8	F
			W	Victoria Rd	L	74	25.0	B	73	35.4	C
					T	587	27.9	B	652	31.1	C
					R	354	44.2	D	421	40.5	C
			Total			2584	49.2	D	652	45.0	D
2	Victoria Road / Evans Street	S	N	Evans St	L	97	64.4	E	106	53.6	D
					T	139	63.7	E	141	63.8	E
					R	54	55.8	D	57	67.5	E
			E	Victoria Rd	L	54	14.6	B	63	11.2	A
					T	573	11.8	A	624	7.0	A
			S	Evans St	L	31	56.8	E	45	52.8	D
					T	114	52.9	D	110	52.9	D
			W	Victoria Rd	L	16	2.5	A	23	1.8	A
					T	888	8.4	A	942	7.6	A
			Total			1966	20.8	B	2111	18.5	B
3	Victoria Road / Robert Street	S	N	Victoria Rd	L	46	6.3	A	44	10.7	A
					T	1140	32.1	C	1109	36.5	C
			E	Robert St	L	711	22.2	B	735	25.0	B
					R	12	49.4	D	16	58.0	E
			S	Victoria Rd	T	523	6.9	A	533	11.8	A
					R	888	39.0	C	986	77.5	F
			Total			3320	27.6	B	3423	41.8	C
5	Balmain Road / Lilyfield Road	S	N	Balmain Rd	L	160	9.2	A	98	11.0	A
					T	266	8.5	A	387	13.9	A
			E	Lilyfield Rd	L	74	29.6	C	83	30.5	C
					T	54	34.2	C	61	23.6	B
					R	17	26.4	B	18	27.9	B
			S	Balmain Rd	L	117	12.8	A	117	9.8	A
					T	295	7.3	A	244	9.0	A
					R	463	12.3	A	458	10.7	A
			W	Lilyfield Rd	L	1	7.3	A	7	55.0	D
					T	19	35.4	C	30	33.7	C
					R	39	25.1	B	81	77.2	F
			Total			1505	12.8	A	1584	16.9	B
6	The Crescent / Victoria Road	S	N	Victoria Rd	L	0	0.0	A	0	0.0	A
					R	0	0.0	A	0	0.0	A
			E		T	1715	24.5	B	1694	23.9	B
					R	825	20.3	B	874	20.8	B
			W	The Crescent	L	1015	37.0	C	1114	36.2	C
			Total			3555	27.1	B	3682	26.9	B

#	Intersection	Type	App.	Approach name	Turn	7:15AM - 8:15AM			8:15AM - 9:15AM		
						Volume (veh)	Delay (s)	LOS	Volume (veh)	Delay (s)	LOS
7	Balmain Road / Perry Street / Wharf Road	S	N	Wharf Rd	L	18	1.7	A	18	1.7	A
					T	22	1.6	A	33	1.6	A
					R	3	1.7	A	1	1.8	A
			E	Balmain Rd	L	263	3.8	A	431	3.9	A
					T	316	4.3	A	205	4.2	A
					R	11	5.8	A	21	6.2	A
			S		L	46	2.0	A	35	2.1	A
					T	20	1.9	A	19	2.1	A
					R	180	2.6	A	163	2.4	A
			W	Perry St	L	9	3.9	A	14	3.2	A
					T	237	6.1	A	247	4.3	A
					R	124	17.2	B	55	8.1	A
			Total			1249	5.4	A	1242	3.9	A
8	City-West Link Road / The Crescent	S	E	The Crescent	L	905	14.6	B	954	14.5	B
					T	2046	6.7	A	1976	6.9	A
			S		L	262	49.7	D	294	104.3	F
					R	0	0.0	A	0	0.0	A
			W	City-West Link Rd	T	146	55.7	D	141	55.0	D
					R	153	95.4	F	173	92.1	F
			Total			3512	17.9	B	3538	23.1	B
9	City-West Link Road / Norton Street	S	N	Norton St	L	12	48.6	D	11	6.5	A
					T	166	66.6	E	177	61.4	E
			E	City-West Link Rd	L	337	25.0	B	377	26.9	B
					T	2052	48.4	D	2222	47.2	D
					R	7	70.2	E	15	82.2	F
			S	Norton St	L	105	178.8	F	104	142.2	F
					T	125	185.6	F	160	174.2	F
					R	99	199.6	F	90	228.0	F
			W	City-West Link Rd	L	5	5.3	A	0		
					T	1516	6.9	A	1577	9.7	A
					R	185	70.4	E	131	66.6	E
			Total			4609	44.5	D	4864	44.1	D
10	City-West Link Road / Brenan Street / Balmain Road	S	N	Balmain Rd	L	140	41.2	C	193	35.1	C
					T	131	35.8	C	143	45.1	D
					R	252	35.9	C	378	30.4	C
			E	City-West Link Rd	L	134	19.4	B	107	22.4	B
					T	1968	20.4	B	2015	29.6	C
