Graythwaite

Part 3A Concept Application & Stage 1 Project Application

Transport & Accessibility Impact Assessment

24 November 2010

Prepared for

Sydney Church of England Grammar School (Shore)

Halcrow

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This report has been issued and amended as follows:

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V01	Draft for internal review	28/09/2010	-	JR
V02	Draft for internal review	30/09/2010	-	JR
V03	Draft for WSP review	06/10/2010	-	JR
V04	Draft for Shore (client) review	18/10/2010		JR
V05	Draft for Final DoP Submission	18/11/2010		JR
V06	Final for DoP Submissions	24/11/2010		JR

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1 Introduction

In 2009 the Sydney Church of England Grammar School (Shore) purchased the site known as Graythwaite in North Sydney. The Graythwaite site is located adjacent to the Shore's North Sydney Campus which forms the Senior and Preparatory Schools.

The Graythwaite site was purchased by Shore with the objective of integrating the site with the existing Shore site into a single school campus for both existing and future educational uses.

This traffic and parking report has been prepared on behalf of the Shore as part of the Concept Plan Application and Stage 1 Project Application to conserve and restore existing buildings and develop new educational facilities.

The Concept Plan for the Graythwaite site includes the potential to accommodate an additional 500 students and some 50 staff within new buildings to be constructed on the Graythwaite site.

It is proposed that development will be staged over some 10 – 15 years as follows:

- Stage 1 : conservation and restoration of Graythwaite House and associated buildings (no additional students or staff);
- Stage 2 : new buildings accommodating an additional 100 students and 10 staff; and
- Stage 3 : a new building accommodating an additional 400 students and 40 staff.

The purpose of this report is to consider and assess the traffic and transport issues relating to the proposed Concept Plan and Stage 1 development. In doing so, the assessment presented in this report addressed the issues identified in the Director Generals' Requirements (MP 10_0149 and MP 10_0150).

While it is noted that the proposed development which is the subject of the Concept Plan and Stage 1 Project Application would be limited to the Graythwaite site, the traffic

and transport assessment presented in this report has generally considered the Shore school and Graythwaite site as a single integrated site.

As such the assessment has considered the cumulative implications of development of Shore on its surrounding local area.

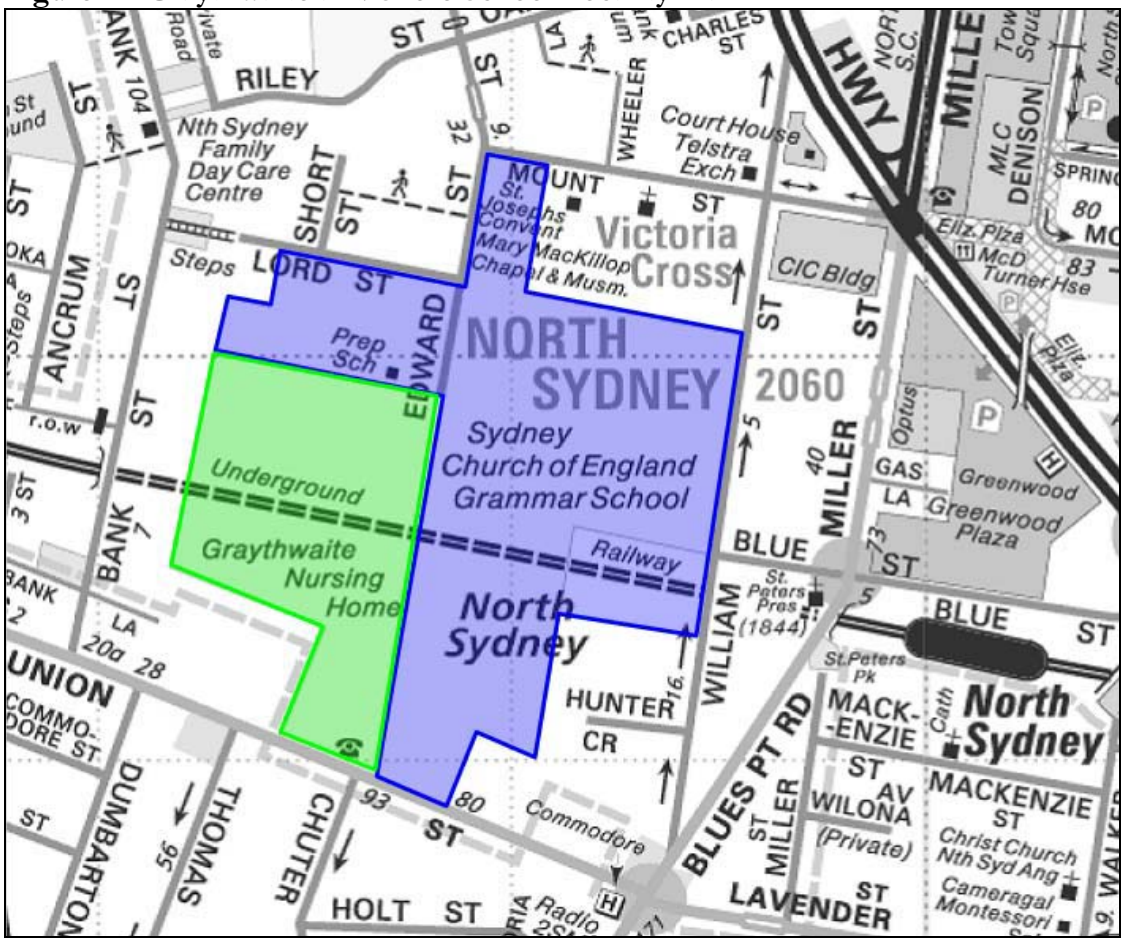
2 Existing Traffic and Transport Conditions

2.1 Graythwaite Site

The site referred to as Graythwaite is located in North Sydney adjacent to the Shore School. Graythwaite has its primary road frontage to Union Street. A secondary frontage exists to Edward Street.

The location of the Graythwaite site relative to the Shore School is shown in Figure 1.

Figure 1 – Graythwaite and Shore School Locality Plan



Prior to the purchase of Graythwaite by the Shore School, the site was most recently used as a nursing home operated by Hope Healthcare under the ownership of the NSW Department of Health.

A comprehensive history of Graythwaite's other earlier uses are identified in the Conservation Management Plan (CMP) prepared in conjunction with the Concept Application by Tanner Associates (October 2010).

Vehicle access to Graythwaite is provided via the main driveway at Union Street. This driveway is approximately 5 metres wide along its length between Union Street and Graythwaite House. The driveway is lined with trees and is understood to be an important historical feature of the site.

A secondary vehicle access to the site is available from Edward Street.

A number of separate hardstand (asphalt) areas are located adjacent to Graythwaite House and the associated site buildings. These hard stand areas have been used in the past to accommodate on site parking in an informal parking arrangement.

Some 7 marked parking spaces are provided at the rear of Graythwaite House with space for an additional 16-20 spaces within the hard stand areas around the House.

In total, it is estimated that the Graythwaite site has the potential to accommodate in the order of 25 parked vehicles on the site under existing conditions and that this capacity has existed for some time.

2.2 Shore School Site

The location of the Shore School relative to Graythwaite and the surrounding locality is shown in Figure 1.

The School has road frontages to William Street, Mount Street, Edward Street, Lord Street and Union Street.

The School is separated into the Senior School and the Preparatory School. While there are two separate sites, pedestrian linkages are provided along the Edward Street frontages. These linkages are important as the Preparatory School and Senior School share the use of a number of school facilities.

The Shore School site is located within close proximity to the North Sydney transport interchange which provides good access to major rail and bus public transport

networks. The main access to the School on William Street is located some 150 metres from the entrance / exit of the North Sydney railway station.

In the afternoon Preparatory School students which leave the school by public transport are escorted by a member of staff through the Senior School to the North Sydney rail and bus services. There is a turning circle in the front of the Preparatory School that allows car delivery and pick-up via Edward Street. Students are supervised until such time as public transport services have picked up all students.

Other School management activities include:

- Staff supervision and management of the Edward Street pick up / drop off area; and
- Staff supervision of boys waiting for buses at Mount Street.

The School currently accommodates the following number of students and staff:

- Senior School = 1,190 students
- Preparatory School = 240 students
- Staff = 240 full-time staff members
- Part-time Staff = 150 staff members (based on travel survey distribution to some 390 staff)

The School site currently provides a total of 151 formal car parking spaces[1]. This includes:

- Centenary Building Car Park = 50 spaces (accessed via William Street)
- Bishops Gate Car Park = 68 spaces (accessed via Union Street)
- Adjacent to Hodges House = 23 spaces (at grade accessed via Union Street)
- Other at grade spaces spread throughout the school campus

Loading and service vehicle access is provided via:

- Edward Street – maintain vehicle gate near maintenance building;
- Union Street – via Bishops Gate access (access to Dining Hall)
- William Street – access to Drama Theatre loading dock.

[1] Source: Email provided by WSP dated 27/5/2010

A plan showing the existing vehicle access arrangements to on site parking and service vehicle areas is provided in Appendix A.

A formal vehicle drop off / pick up facility is provided on the Preparatory School site. This facility is accessed via separate entry and exit driveways at Edward Street.

Shore school buses transport students between the School site and the sports facilities located at Northbridge. These buses load and unload students from the southern side of Mount Street between Edward Street and Wheeler Lane from a designated time enforced bus zone.