					R	241	33.9	C	198	31.5	C
			S	Balmain Rd	L	135	73.7	F	135	74.9	F
					T	193	66.0	E	192	68.8	E
					R	104	61.8	E	129	53.0	D
			W	City-West Link Rd	L	425	25.5	B	404	33.9	C
					T	1191	63.7	E	1284	81.8	F
			Total			4914	37.9	C	5178	46.7	D

#	Intersection	Type	App.	Approach name	Turn	7:15AM - 8:15AM			8:15AM - 9:15AM		
						Volume (veh)	Delay (s)	LOS	Volume (veh)	Delay (s)	LOS
11	City-West Link Road / Brenan Street / Catherine Street	S	N	Catherine St	L	85	45.8	D	115	68.9	E
					T	429	80.3	F	349	64.5	E
					R	37	63.8	E	14	61.7	E
			E	City-West Link Rd	T	2000	23.4	B	1982	22.8	B
			S	Catherine St	L	147	77.6	F	142	119.2	F
			W	City-West Link Rd	T	1466	21.0	B	1599	28.8	C
			Total			4164	31.2	C	4201	33.2	C
13	Catherine Street / Moore Street	S	N	Catherine St	L	361	3.1	A	318	2.5	A
					T	141	33.2	C	113	34.4	C
					R	13	27.4	B	6	38.3	C
			E	Moore St	L	39	6.9	A	33	16.0	B
					T	313	11.9	A	327	14.5	B
					R	214	14.0	A	160	16.1	B
			S	Catherine St	L	42	31.8	C	41	44.7	D
					T	188	37.3	C	167	34.5	C
					R	31	27.5	B	46	35.8	C
			W	Moore St	L	96	18.6	B	88	18.2	B
					T	118	20.7	B	106	15.9	B
			Total			1556	17.1	B	1405	18.0	B
14	Styles Street / Catherine Street	S	N	Catherine St	L	9	41.8	C	4	28.3	B
					T	175	44.3	D	133	28.0	B
					R	79	42.1	C	68	26.3	B
			E	Styles St	L	115	9.1	A	76	9.5	A
					T	202	10.7	A	287	10.6	A
					R	21	11.8	A	20	21.0	B
			S	Catherine St	L	35	23.1	B	46	31.5	C
					T	44	29.4	C	52	47.9	D
					R	11	51.7	D	30	55.3	D
			W	Styles St	L	139	21.9	B	115	23.3	B
					T	440	21.7	B	504	24.3	B
					R	35	26.5	B	52	24.9	B
			Total			1305	23.8	B	1387	22.8	B
19	Marion Street / Norton Street	S	N	Norton St	L	96	51.7	D	97	73.6	F
					T	230	43.5	D	189	46.7	D
					R	41	76.7	F	29	59.1	E
			E	Marion St	L	171	37.2	C	197	35.7	C
					T	325	23.8	B	324	26.8	B
					R	43	33.8	C	84	35.7	C
			S	Norton St	L	79	37.3	C	64	36.6	C
					T	56	44.0	D	89	42.5	D
					R	4	99.8	F	4	110.9	F
			W	Marion St	L	25	13.4	A	17	25.7	B
					T	482	8.9	A	547	13.7	A
					R	125	14.6	B	143	19.5	B
			Total			1677	27.4	B	1784	30.1	C

#	Intersection	Type	App.	Approach name	Turn	7:15AM - 8:15AM			8:15AM - 9:15AM		
						Volume (veh)	Delay (s)	LOS	Volume (veh)	Delay (s)	LOS
20	Marion Street / Leichhardt Street / Balmain Road	S	N	Balmain Rd	L	10	54.4	D	18	41.6	C
					R	135	50.2	D	128	38.3	C
			E	Leichhardt St	T	321	16.8	B	391	22.2	B
					R	21	25.8	B	28	35.2	C
			S	Balmain Rd	L	2	63.4	E	5	61.3	E
					T	61	70.2	E	65	69.5	E
					R	1	41.5	C	1	50.8	D
			W	Marion St	L	265	26.7	B	203	45.8	D
					T	524	29.1	C	583	48.5	D
			Total			1340	29.9	C	1422	40.6	C
22	Johnston Street / Collins Street	S	N	Johnston St	L	3	21.0	B	7	14.2	A
					T	380	47.8	D	543	24.3	B
					R	169	43.3	D	176	38.8	C
			E	Collins St	L	74	16.1	B	85	17.9	B
			S	Johnston St	L	129	33.7	C	207	37.4	C
					T	536	35.9	C	494	39.7	C
			W	Collins St	L	254	19.1	B	287	22.6	B
					R	206	18.7	B	201	22.8	B
			Total			1751	33.7	C	2000	30.0	C
23	Johnston Street / Booth Street	S	N	Johnston St	L	33	59.9	E	38	77.2	F
					T	479	70.6	F	546	75.2	F
					R	80	57.8	E	126	52.6	D
			E	Booth St	L	118	34.2	C	182	59.1	E
					T	464	51.5	D	414	71.2	F
					R	54	50.1	D	74	82.0	F
			S	Johnston St	L	74	15.8	B	42	68.7	E
					T	493	22.2	B	411	54.5	D
					R	196	23.6	B	292	21.5	B
			W	Booth St	L	37	16.9	B	52	24.4	B
					T	273	31.4	C	212	28.9	C
					R	12	38.2	C	42	57.9	E
			Total			2313	42.1	C	2431	56.9	E
27	Booth Street / Wigram Road	RB	N	Wigram Rd	L	100	2.3	A	84	7.6	A
					R	186	1.6	A	266	7.2	A
			E	Booth St	T	413	6.5	A	422	37.0	C
					R	323	6.2	A	312	29.5	C
			W		L	392	1.9	A	417	1.8	A
					T	240	1.9	A	295	1.9	A
			Total			1654	6.5	A	1796	37.0	C

#	Intersection	Type	App.	Approach name	Turn	7:15AM - 8:15AM			8:15AM - 9:15AM		
						Volume (veh)	Delay (s)	LOS	Volume (veh)	Delay (s)	LOS
28	Minogue Crescent / Wigram Road	S	N	Minogue Cres	L	99	13.9	A	115	17.0	B
					T	223	22.1	B	215	17.9	B
					R	10	26.4	B	12	24.6	B
			E	Wigram Rd	L	10	23.4	B	8	21.0	B
					T	119	22.6	B	135	20.6	B
					R	140	29.6	C	115	27.2	B
			S	Minogue Cres	L	148	12.5	A	220	15.4	B
					T	420	15.2	B	439	18.7	B
					R	56	12.5	A	78	18.6	B
			W	Wigram Rd	L	2	35.1	C	0		
					T	145	44.6	D	126	68.0	E
					R	211	49.4	D	212	66.1	E
			Total			**1583**	**25.0**	**B**	**1675**	**28.6**	**C**
29	Ross Street / Bridge Road	S	N	Ross St	L	109	31.2	C	173	34.6	C
					T	322	40.4	C	253	27.9	B
			E	Bridge Rd	L	40	20.8	B	38	23.0	B
					T	662	23.7	B	615	22.4	B
					R	180	26.3	B	217	30.0	C
			S	Ross St	L	185	47.8	D	199	48.6	D
					T	470	45.2	D	536	51.0	D
			W	Bridge Rd	L	94	30.4	C	101	27.8	B
					T	491	37.3	C	432	40.9	C
					R	0			0		
			Total			**2553**	**34.8**	**C**	**2564**	**35.8**	**C**
30	Pyrmont Bridge Road / Booth Street / Mallett Street	S	N	Booth St	L	243	32.5	C	240	29.1	C
					T	285	63.6	E	279	49.2	D
			E	Pyrmont Bridge Rd	L	147	15.2	B	150	24.6	B
					T	368	11.9	A	358	18.0	B
					R	161	39.3	C	179	47.1	D
			S	Mallett St	L	19	61.8	E	29	43.9	D
					T	275	41.4	C	264	37.6	C
					R	74	54.6	D	80	55.8	D
			W	Pyrmont Bridge Rd	L	134	42.0	C	135	37.1	C
					T	245	27.0	B	205	19.4	B
			Total			**1951**	**34.8**	**C**	**1919**	**33.3**	**C**
34	Marion Street / Foster Street	S	N	Foster St	L	30	48.8	D	16	49.7	D
					T	533	38.4	C	471	39.4	C
					R	177	42.5	C	160	41.5	C
			E	Marion St	L	101	50.5	D	134	40.1	C
					T	371	37.6	C	441	29.5	C
			S	Foster St	L	223	16.5	B	173	24.8	B
					T	392	22.3	B	388	26.5	B
					R	170	26.7	B	147	36.2	C
			W	Marion St	L	125	89.2	F	140	48.1	D
					T	366	81.1	F	401	46.4	D
					R	63	91.5	F	83	48.9	D
			Total			**2551**	**43.9**	**D**	**2554**	**36.7**	**C**

#	Intersection	Type	App.	Approach name	Turn	7:15AM - 8:15AM Volume (veh)	7:15AM - 8:15AM Delay (s)	7:15AM - 8:15AM LOS	8:15AM - 9:15AM Volume (veh)	8:15AM - 9:15AM Delay (s)	8:15AM - 9:15AM LOS
35	Marion Street / Flood Street	S	N	Flood St	L	24	34.1	C	29	25.5	B
			N	Flood St	T	143	25.8	B	203	26.7	B
			N	Flood St	R	12	37.1	C	25	37.8	C