2.3 Surrounding Road Network Operation

2.3.1 Traffic and Pedestrian Surveys

As part of the traffic assessment for the Graythwaite site concept plan, traffic and pedestrian counts were undertaken at key intersections within the surrounding road network on a typical school weekday (20 May 2010).

Traffic and pedestrian counts undertaken included:

- Intersection vehicle turning movements counts at key road network intersections;
- Vehicle drop off and pick up activities;
- Pedestrian flows; and
- Union Street (weekly traffic flow).

The extent of the traffic and pedestrian surveys are shown in Figure 2.

2.3.2 Traffic Count Survey Results

The surveys indicated that the peak hour traffic flows occurred between 7:30am - 8:30am and 3:00pm - 4:00pm for the morning and afternoon peak hours, respectively.

The mid block two-way peak hours flows are summarised in Table 2.1 and intersection turning movement flows are presented in Figure 3 and Figure 4 for the morning and afternoon peak hours, respectively.

Figure 2 – Traffic and Pedestrian Surveys

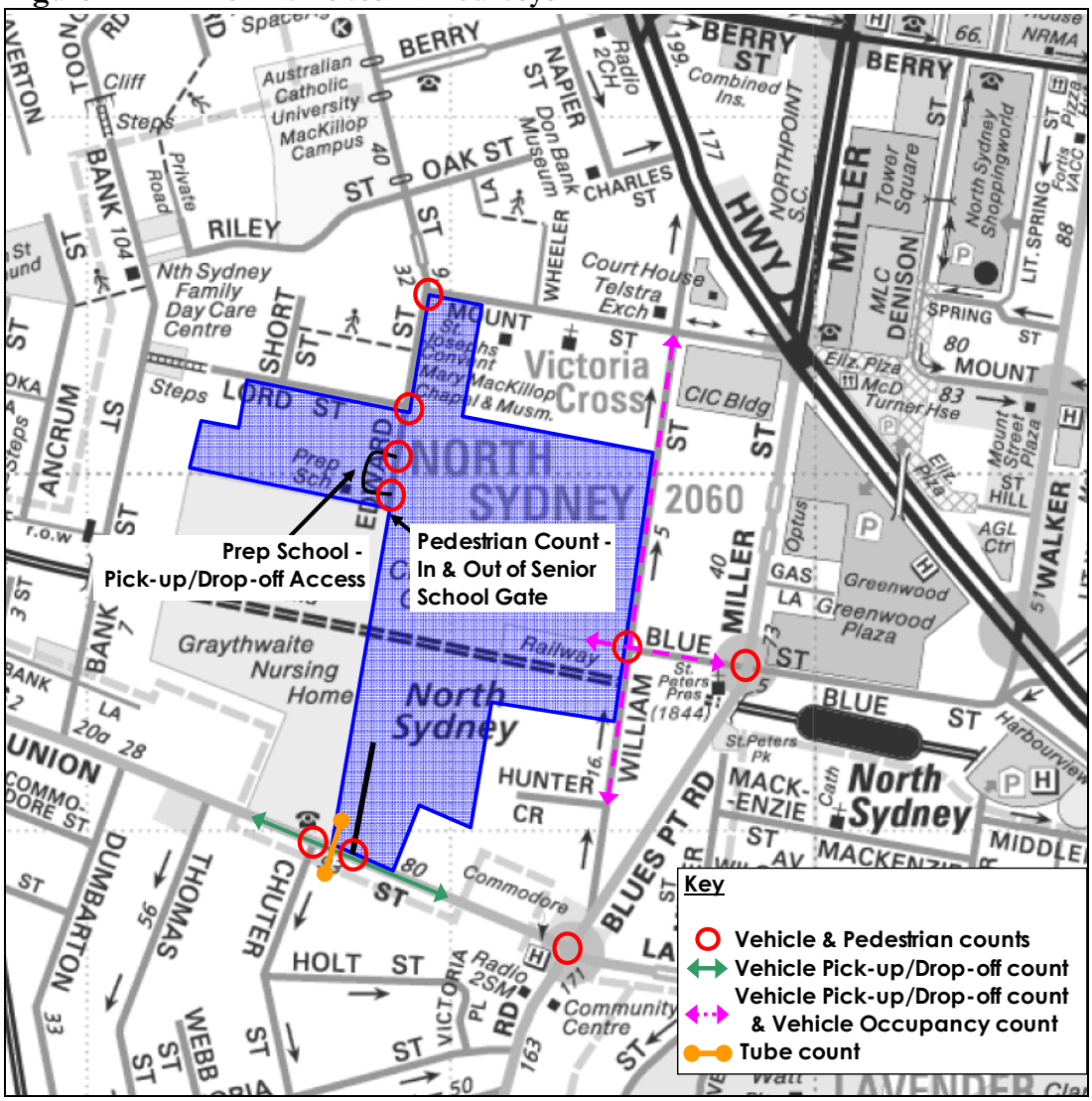


Figure 3 – Surveyed Vehicle Flows (7:30am-8:30am)

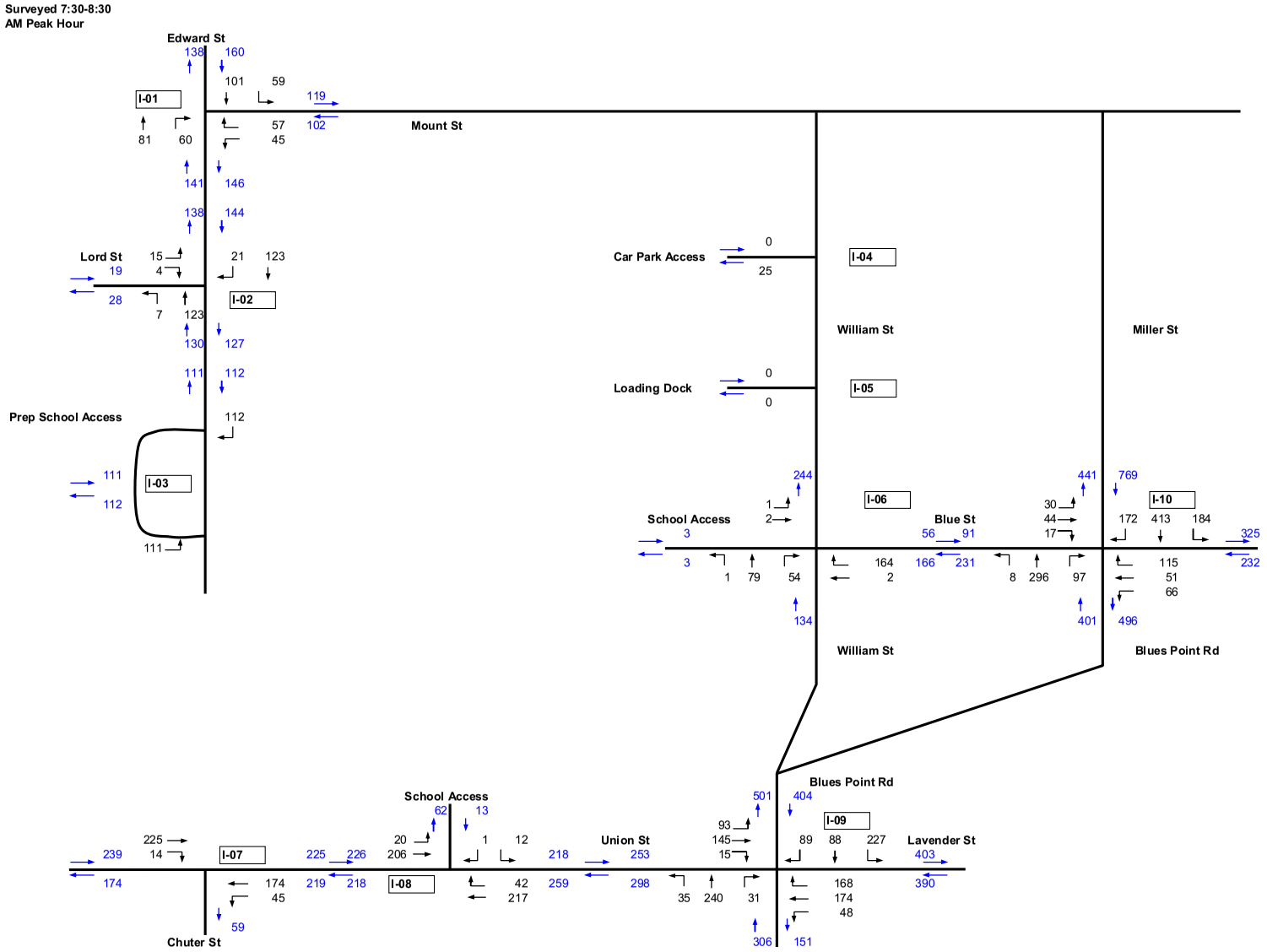


Figure 4 – Surveyed Vehicle Flows (3:00pm-4:00pm)

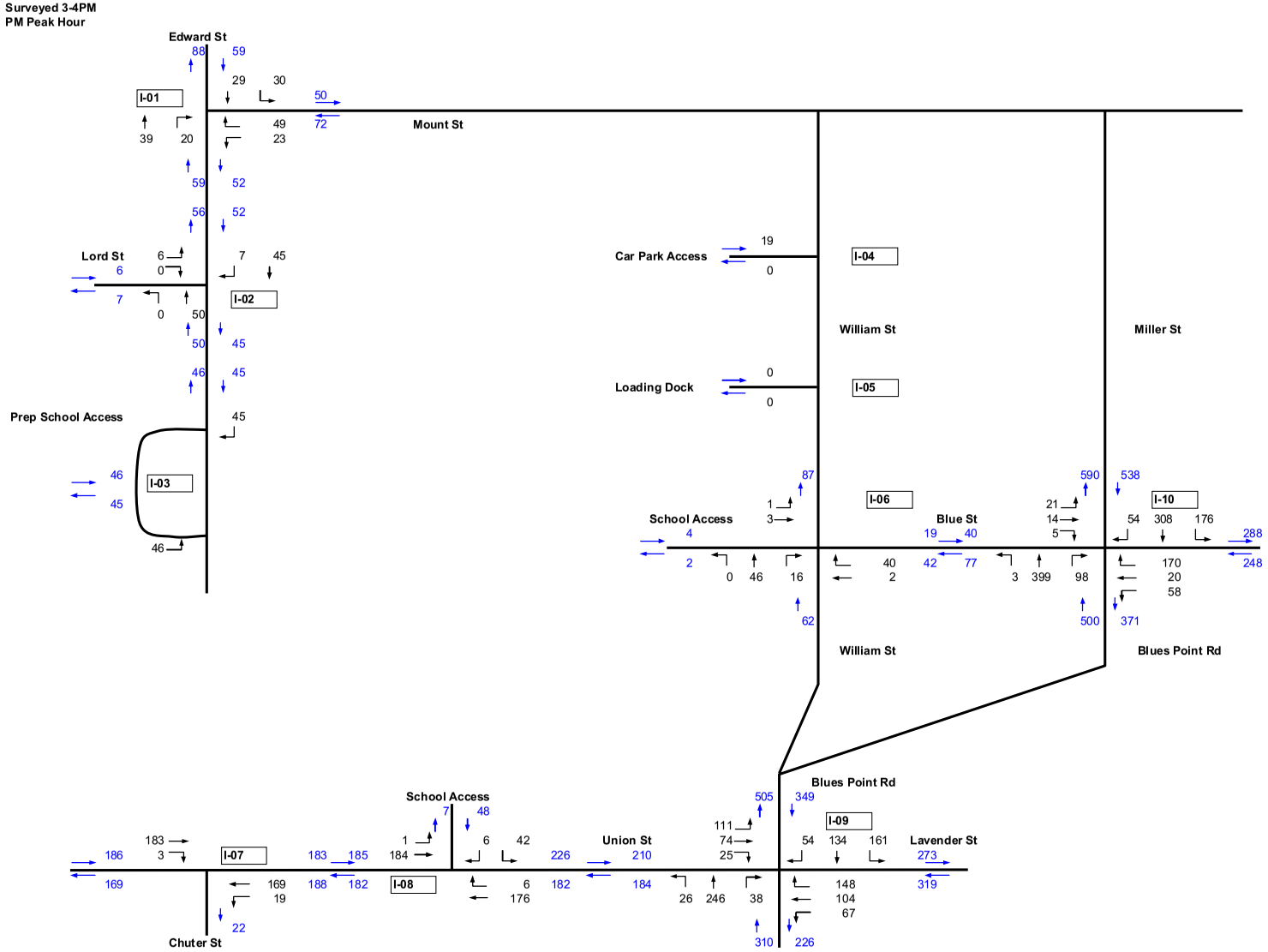


Table 2.1 – Two-way Peak Hours Flows (Vehicles/Hour)

Locations	AM Peak Hour Vehicles/hr 7:30-8:30am	PM Peak Hour Vehicles/hr 3:00-4:00pm
William St, south of Blue St/School Access	134	62
William St, north of Blue St/School Access	244	87
Miller St, south of Blue St	897	871
Miller St, north of Blue St	1,210	1,128
Blue St, east of William St	222	61
Blue St, east of Miller St	557	536
Union St, west of Chuter St	413	355
Union St, east of School Access	477	408
Blues Point Rd, south of Union St	457	536
Blues Point Rd, north of Union St	905	854
Lavender St, east of Blues Point Rd	793	592
Chuter St, south of Union St	59	22
School Access, north of Union St	75	55
Edward St, south of Lord St	257	95
Edward St, south of Mount St	287	111
Edward St, north of Mount St	298	147
Lord St, west of Edward St	47	13
Mount St, east of Edward St	221	122

The results shown in Table 2.1 indicate that these roads typically carry considerably more traffic during the morning peak hour compared to the afternoon peak hour. This is a function of the School's morning peak period coinciding with general commuter morning peak. In the afternoon the School's peak occurs prior to the commuter peak.

Union Street, which is a collector road, carries less than 500 vehicles per hour. The volume of 500 vehicles is the upper limit for the collector type road.

With the exception of Union Street all of the surveyed roads carry less than 300 vehicles during the peak hour. The volume of 300 vehicles per hour is considered to be the upper limit for the Environmental Capacity performance standard for local streets.

It is important to note that Environmental Capacity guidelines are not absolute thresholds nor are they reflective of the carrying capacity of roads. The Environmental Capacity guidelines provide an indication of the level of traffic beyond which amenity may be affected and where measures such as local traffic calming are to be considered.

Other notable findings of the traffic surveys include:

- Edward Street – traffic flows are principally associated with the School. Traffic flows south of Lord Street are exclusively School traffic.
- William Street (south) is the primary route to the School's main gate (i.e. Drop off area). Blue Street is a secondary route.

Generally the roads within the surrounding road network operate with traffic flows consistent with their function (i.e. local access road, collector roads etc. are carrying traffic flows below the thresholds that would be expected for the various types of road).

The tube count survey was conducted on Union Street between Chuter Street and the School driveway access for a continuous seven days. The data collected includes vehicles counts by 12 classifications according to the Austroad and speed data.

Figure 5 below shows the 24-hour profile of hourly flows on Union Street for the weekday peak (i.e. Thursday during this measured period), 5-day weekday average and 7-day average.

Figure 5 – Union Street surveyed Traffic Flows - 24 Hour Daily Profile

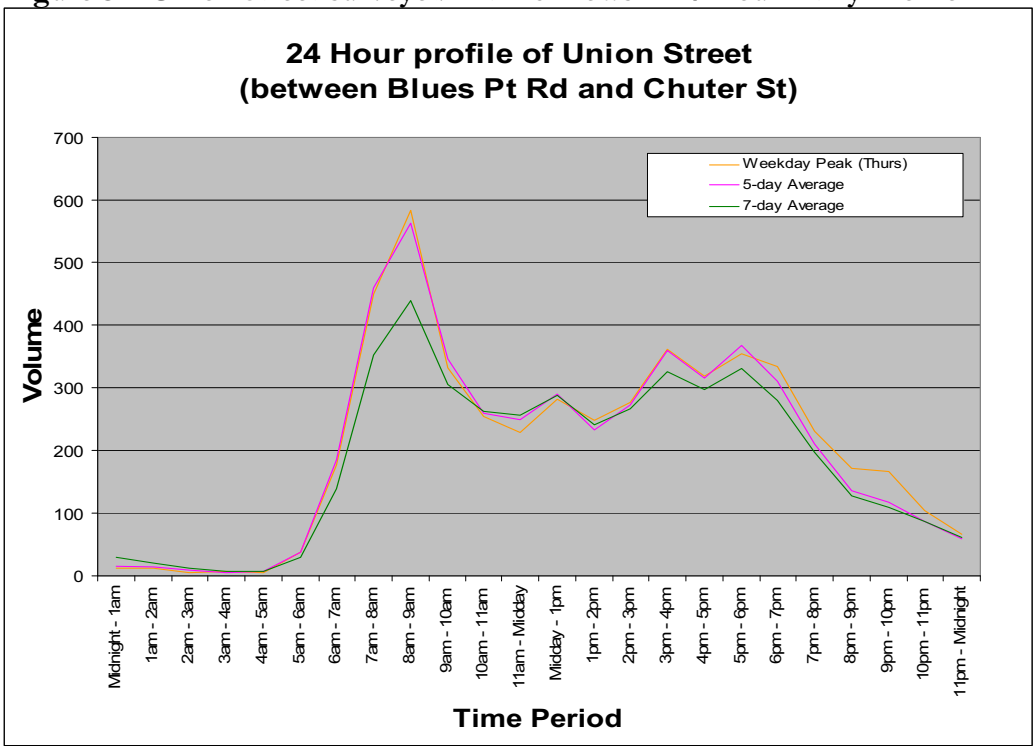


Table 2.2 summarises the 85th percentile speed for the weekday during the School Zone periods by direction.

Table 2.2 – Weekday the 85th percentile Speed on Union Street by Direction during School Zone Periods

Period	85th Percentile Speed (km/hr)	
	Eastbound	Westbound
8-9AM	48	42
9-10AM	50	43
2-3PM	50	47
3-4PM	49	45
4-5PM	51	47

Table 2.2 indicates that the 85th percentile speed on Union Street are higher than the school zone speed of 40km/hr for both directions during the morning and afternoon school zone periods.

The results indicate that the eastbound traffic generally travels with a higher speed than the westbound traffic.

2.3.3 Existing Intersection Operation

The operation of the surrounding local intersections was analysed using the SIDRA modelling software.

SIDRA determined the average delay that vehicles encounter and the corresponding level of service. SIDRA provides intersection performance measures which can be compared to the performance criteria set out in the following Table 2.3.