			E	Marion St	L	188	12.6	A	179	15.9	B
			E	Marion St	T	374	10.2	A	418	14.5	A
			E	Marion St	R	58	17.1	B	44	23.8	B
			S	Flood St	L	71	40.4	C	102	30.0	C
			S	Flood St	T	190	34.2	C	255	27.7	B
			S	Flood St	R	181	45.0	D	231	37.3	C
			W	Marion St	L	70	12.5	A	35	27.2	B
			W	Marion St	T	567	16.2	B	585	22.7	B
			W	Marion St	R	42	20.0	B	55	33.3	C
				Total		1920	21.1	B	2161	24.0	B
36	Marion Street / Ramsay Street	S	N	Ramsay St	L	356	12.1	A	373	15.1	B
			N	Ramsay St	T	89	57.1	E	73	56.2	D
			E	Marion St	L	133	10.9	A	154	11.2	A
			E	Marion St	R	481	14.2	A	466	15.3	B
			S	Ramsay St	T	172	29.9	C	220	23.4	B
			S	Ramsay St	R	188	35.1	C	175	28.4	B
				Total		1419	20.7	B	1461	19.7	B
39	Parramatta Road / Liverpool Road (Hume Highway)	S	E	Parramatta Rd	L	887	5.1	A	877	6.7	A
			E	Parramatta Rd	T	1553	37.0	C	1536	35.6	C
			S	Liverpool Rd	L	183	30.9	C	188	53.4	D
			S	Liverpool Rd	R	485	66.8	E	537	88.6	F
			W	Parramatta Rd	T	1183	6.4	A	1291	6.4	A
			W	Parramatta Rd	R	408	60.8	E	394	53.6	D
				Total		4699	28.2	B	4823	30.6	C
41	City-West Link Road / James Street	S	N	City-West Link Rd	L	13	105.4	F	6	59.0	E
			N	City-West Link Rd	T	135	92.6	F	85	71.7	F
			N	City-West Link Rd	R	123	117.4	F	97	87.3	F
			E	James St	L	613	1.1	A	686	1.0	A
			E	James St	T	1541	8.9	A	1638	10.3	A
			S	City-West Link Rd	L	47	85.9	F	47	109.8	F
			S	City-West Link Rd	T	141	89.8	F	157	119.3	F
			S	City-West Link Rd	R	381	75.9	F	424	109.7	F
			W	James St	L	358	3.9	A	363	3.8	A
			W	James St	T	1299	22.0	B	1276	25.8	B
				Total		4651	25.4	B	4779	28.7	C

#	Intersection	Type	App.	Approach name	Turn	7:15AM - 8:15AM			8:15AM - 9:15AM		
						Volume (veh)	Delay (s)	LOS	Volume (veh)	Delay (s)	LOS
42	Tebbutt Street / Lords Road	S	N	Forster St	L	57	18.5	B	57	16.3	B
					T	786	19.9	B	769	18.2	B
			E	Lords Rd	L	111	34.8	C	140	39.2	C
					T	46	32.2	C	48	30.0	C
					R	93	35.0	C	65	35.1	C
			S	Tebbutt St	L	27	5.5	A	22	7.5	A
					T	587	15.4	B	550	12.0	A
					R	106	19.7	B	146	19.7	B
			W	Lords Rd	L	53	28.5	B	49	32.1	C
					T	6	40.0	C	17	35.1	C
					R	44	26.8	B	33	32.7	C
			Total			1916	20.6	B	1896	19.5	B
43	Lilyfield Road / James Street	S	N	Mary St	L	63	7.9	A	73	1.7	A
					T	198	95.1	F	100	81.7	F
					R	26	72.7	F	25	64.2	E
			E	Lilyfield Rd	L	18	11.6	A	18	41.9	C
					T	48	32.2	C	57	30.4	C
					R	23	33.3	C	17	25.7	B
			S	James St	L	45	29.6	C	58	29.1	C
					T	383	41.3	C	340	39.6	C
					R	65	45.8	D	127	53.5	D
			W	Lilyfield Rd	L	39	51.4	D	30	38.1	C
					T	77	50.0	D	72	35.6	C
					R	51	31.8	C	41	38.1	C
			Total			1036	49.6	D	958	41.8	C
44	Tebbutt Street / Hathern Street	S	N	Tebbutt St	T	31	20.3	B	22	25.5	B
					R	965	25.1	B	972	32.0	C
			S		L	299	23.9	B	238	16.5	B
					T	40	41.5	C	37	42.8	D
			W	Hathern St	L	703	9.8	A	705	10.5	A
					R	83	39.3	C	121	34.4	C
			Total			2121	20.7	B	2095	23.3	B
45	Parramatta Road / Sloane Street	S	N	Sloane St	L	59	59.0	E	35	85.4	F
					T	191	66.3	E	226	63.7	E
					R	131	90.4	F	128	93.1	F