The surveyed traffic flows as presented in Figures 3 and 4 have been used in SIDRA analysis. The results of the SIDRA analysis are presented in Table 2.4.

Table 2.3 – Level of Service Criteria

Level of Service	Average Delay per Vehicle (secs/veh)	Signals & Roundabouts	Give Way & Stop Signs
A	Less than 14	Good operation	Good operation
B	15 to 28	Good with acceptable delays & spare capacity	Acceptable delays & Spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operating near capacity	Near capacity & accident study required
E	57 to 70	At capacity; at signals, incidents will cause excessive delays Roundabouts require other control mode	At capacity, requires other control mode
F	> 70	Extra capacity required	Extreme delay, traffic signals or other major treatment required

Adapted from RTA Guide to Traffic Generating Developments, 2002.

Table 2.4 – Existing Intersection Operation

	AM Peak Hour		PM Peak Hour	
	Ave Delay (sec/veh)	Level of Service (LoS)	Ave Delay (sec/veh)	Level of Service (LoS)
Edward St – Mount St	6	A	8	A
Edward St – Lord St	5	A	6	A
William St – Blue St	6	A	6	A
Union St – Chuter St	6	A	6	A
Union St – School Access	6	A	6	A
Union St-Blues Point Rd	26	B	25	B
Blue St-Miller St	27	B	17	B

The results of the SIDRA analysis indicate that each of the intersections is currently operating satisfactorily with good levels of service.

2.4 Existing School Travel Demand

In May 2010 Shore commissioned Halcrow to undertake an analysis of the School's existing travel demands and travel behaviour.

The purpose of this analysis was to develop an understanding of the School's existing travel demands and travel behaviours of Shore School and its interaction with the surrounding transport networks.

Furthermore the analysis would provide suitable baseline data upon which an assessment of potential future development of the School and Graythwaite could be assessed.

The analysis included traffic and pedestrian surveys of the School and the surrounding road network as well as a travel questionnaire for students and staff.

The results of the existing School travel demand analysis have been documented in a stand alone report. This report is provided in Appendix B. The following sections of this report present a summary of the analysis findings.

2.4.1 Travel Questionnaire

Travel survey questionnaires were sent out to 1,426 students and 393 staff members (permanent and part-time staff) asking a range of questions about how they travel to and from the School each day. A copy of the questionnaire and the results is presented in Appendix B.

About 830 people responded to the survey (i.e. 667 students and 163 staffs), which is about a 46% survey response. While the data set is not perfect, it does provide a very definite picture of typical travel patterns.

The following is a summary of the key findings.

i. Arrival & Departure Times at School

Figure 6 and Figure 7 show the distribution of respondents by arrival and departure times at the School.

Figure 6 shows that about 75% of students/staffs arrive between 7:30 and 8:30AM with some 20% of students/staffs arriving before 7:30AM.

Figure 7 shows that a significant number of respondents (i.e. 53%) leave school during the 20 minute period between 2:55 and 3:15PM.

Figure 6 – Arrival Time at Shore School (Students and Staff)

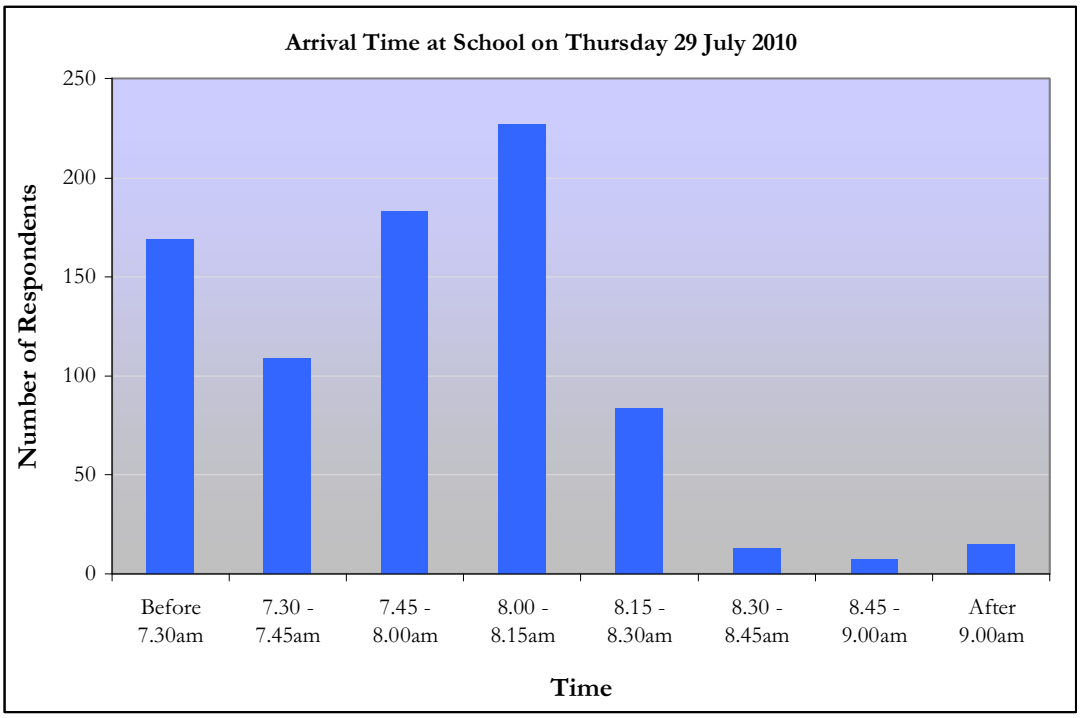
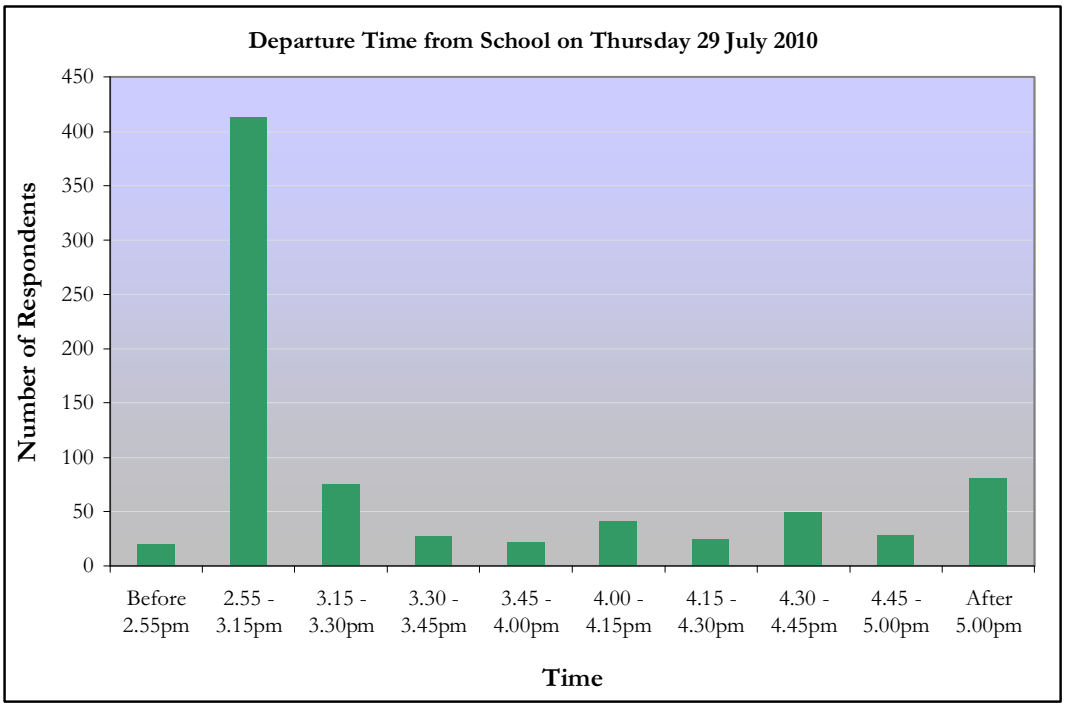


Figure 7 – Departure Times from Shore School (Students and Staff)



These arrival and departure times have implications for the traffic flow loadings on the surrounding road network, particularly in the PM peak with the concentration of departures in one short period.

However as noted below the amount of traffic generated by the School in PM peak is significantly lower than the AM with a mode shift to public transport.

ii. Mode of Travel

Table 2.5 shows the travel mode for students/staffs to and from the School.

Table 2.5 – Travel Mode for Students/Staff

Travel Mode	To School Trips (% of Mode Share)	From School Trips (% of Mode Share)
Car driver	113 (14%)	102 (13%)
Car passenger	259 (32%)	163 (20%)
Train	142 (18%)	143 (18%)
Bus	179 (22%)	215 (27%)
School bus to Northbridge for Sports	-	57 (7%)
Cycle	4 (1%)	3 (0%)
Walk	26 (3%)	24 (3%)
Live on site	84 (10%)	73 (9%)
Others	-	20 (3%)
Total	807	800 (100%)

The results indicate that the highest mode choice is by private vehicle. The percentage of the students/staffs travelling to school by private vehicle is about 46% and from school is about 33%.

The results shown in Table 2.5 also indicate that there is a difference in the mode choice for the travel to and from school. The percentage of car travel is approximately 13% higher for travelling to school in the morning (46%) compared to the travelling from school in the afternoon (33%). This difference is contributed to by the increase in bus usage for the return journey home or to Northbridge for sports.

iii. Vehicle Occupancy

The stated average vehicle occupancy of students/staffs being dropped off at school is approximately 1.24 persons per vehicle.

This is consistent with observational surveys conducted in May 2010 which indicated the vehicle occupancy of 1.21 and 1.23 students per car for the morning and afternoon peak periods, respectively.

iv. Drop-off and Pick-up Locations

Table 2.6 presents the stated percentages of drop-off and pick-up occurring at different locations near the School.

Table 2.6 – Drop-off and Pick-up Locations

Locations	Drop-off locations	Pick-up locations
Blue Street	17%	10%
William Street	7%	7%
Edward Street	7%	7%
Prep School Drop Off (Edward Street)	56%	65%
Lord Street	1%	0%
Union Street	3%	3%
Mount Street	5%	2%
Others	4%	5%

The results indicate that the Preparatory School drop-off at Edward Street is the most popular location with 56% and 65% of total drop-off and pick-up occurring at this location. Blue Street and William Street are also commonly used with totals of about 17% to 24% using these streets.

v. Parking Locations

Table 2.7 presents the percentages of where students/staff park their vehicles near the School.

The results above show that about 65% of cars are parked in the William Street or Union Street on site car parks. About 13% of vehicles are parked on streets near the school and about 23% of vehicles are parked on streets at some distance away from the school.

Table 2.7 – Parking Locations

Locations	Number of Parked Cars	Percentages
William Street car park	33	30%
Union Street car park	39	35%
Blue Street	3	3%
William Street	2	2%
Edward Street	3	3%
Lord Street	1	1%
Union Street	3	3%
Mount Street	2	2%
Other (please specify)	26	23%

2.4.2 Vehicle Drop Off / Pick Up and Pedestrian Surveys

Traffic and pedestrian surveys were undertaken of the road network surrounding the School. These surveys included counts of School activity, namely vehicle drop offs / pick ups and pedestrian flows.

Further details are provided above in Section 2.3 of this report regarding traffic flows and intersection operation.

i. Pedestrian Surveys

The key findings of the pedestrian surveys were:

- William Street via Blue Street is the principal pedestrian access to the School (742 pedestrians in the AM peak)
- Edward Street is a secondary access with minimal walk in flows other than between the Senior and Preparatory School sites
- Higher pedestrian flows were recorded in PM peak than AM peak reflecting the shift to public transport modes in the afternoon.
- Union Street is an under utilised pedestrian access with very low pedestrian flows recorded at these gates (i.e. 16 pedestrians in the AM peak and 56 pedestrians in the PM peak)

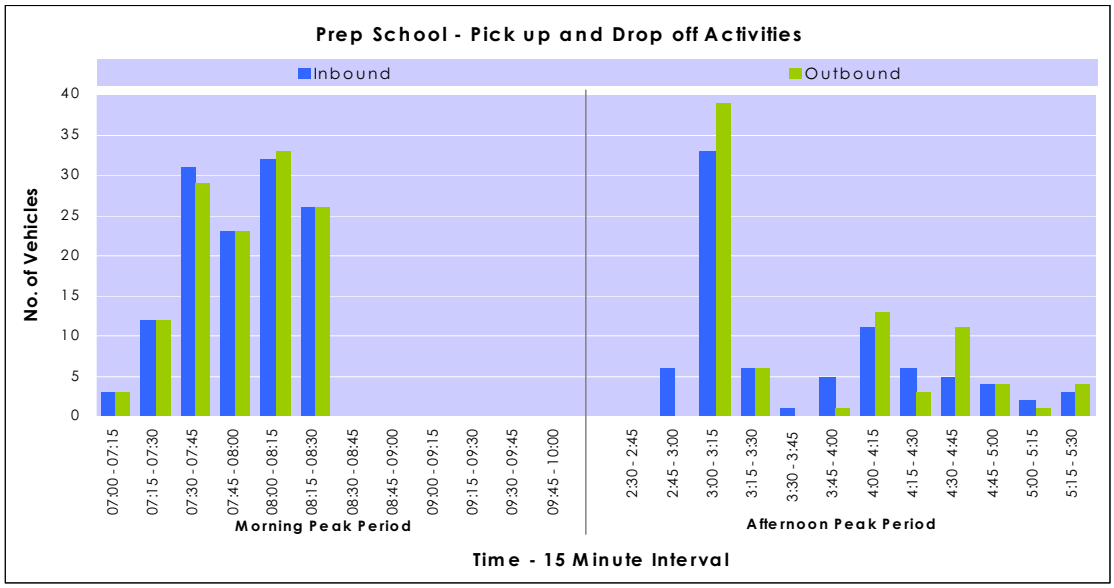
ii. Preparatory School Drop Off / Pick Up Facility

The key findings of the Preparatory School drop off / pick up facility were:

- Relatively similar total volumes of traffic movements over the surveyed AM and PM periods
- AM – even dispersal of traffic over 1 hour
- PM – Concentration of traffic in one 15 minute period
- Concentration of traffic will adversely impact on the capacity of the drop off facility.
- Observations indicate that some congestion occurs during the peak PM pick up period. This suggests that the facility is approaching capacity under its current operation management.

The distribution of drop off and pick ups are shown in Figure 8.

Figure 8 – Preparatory School Drop Off / Pick Up Vehicle Movements



iii. Senior School Drop Off / Pick Up - On Street

Senior School drop offs and pick ups occur on street. The extent of drop of and pick ups is shown in Figure 9 and 10.

Figure 9 – William Street Drop Off/Pick up Vehicle Movements

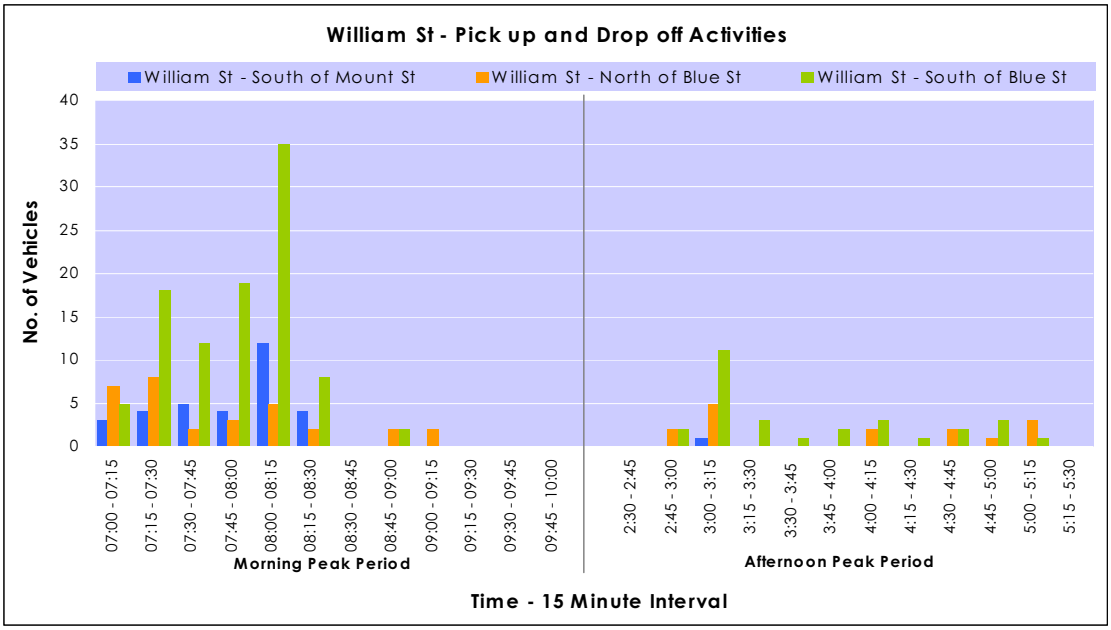
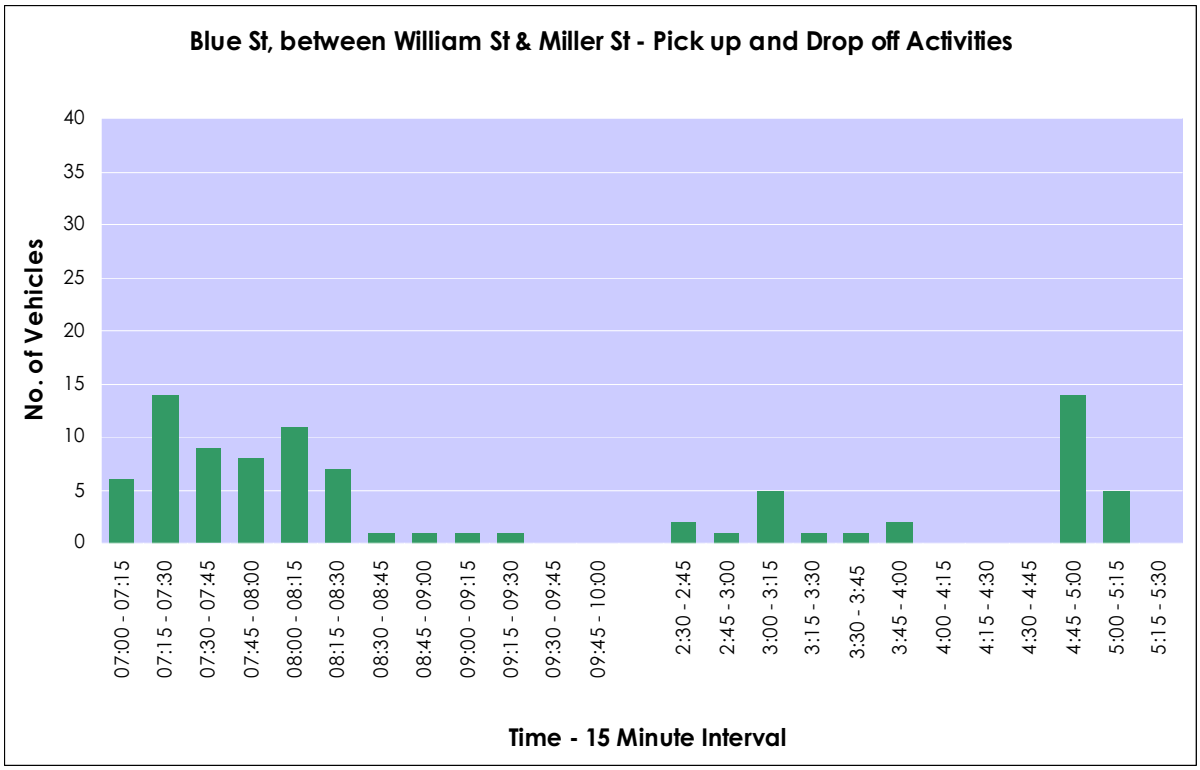