			E	Parramatta Rd	L	61	29.2	C	56	32.3	C
					T	2255	29.1	C	2195	26.0	B
			S	Sloane St	L	61	45.7	D	74	57.0	E
					T	180	48.5	D	167	53.7	D
			W	Parramatta Rd	L	192	15.8	B	243	17.2	B
					T	1671	19.3	B	1742	22.4	B
			Total			4801	29.6	C	4866	29.7	C

#	Intersection	Type	App.	Approach name	Turn	7:15AM - 8:15AM			8:15AM - 9:15AM		
						Volume (veh)	Delay (s)	LOS	Volume (veh)	Delay (s)	LOS
47	Parramatta Road / Old Canterbury Road / Tebbutt Street	S	N	Tebbutt St	L	114	25.0	B	143	9.7	A
			E	Parramatta Rd	L	204	13.1	A	214	14.1	A
					T	2257	12.7	A	2230	6.7	A
			S	Old Canterbury Rd	L	76	20.7	B	53	16.8	B
			W	Parramatta Rd	T	1356	40.4	C	1542	33.5	C
			Total			4007	22.6	B	4182	17.2	B
49	Old Canterbury Road / Railway Terrace / Longport Street	S	N	Old Canterbury Rd	L	113	48.3	D	52	30.8	C
					T	1330	54.0	D	1372	35.3	C
			E	Railway Terrace	L	57	32.9	C	52	22.0	B
					T	727	33.8	C	681	28.3	B
			S	Old Canterbury Rd	L	124	71.9	F	152	80.1	F
					T	742	76.1	F	707	87.5	F
					R	1	137.3	F	1	176.7	F
			W	Longport St	L	95	24.1	B	145	38.2	C
					T	610	30.3	C	602	46.8	D
			Total			3799	50.0	D	3764	47.4	D
50	Parramatta Road / Norton Street	S	N	Norton St	L	335	136.4	F	212	98.2	F
					R	85	176.1	F	171	161.4	F
			E	Parramatta Rd	T	1692	24.8	B	1586	25.8	B
					R	386	46.0	D	431	60.4	E
			W		L	18	31.4	C	17	56.9	E
					T	942	38.7	C	1090	36.6	C
			Total			3458	45.5	D	3507	44.5	D
51	Parramatta Road / Flood Street / West Street	S	N	Flood St	L	12	87.9	F	5	328.3	F
					T	210	134.2	F	181	172.0	F
					R	91	372.5	F	35	625.6	F
			E	Parramatta Rd	L	39	44.8	D	50	48.1	D
					T	1680	59.0	E	1661	59.1	E
			S	West St	L	476	47.4	D	471	63.8	E
					T	273	54.7	D	319	64.8	E
					R	1	126.4	F	1	62.7	E
			W	Parramatta Rd	L	204	23.1	B	235	22.1	B
					T	890	21.4	B	1092	23.6	B
					R	366	227.6	F	357	188.5	F
			Total			4242	72.8	F	4407	69.0	E
52	Parramatta Road / Crystal Street / Balmain Road	S	E	Parramatta Rd	L	255	28.9	C	195	48.4	D
					T	1755	37.0	C	1632	55.7	D
			S	Crystal St	L	273	59.8	E	338	66.7	E
					T	62	79.2	F	75	98.8	F
					R	143	84.5	F	168	128.4	F
			W	Parramatta Rd	L	1	27.6	B	0		
					T	1112	16.5	B	1087	17.0	B
					R	247	114.9	F	253	90.2	F
			Total			3848	39.6	C	3748	51.6	D

#	Intersection	Type	App.	Approach name	Turn	7:15AM - 8:15AM			8:15AM - 9:15AM		
						Volume (veh)	Delay (s)	LOS	Volume (veh)	Delay (s)	LOS
53	Parramatta Road / Catherine Street / Phillip Street	S	N	Catherine St	L	12	68.6	E	40	95.2	F
					T	65	67.2	E	35	114.9	F
					R	189	81.8	F	106	154.1	F
			E	Parramatta Rd	L	2	50.0	D	6	184.4	F
					T	1731	39.5	C	1639	94.4	F
			S	Phillip St	L	41	49.4	D	47	49.0	D
					T	50	27.1	B	60	30.1	C
					R	21	43.1	D	12	42.4	C
			W	Parramatta Rd	L	59	27.5	B	93	20.9	B
					T	1159	9.9	A	1119	11.0	A
			Total			**3329**	**32.0**	**C**	**3157**	**63.0**	**E**
56	Crystal Street / Douglas Street / Brighton Street	S	N	Crystal St	L	72	59.5	E	45	59.4	E
					T	412	69.8	E	386	66.5	E
			E	Douglas St	L	548	25.0	B	550	30.7	C
					T	62	74.2	F	93	79.6	F
					R	32	65.6	E	51	87.3	F
			S	Crystal St	L	167	19.1	B	179	11.0	A
					T	483	28.6	C	534	12.3	A
					R	411	36.0	C	409	17.3	B
			W	Brighton St	L	31	21.5	B	41	28.6	C
					T	20	92.0	F	29	94.9	F
					R	138	103.8	F	162	104.3	F
			Total			**2376**	**43.0**	**D**	**2479**	**37.7**	**C**
57	Crystal Street / Trafalgar Street	S	N	Crystal St	L	27	46.6	D	36	23.6	B
					T	888	34.6	C	914	32.1	C
					R	203	33.3	C	209	30.1	C
			E	Trafalger St	L	67	68.8	E	73	115.8	F
					T	140	68.3	E	139	95.2	F
			S	Crystal St	L	93	18.7	B	120	28.1	B
					T	910	30.4	C	978	29.2	C
			W	Trafalger St	L	153	39.7	C	145	31.0	C
					T	151	51.0	D	208	52.3	D
			Total			**2632**	**36.5**	**C**	**2822**	**37.4**	**C**
58	New Canterbury Road / Stanmore Road / Crystal Street / Shaw Street	S	N	Crystal St	L	47	61.4	E	62	86.1	F
					T	497	62.3	E	513	95.1	F
					R	431	96.9	F	423	91.5	F
			E	Stanmore Rd	L	60	91.1	F	132	83.1	F
					T	801	81.7	F	895	75.9	F
					R	323	141.6	F	354	116.8	F
			S	Shaw St	L	28	49.4	D	36	62.2	E
					T	445	53.2	D	444	60.2	E
			W	New Canterbury Rd	L	242	53.7	D	288	59.5	E
					T	778	51.1	D	822	50.9	D
			Total			**3652**	**74.0**	**F**	**3969**	**75.8**	**F**

#	Intersection	Type	App.	Approach name	Turn	7:15AM - 8:15AM			8:15AM - 9:15AM		
						Volume (veh)	Delay (s)	LOS	Volume (veh)	Delay (s)	LOS
59	Gordon Street / Trafalgar Street	S	N	Gordon St	T	856	21.2	B	884	26.0	B
			E	Trafalger St	L	51	33.5	C	69	82.6	F
					R	356	89.4	F	330	120.5	F
			S	Gordon St	T	447	36.4	C	418	23.7	B
					R	716	93.8	F	767	51.5	D
				Total		2426	55.7	D	2468	47.8	D
60	New Canterbury Road / Gordon Street / Livingstone Road	S	N	Gordon St	L	316	58.2	E	337	67.4	E
					T	579	63.7	E	608	75.4	F
			E	New Canterbury Rd	L	59	25.0	B	55	17.6	B
					T	903	20.3	B	986	20.2	B
					R	426	53.8	D	424	41.5	C
			S	Livingstone Rd	L	133	33.0	C	112	34.0	C
					T	673	47.0	D	680	34.4	C
			W	New Canterbury Rd	L	85	32.8	C	63	34.5	C
					T	729	33.7	C	753	31.3	C
			Total			3903	41.3	C	4018	39.8	C
62	Ramsay Road / Dalhousie Street	S	N	Dalhousie St	L	73	29.0	C	65	25.6	B
					T	219	25.7	B	207	26.0	B
					R	60	23.2	B	77	29.5	C
			E	Ramsay St	L	109	22.4	B	82	31.3	C
					T	392	23.8	B	438	30.1	C
					R	78	23.9	B	83	33.2	C
			S	Dalhousie St	L	111	41.0	C	144	38.5	C
					T	142	31.6	C	137	37.9	C
					R	113	31.3	C	76	28.9	C
			W	Ramsay St	L	56	22.0	B	50	19.7	B
					T	330	16.6	B	355	13.6	A
					R	80	22.7	B	50	16.7	B
			Total			1763	24.9	B	1764	26.9	B
65	Stanmore Road / Liberty Street	S	N	Liberty St	L	400	26.9	B	369	25.2	B
					R	379	23.5	B	488	25.7	B
			E	Stanmore Rd	T	910	35.5	C	978	40.1	C
					R	396	93.5	F	355	137.3	F
			W		L	169	14.2	A	182	6.5	A
					T	646	31.9	C	692	21.9	B
			Total			2900	38.6	C	3064	41.2	C

#	Intersection	Type	App.	Approach name	Turn	7:15AM - 8:15AM			8:15AM - 9:15AM		
						Volume (veh)	Delay (s)	LOS	Volume (veh)	Delay (s)	LOS
66	Ross Street / St Johns Road	S	N	Ross St	L	104	29.5	C	102	18.8	B