Figure 10 – Blue Street Drop Off/Pick up Vehicle Movements



iv. School Bus Operation

Designated Shore School buses operate from the marked kerb side "bus zone" on the southern side of Mount Street.

Pedestrian access from the School to the Mount Street bus zone is provided via a pedestrian gate and path along the School's Mount Street frontage.

Typically the School runs up to 8 buses per afternoon between the School and the Northbridge sporting facilities.

It is understood that discussions between the School and North Sydney Council have been undertaken regarding general traffic and parking arrangements in Mount Street. These discussions have included School bus operations. It is understood that Council has acknowledged that bus operations are part of all schools' activities and that the Mount Street bus stops are considered to be a practical location for this travel task.

3 Strategic Context

This section outlines government plans and strategies which provide a transport context within which this proposed development should be considered including the various transport related environmental planning instruments and guidelines referenced in the DGRs.

3.1 State Strategic Planning Policy and Plans

3.1.1 NSW State Plan

The NSW State Plan 2006 defines the NSW Government's overarching goals and priorities for action. It is intended to set a framework for linking the various other NSW Government plans and policies, including the Metropolitan Strategy.

Transport-relevant goals include:

- A high quality transport system
- Practical environmental solutions
- Improved urban environments

Beneath these goals are a number of transport-relevant priorities with associated targets.

The priorities are:

- Increasing share of peak hour journeys on a safe and reliable public transport system
- Safer roads
- Cleaner air and progress on greenhouse gas reduction
- Jobs closer to home
- Improve the efficiency of the road network

3.1.2 Metropolitan Strategy and Metropolitan Transport Plan

The Metropolitan Strategy (December 2005) outlines a broad framework vision for the future growth of the Sydney metropolitan area to 2031. The strategy proposes the concentration of growth in centers by identifying housing and employment capacity targets for Sydney's sub regions and strategic centers.

3.1.3 The Metropolitan Strategy

The Metropolitan Strategy's transport vision for Sydney is "… neighbourhoods with improved local transport, with walking and cycling facilities and bus services to major centres. People will be able to carry out more of their trips closer to home, reducing the time taken and cost of longer trips".

Transport actions proposed by the Metro Strategy are:

- Improve transport between Sydney's centres
- Improve the existing transport system
- Influence travel choices to encourage more sustainable travel
- Improve transport decision-making, planning, evaluation and funding:
- Ensure sufficient port capacity is available to serve Sydney:
- Improve the efficiency of all types of freight movements in Sydney:
- Connect the regions and economic gateways within the GMR:
- Minimise the adverse impacts from freight movements

A review of the Metropolitan Strategy is presently underway and is expected to be completed by the end of 2010.

3.1.4 Metropolitan Transport Plan

This was released in February 2010 and provides a 25 year vision for the linking of Sydney's land use planning with its transport network. It is intended that this plan be merged with the updated Metropolitan Strategy when it is completed. The plan includes a 10 year funding guarantee for essential transport infrastructure and services.

The plan includes:

- The $4.5 billion Western Express City Rail Service – a separate dedicated rail track to slash travelling times from Western Sydney to the city.
- Start of work on the $6.75 billion North West rail link from Epping to Rouse Hill.
- A $500 million expansion of the current light rail system with an extension from Lilyfield to Dulwich Hill.
- Improvement to bus services – including 1000 new buses in strategic bus corridors.
- New trains – addition of 626 rail carriages.
- $158 million for cycleway.

- $400 million for commuter car park.
- $225 millions for ferries.
- $536 million for motorway planning, transit corridor reservations and land acquisition.
- $483 million to deliver important freight works in Sydney.
- $21.9 million of State and Federal Funded road projects.

3.1.5 Inner Northern Subregion Draft Subregional Strategy (Draft)

This draft policy sets key directions for transport namely:

- Improve access to Macquarie Park;
- Integrate transport and land use opportunities;
- Manage traffic and improve key corridors; and
- Manage growth of commercial vehicle movements.

3.1.6 State Environmental Planning Policy (Infrastructure) 2007

State Environmental Planning Policy (Infrastructure) 2007 (the SEPP) was introduced to facilitate the delivery of infrastructure across the State by improving regulatory certainty and efficiency. Prior to the SEPP being introduced, planning for infrastructure was regulated through a complex array of local, regional and State statutory planning instruments and overlapping legislation.

The new Infrastructure SEPP provides a consistent planning regime under the Environmental Planning and Assessment Act 1979 (the Act) that outlines the approval process and assessment requirements for infrastructure proposals.

Infrastructure is defined to included hospitals, schools, railways, roads, power and water supplies, and other services necessary to maintain the State's economy and the wellbeing of its communities.

In essence the Infrastructure SEPP establishes the assessment and consultation framework for infrastructure developments, including educational establishments, to be considered under the Part 3A process.

3.2 Local Planning and Policy

3.2.1 North Sydney Local Environmental Plan 2001 and North Sydney Development Control Plan 2002

North Sydney Council is undertaking a major review of its LEP and DCP. This review responds to the NSW State Government's planning reform program.

The review will result in the preparation of a new comprehensive local environmental plan (LEP) and consolidated development control plan (DCP) for the North Sydney local government area.

However the North Sydney LEP 2001 and North Sydney DCP are the current documents.

The DCP seeks to achieve:

- Existing levels of traffic generation are contained and reduced
- Public transport, including walking and cycling, is the main form of access
- Parking is adequate and managed in a way that maintains pedestrian safety and the quality of the public domain and minimises traffic generation
- Parking is limited to minimise impacts on surrounding areas
- Parking is accessible to all.

In essence the DCP has used parking rates (restrictions to over provision of parking) as a measure to control traffic generation of development.

3.2.2 North Sydney Council 2020 Vision – Strategic Plan

The 2020 Vision seeks to establish the principles for achieving the long term vision for North Sydney. The vision states that the use of public transport and other alternatives to the private car will be encouraged through the improvement and expansion of sustainable transport options and seeking to make North Sydney a pedestrian friendly environment.

In particular the plan states that:

For a reliable, and accessible and sustainable transport system, we will:

- *Promote equity of access to public and community transport.*
- *Incorporate true environmental and social costs in our transport planning.*
- *Pursue improvement and expansion of sustainable transport options.*
- *Encourage the use of alternative modes of transport to the private car.*

Some of the stated aims with regard to transport include:

- *The impact of the private car on our community and environment is dramatically reduced.*
- *The frequency, quality and diversity of public transport throughout North Sydney is increased.*
- *Pedestrians and cyclists enjoy easy and safe access throughout North Sydney.*
- *Transport management is coordinated at a regional level.*

3.2.3 North Sydney Bike Strategy (2009)

The North Sydney Bike Strategy identifies a local on road cycle route along Mount Street west of Miller Street and on to Edward Street north of Mount Street. This local on road route connects North Sydney station with Wollstonecraft station and on to St Leonards Station.

This on road route is maintained as part of the Strategy's recommendation however it is noted that no specific improvements along this section are proposed.

3.3 Comment on Strategic Context

Many of the underlying themes of the plans and strategies have relevance to the proposal. Current State policies provide a good framework to support local strategies to improve the level of accessibility and sustainable transport for the North Sydney Area.

A list of objectives has been developed for the assessment of the proposed Shore master plan development including the Graythwaite site which aim to support the State and local transport strategies.

3.3.1 Objectives

The objectives for achieving sustainable travel for Shore would include:

- Reduce the rate of growth of car based trips;
- Support and improve sustainable transport facilities for existing users of public transport, walking and cycling to the site;
- At the same time ensure that appropriate provisions are made for car parking and for traffic travelling to and from the centre to minimise the impacts to surrounding residents.

3.3.2 Considerations

The Shore school site (including Graythwaite) and the nature of site uses as an educational establishment has a number of advantages in relation to the achievement of above objectives, namely:

- Close proximity to rail and bus services (ie. North Sydney station) providing good walkable access to public transport;
- there are exiting good levels of public transport modes by students at the school;
- the peak PM period traffic generating activity of the School occurs prior to the normal commuter PM peak period.
- As an institution there is the ability to efficiently manage travel demands (ie. students walking to North Sydney station are supervised by staff).

4 Overview of Proposed Development

4.1 Overview of Concept Plan and Staged Development

Tanner Architects and P D Mayoh Pty Ltd have completed extensive site analysis and master planning work for the site (contributing in part to a new Conservation Management Plan (CMP) for the site).

The Master Plan for Graythwaite as proposed in the Concept Application is shown in Appendix C.

It is noted that Shore is seeking approval for the proposed works under Part 3A of the EP&A Act as represented by the Concept Application and a Stage 1 Project Application. Stages 2 and 3 will be the subject of separate Project Applications.

The development is proposed to be completed over 10 to 15 years, comprising:

Stage 1

- Conservation and refurbishment of Graythwaite House (the House), Coach House, Tom O'Neill Building and associated garden area (the House will not be used for school classes but rather for administrative support and other activities, including perhaps the school archives).
- Drainage and storm water improvements, site levelling and landscaping of the site (significantly on the middle and lower terraces).
- Formalisation of car parking to provide 6 designated visitor car parking spaces adjacent to Graythwaite House and one adjacent to the Coach House for use by the site's caretaker.
- Improvements to existing internal access road between Union Street and Graythwaite House.
- Miscellaneous works including site fencing.
- No anticipated increase in student or staff population.

Stage 2

- Development of a new building to the north of the House which may be used for education or administration purposes.
- Demolition of the Ward building to the east of the House.
- Construction of two new buildings to the east of the House for additional classrooms, teaching or other educational facilities.
- Construction of a basement car parking facility under the new east building (41 spaces) with access via the Graythwaite driveway.
- Up to 100 additional students and 10 additional staff.

Stage 3

- Construction of two new buildings to the west of the House for additional classrooms, teaching or other educational facilities.
- Up to 400 additional students and 40 additional staff

It is noted that separate to this Part 3A application, it is planned to seek approval to undertake temporary works to prevent further deterioration of the house.

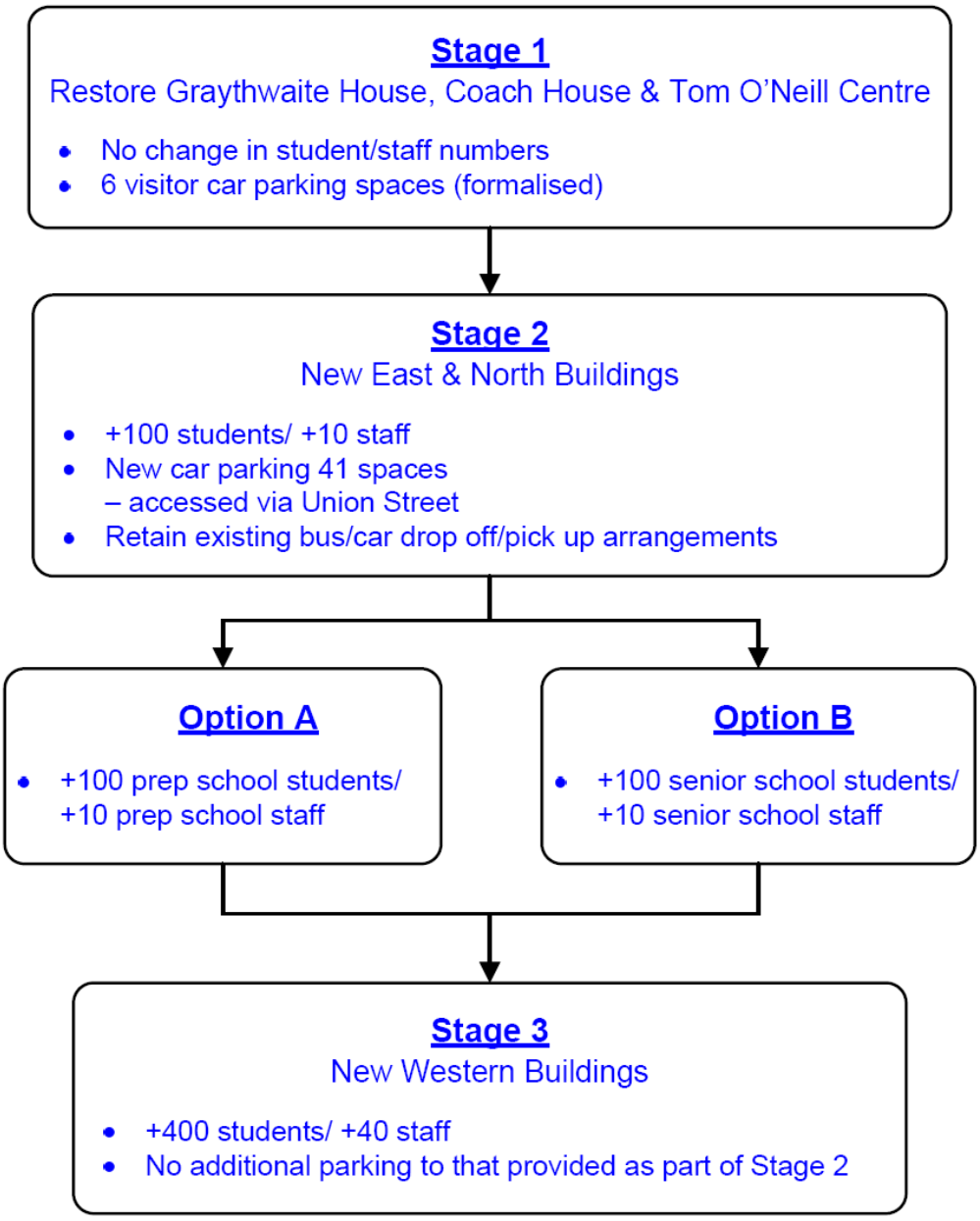
A summary of the development staging for the above Master Plan concept is provided in Figure 11.

For Stage 2 it is currently not known whether the additional 100 students and 10 staff will be associated with the Senior School or the Preparatory School or a combination of both.

The assessment presented in this report has considered the implications of two Stage 2 options, namely all 100 students and 10 staff being associated with the Senior School and all 100 students and 10 staff associated with the Preparatory School. As the Preparatory School and Senior School have quite different travel demands, assessment of these two options allows the worst case transport impact for each situation to be assessed for this stage.

It is currently proposed as part of the Concept Application for Graythwaite that of the additional 500 students to be accommodated on site for the total project scope, up to 100 students would be Preparatory School students.

Figure 11 – Concept Plan Development Staging



4.2 On Site Car Parking Provisions

It is proposed to provide additional formalised on site car parking on Graythwaite as part of the proposed Concept Plan Application.

As part of Stage 1, it is proposed that the existing ad hoc parking on the Graythwaite site be formalised with the provision of 6 visitor parking spaces in front of Graythwaite House including one accessible car space and one parking space outside the Coach House for use by the site's caretaker. It is intended that the 6 visitor spaces will be available for short-term use by visitors to the administration offices within Graythwaite House. During Stage 1 the primary parking area for visitors will remain along William and Union Streets.

It is proposed to provide some 41 car parking spaces in two levels of the basement space under the new East Building which will be constructed during the Stage 2 works. These 41 parking spaces would service both Stage 2 and Stage 3 developments as no further parking is proposed as part of the Stage 3 works.

The proposed Stage 2 parking spaces would be typically allocated for staff or visitor parking during school days, and would also be available at other times for meetings in the meeting rooms in Graythwaite House outside of school hours. This would be particularly useful for night-time meetings as it offers not only convenience but also safety by reducing an amount of pedestrian travel from distant street parking. Use of the car park would also relieve existing and potential pressure on local street parking spaces which otherwise may be used by adjacent residents or visitors.

4.3 Vehicle Access Arrangements

The proposed vehicle access arrangements are shown in the Concept Plan drawings provided in Appendix C.

There are adequate width travel paths around the Graythwaite School site (including access to the proposed new buildings) from the Union and Edward Street entrances for use by emergency vehicles (i.e. ambulance, fire) and service/delivery vehicles (cleaning, maintenance, security), but regular vehicle entry to the Graythwaite buildings will principally be via the existing entry / exit driveway at Union Street

Car parking on the Graythwaite site will be accessed via the existing entry / exit driveway at Union Street. It is proposed that the existing internal road from the Union Street driveway will be widened locally with reinforced grass verges to allow vehicles to pass. This limited amount of roadwork will not adversely affect the heritage values of the driveway. New signage will be provided at the top and bottom of the Graythwaite driveway advising of the two way traffic arrangement.

4.4 Pedestrian Access Arrangements

The proposed pedestrian access arrangements are shown in Appendix C. While pedestrian access will be possible from Union Street, the School will control student pedestrian access to be only via Edward Street and the Senior School campus via a number of pedestrian linkages.

The primary pedestrian access to the School (including Graythwaite) will continue to be via the main entrance on William Street.

4.5 Service Vehicle Arrangements

Service vehicle access arrangements and facilities will remain unchanged by the Master Plan. Service vehicles will continue to utilise the existing service vehicle facilities from Edward Street and the existing School's Union Street entrance/exit. It is noted that service/delivery vehicles usually visit the site outside of peak student arrival and departure times.