					T	301	29.9	C	251	25.0	B
					R	1	10.2	A	2	19.8	B
			E	St Johns Rd	L	73	39.4	C	77	33.7	C
					T	8	39.7	C	9	50.4	D
					R	241	45.0	D	258	42.2	C
			S	Ross St	L	0			0		
					T	338	16.5	B	364	27.2	B
					R	74	25.2	B	88	32.8	C
			W	St Johns Rd	L	76	56.8	E	115	71.5	F
					T	33	57.2	E	28	49.4	D
					R	26	48.2	D	32	64.6	E
			Total			1275	32.2	C	1326	35.2	C
67	Parramatta Road / Young Street / Percival Road	S	N	Young St	L	6	82.9	F	13	74.9	F
					T	148	60.7	E	151	64.8	E
					R	0			0		
			E	Parramatta Rd	L	56	8.6	A	48	47.1	D
					T	1624	4.0	A	1578	52.1	D
			S	Percival Rd	L	11	40.8	C	13	46.4	D
					T	89	43.6	D	78	45.9	D
					R	48	61.5	E	29	36.5	C
			W	Parramatta Rd	L	35	16.7	B	23	17.3	B
					T	1172	16.8	B	1150	18.3	B
			Total			3189	13.8	A	3083	39.5	C
68	Parramatta Road /Northumberland Avenue / Johnston Street	S	N	Johnston St	L	265	46.4	D	234	58.3	E
					T	294	77.6	F	517	87.0	F
					R	70	135.0	F	103	174.4	F
			E	Parramatta Rd	L	63	19.4	B	97	46.3	D
					T	1587	19.9	B	1518	49.2	D
					R	134	52.9	D	139	82.8	F
			S	Northumberland Dr	L	43	55.0	D	31	57.2	E
					T	390	45.6	D	446	43.9	D
					R	20	81.1	F	30	196.3	F
			W	Parramatta Rd	L	122	27.3	B	87	44.7	D
					T	1047	35.8	C	1023	61.5	E
			Total			4035	36.4	C	4225	61.8	E
69	Parramatta Road / Bridge Road	S	E	Parramatta Rd	L	338	38.2	C	241	41.4	C
					T	1650	37.0	C	1699	46.9	D
			S	Bridge Rd	L	16	142.8	F	14	62.1	E
					R	282	122.0	F	313	81.3	F
			W	Parramatta Rd	T	1071	23.2	B	1083	36.1	C
					R	324	120.7	F	225	206.0	F
			Total			3681	47.4	D	3575	56.3	D

#	Intersection	Type	App.	Approach name	Turn	7:15AM - 8:15AM			8:15AM - 9:15AM		
						Volume (veh)	Delay (s)	LOS	Volume (veh)	Delay (s)	LOS
70	Parramatta Road /Pyrmont Bridge Road / Denison Street	S	N	Pyrmont Bridge Rd	L	5	118.6	F	5	97.3	F
					T	25	80.7	F	44	212.0	F
					R	316	113.4	F	307	161.7	F
			E	Parramatta Rd	L	41	58.5	E	45	84.8	F
					T	1653	44.1	D	1622	78.1	F
			W		L	415	8.5	A	385	4.2	A
					T	1132	14.1	A	1227	13.9	A
			Total			3587	37.1	C	3635	57.4	E
71	Parramatta Road / Mallett Street	S	N	Mallett St	L	43	89.1	F	74	80.9	F
					T	388	97.0	F	328	74.6	F
					R	17	276.0	F	17	198.9	F
			E	Parramatta Rd	L	211	7.7	A	226	8.0	A
					T	1643	6.9	A	1605	11.7	A
			S	Mallett St	L	42	177.4	F	41	186.1	F
					T	256	190.1	F	196	186.2	F
					R	25	234.2	F	27	171.5	F
			W	Parramatta Rd	L	49	17.5	B	79	5.5	A
					T	1100	9.2	A	1161	4.3	A
			Total			3774	35.0	C	3754	28.9	C
72	Parramatta Road / Ross Street / Western Avenue	S	N	Ross St	L	183	37.7	C	183	62.0	E
					T	87	45.9	D	89	67.1	E
					R	129	68.2	E	84	133.9	F
			E	Parramatta Rd	L	6	69.1	E	14	55.5	D
					T	1640	84.1	F	1624	72.5	F
					R	262	243.2	F	308	163.9	F
			S	Western Ave	L	71	54.9	D	55	154.7	F
					T	75	54.2	D	63	132.7	F
					R	27	57.7	E	34	161.7	F
			W	Parramatta Rd	L	74	53.7	D	94	32.4	C
					T	976	50.1	D	1079	29.6	C
			Total			3530	80.5	F	3627	70.3	E
73	Great Western Highway / Glebe Point Road	S	N	Glebe Point Rd	L	333	30.4	C	339	102.6	F
					R	166	54.9	D	146	105.8	F
			E	Great Western Hwy	T	1753	23.6	B	1757	21.1	B
					R	263	48.9	D	268	41.9	C
			W		L	29	22.7	B	44	11.1	A
					T	1209	30.4	C	1319	38.9	C
			Total			3753	29.5	C	3873	38.8	C

#	Intersection	Type	App.	Approach name	Turn	7:15AM - 8:15AM Volume (veh)	Delay (s)	LOS	8:15AM - 9:15AM Volume (veh)	Delay (s)	LOS
74	Broadway / City Road (Princes Highway) / Bay Street	S	N	Bay St	L	26	10.9	A	44	9.9	A
			E	Broadway	L	589	8.7	A	576	8.3	A
					T	1200	39.6	C	1183	32.9	C
			S	City Rd	L	832	42.9	D	833	47.8	D
					T	153	55.4	D	195	66.0	E
					R	602	51.0	D	606	58.1	E
			W	Great Western Hwy	L	100	19.1	B	87	23.6	B
					T	727	18.1	B	775	26.5	B
					R	727	77.1	F	787	147.8	F
			Total			4956	40.1	C	5086	53.3	D
75	University Avenue / Parramatta Road / Derwent Street / Arundel Street	S	E	Parramatta Rd	L	72	6.4	A	76	5.3	A
					T	1861	3.2	A	1854	4.3	A
			S	University Ave	L	65	74.3	F	69	83.4	F
					R	47	81.4	F	47	104.9	F
			W	Parramatta Rd	T	1210	8.2	A	1294	35.2	C
			Total			3255	7.6	A	3340	19.3	B
79	Douglas Street / Percival Road	S	N	Percival Rd	L	52	22.6	B	63	21.4	B
					R	375	23.6	B	438	30.3	C
			E	Douglas St	T	72	33.7	C	88	31.8	C
					R	121	43.0	D	117	45.3	D
			W		L	414	13.3	A	405	13.1	A
					T	75	38.6	C	72	29.8	C
			Total			1109	23.5	B	1183	25.5	B
80	Railway Terrace / Victoria Street	P	E	Railway Terrace	L	117	1.9	A	98	1.8	A
					T	783	2.1	A	733	1.6	A
			S	Victoria St	L	22	3.7	A	17	3.3	A
					R	34	10.3	A	27	9.9	A
			W	Railway Terrace	T	718	13.3	A	662	35.5	C
			Total			1674	13.3	A	1537	35.5	C
81	Parramatta Road / Dalhousie Street	S	N	Dalhousie St	L	192	338.1	F	205	411.1	F
					R	159	395.0	F	187	413.8	F
			E	Parramatta Rd	T	1512	15.3	B	1473	14.3	A
					R	211	65.9	E	239	66.9	E
			W		L	143	55.2	D	105	38.2	C
					T	1577	54.5	D	1660	34.6	C
			Total			3794	68.2	E	3869	67.2	E

#	Intersection	Type	App.	Approach name	Turn	7:15AM - 8:15AM			8:15AM - 9:15AM		
						Volume (veh)	Delay (s)	LOS	Volume (veh)	Delay (s)	LOS
82	Carillon Avenue / Missenden Road	S	N	Missenden Rd	L	110	19.9	B	121	21.4	B
					T	215	30.1	C	206	30.3	C
					R	83	37.0	C	78	42.6	D
			E	Carillon Ave	L	32	48.6	D	45	47.8	D
					T	410	53.8	D	318	67.3	E
					R	108	50.7	D	133	57.3	E
			S	Missenden Rd	L	183	20.7	B	165	27.0	B
					T	207	35.6	C	268	38.0	C
					R	4	21.2	B	1	64.4	E
			W	Carillon Ave	L	107	103.2	F	94	136.5	F
					T	352	92.2	F	399	124.2	F
					R	64	91.6	F	61	153.9	F
			Total			1875	54.1	D	1889	68.7	E
83	Parramatta Road / Missenden Avenue / Lyons Road	S	N	Lyons Rd	L	21	125.6	F	45	109.9	F
					T	171	102.3	F	185	139.4	F
					R	71	158.4	F	36	323.7	F
			E	Parramatta Rd	L	114	45.2	D	109	169.6	F
					T	1679	66.3	E	1610	168.5	F
			S	Missenden Rd	L	116	64.2	E	142	335.7	F
					T	191	78.5	F	209	334.8	F
					R	50	83.1	F	32	395.6	F
			W	Parramatta Rd	L	77	8.1	A	74	14.7	B
					T	985	7.2	A	1058	12.4	A
					R	120	66.1	E	142	62.1	E
			Total			3595	52.9	D	3642	133.3	F