5 Transport Assessment of Proposed Graythwaite Master Plan

5.1 Stage 1 – Project Application for Graythwaite House Conservation and Refurbishment

5.1.1 Changes to Travel Demand

As documented above, there is no increase in student or staff numbers proposed to occur as part of the Stage 1 works.

As such there would be no change to the existing travel demands associated with the combined Shore School / Graythwaite House site.

5.1.2 Car Parking Provisions and Traffic Generation

It is proposed that on site parking in the front of the Graythwaite House building will be formalised to provide a total of 6 on site visitor parking spaces and one space at the Coach House.

It is noted that the 6 Graythwaite House parking spaces will not be utilised for the drop off and pick up of students or staff. These activities will continue to occur at the Preparatory School drop off / pick area accessed via Edward Street and along William Street for the Senior School. The School intends to employ a caretaker who will reside in the refurbished Coach House with that parking space specifically allocated to the caretaker role.

The proposed provision would reduce the existing on site parking capacity on Graythwaite from some 25 spaces (as estimated in Section 2.1) to 7 spaces.

It is noted that this provision of 7 spaces for the School uses does not arise from any change with regard to student or staff numbers during Stage 1.

However, the Stage 1 proposal would represent a reduction in land use intensity compared with previous uses of Graythwaite, namely the former nursing home with staff, visitor and service vehicle deliveries.

On this basis the proposed Stage 1 development of Graythwaite with the provision of 7 on site visitor parking spaces is not considered to have an adverse impact on traffic generation and parking provision compared with the previous use of the site.

5.1.3 Site Access Arrangements

Site access will be provided via the existing site driveway at Union Street. Vehicle access to the Graythwaite site via Edward Street would be restricted to emergency and service vehicles.

Union Street is a higher order road within the surrounding road network and is suitable to accommodate direct vehicle access to and from properties.

The current surveyed traffic flows along Union Street indicate that there would be sufficient capacity to accommodate the additional traffic associated with the 6 formalised visitor car parking spaces and the caretaker space.

The existing Union Street access can accommodate two vehicles passing each other on the driveway at the street frontage. As such a vehicle waiting to exit the site would not block access for a vehicle entering the site from Union Street.

The available sight distances at the existing Graythwaite site access have been reviewed and found to be satisfactory with regard to AS289.1-2004 requirements for safe vehicle entering and exiting movements.

5.1.4 Service and Emergency Vehicle Access Arrangements

No changes to the existing service vehicle access or on site facilities are proposed as part of the Stage 1 project application. Furthermore there is no expected increase in demand for service vehicle facilities since the occupants of the heritage buildings will be relocations from the existing School. Therefore there will be no impacts of the Stage 1 proposal in service vehicle access.

Emergency vehicle access to Graythwaite will be retained via Edward Street and Union Street at the completion of Stage 1 works. Existing emergency vehicle access to the School campus will remain unchanged by Stage 1 works.

5.2 Stage 2 - New East and North Buildings

5.2.1 Changes to Travel Demand

Changes to the existing travel demand of the combined Shore School and Graythwaite site will occur during Stage 2 as a result of additional students (+100) and staff (+10).

The extent of the travel demand changes and the implications to the surrounding road network will depend on whether the additional students and staff are related to the Preparatory School or Senior School. The two schools have different travel behaviour with a higher vehicle drop off / pick up rate for Preparatory School students than Senior School students who have a relatively higher use of public transport modes.

Furthermore the behaviour of student drop offs and pick ups will be different with Preparatory School movements focusing on Edward Street / Mount Street and the Senior School to Blue Street / William Street.

To assess the road network implications of Stage 2 two options have been considered, namely:

- Option A : + 100 Preparatory School students and +10 staff
- Option B : + 100 Senior School students and +10 staff

In addition to the student drop off and pick vehicle movements, it is noted that an additional 41 staff (or visitor) car parking spaces will be provided under the East Building in Stage 2. The traffic generation potential of these spaces has been included in the assessment. To assess the potential worst case for traffic impacts, it has been assumed that all of the new parking spaces will be fully occupied by new and existing staff (who currently don't park at or near the School) at Stage 2. This assessment will also address the maximum potential impacts from this parking provision for Stage 3.

5.2.2 Traffic Generation Implications

The estimated traffic generation for Stage 2 is shown in Table 5.1. These traffic estimates have been used in the intersection analysis. The estimates are based on surveyed existing travel behaviour obtained by traffic and pedestrian counts and the travel questionnaire.

Table 5.1 – Stage 2 Traffic Generation

	Option A Prep School	**Option B Senior School**
Student No. Increase	100	100
Rate of Vehicle Drop Off / Pick Up per student (One Way)	0.48 trips per student	0.24 trips per student
Number of Student One Way Trips	48	24
Total Number of Student Trips (Inbound + Outbound)	96	48
Staff Trip Rate	0.5 trips / parking space	0.5 trips / parking space
No. of Staff Parking Spaces	41	41
No. of Staff Trips	21	21
Total Vehicle Trips / Peak Hour	117	69

The distribution of the estimated Stage 2 traffic generation is shown in Appendix D.

The estimated traffic generation for Stage 2 have been added to the surveyed traffic flows on the surrounding road network and re-analysed using SIDRA.

The results are presented in Table 5.2 and show that the additional traffic generation of Stage 2 options can be adequately accommodated within the existing road network capacity without significant adverse impacts to 'Level of Service' or average vehicle delays.

While the network operates satisfactorily it is noted that the average vehicle delays at the Edward Street / Mount Street intersection increase from 8 seconds to 15 seconds per vehicle in the PM Peak Hour for Option A (i.e. + 100 Preparatory School students).

Table 5.2 – Stage 2 Intersection Operation

	Existing				Stage 2 - Option A				Stage 2 - Option B			
	AM		PM		AM		PM		AM		PM	
	Ave Delay	LoS	Ave Delay	LoS	Ave Delay	LoS	Ave Delay	LoS	Ave Delay	LoS	Ave Delay	LoS
Edward St-Mount St	6	A	8	A	6	A	15	B	6	A	8	A
Edward St-Lord St	5	A	6	A	6	A	8	A	5	A	6	A
William St-Blue St	6	A	6	A	6	A	6	A	6	A	6	A
Union St-Chuter St	6	A	6	A	6	A	6	A	6	A	6	A
Union St-School Access	6	A	6	A	6	A	6	A	6	A	6	A
Union St-Blues Point Rd	26	B	25	B	26	B	25	B	26	B	25	B
Blue St-Miller St	27	B	17	B	29	C	17	B	29	C	17	B

This reflects the inclusion of the existing peak 15 minute pick up behaviour of the Preparatory School drop off / pick up facility in the afternoon in the modelling analysis.

If it is determined that Stage 2 and 3 project applications include development for the Preparatory School that results in an overall increase in Preparatory School student numbers, the School will examine strategies to address the actual additional traffic load in Edward Street.

5.2.3 Site Access Arrangements

The proposed new staff car parking spaces will be accessed via the existing Graythwaite site driveway at Union Street.

Staff arrival patterns were determined to be spread relatively evenly across a two hour period at the start and end of the school day. This is reflected in the traffic generation and distribution as shown in Appendix D.

As shown in Table 5.2 the additional traffic generated by the provision of staff parking access via Union Street can be adequately accommodated with regard to road network capacity and minimum delays (Level of Service A).

As staff movements are principally made in one direction (i.e. inbound in the morning / outbound in afternoon) there will be minimal two way flows along the Graythwaite driveway and internal road. Therefore the existing driveway with the provision of passing bays on the internal road are considered to be adequate to accommodate traffic movements while retaining the existing heritage features of the driveway.

5.2.4 Parking Provisions

i. Proposed Parking Provision

It is proposed to provide an additional 41 staff car parking spaces under the East Building. These spaces would be constructed as part of Stage 2 works but are provided to accommodate parking demand for both Stage 2 and Stage 3.

In parallel with the Stage 1 works, the School is intending to provide an area for bicycle parking for students on the existing site. While this is not a direct part of the

application, it nevertheless represents a combined sites School contribution to the Government's transport policy initiatives.

The advantages of providing a single consolidated parking area for Stage 2 and Stage 3 include:

- East Building proximity to vehicle access (i.e. Union Street);
- Reduces the number of vehicle paths within the site thereby allowing additional space for pedestrian areas;
- Convenience and safety for special meetings at Graythwaite House particularly at night benefiting both School and Community users; and
- Cost savings and efficiencies associated with building form.

ii. Application of North Sydney Council DCP 2002

North Sydney Council DCP 2002 specifies the maximum parking rates for "educational establishments" to be 1 space / 6 staff.

For the proposed additional increase of 50 staff by the completion of Stage 3 this would represent a maximum provision of 8 parking spaces. Therefore without other considerations, the proposed development parking provision would exceed Council's maximum allowable spaces.

As highlighted earlier in Section 2.1, the previous uses of Graythwaite had space provision for up to 25 parking spaces. The Stage 1 of the proposed project occupies 7 of those spaces so that there is a theoretical unused "existing use right" to a further 18 spaces. The DCP 2002 allows for a further 8 spaces making the total new spaces permissible for the site to be 26 (based on staff numbers). On this basis, the exceedance of the proposed 48 total parking spaces over the DCP requirement is 22 spaces.

In addition to the specified parking rates the DCP 2002 sets out the objectives for parking provision which include:

- Existing levels of traffic generation to be retained and reduced
- Public transport, including walking and cycling is the main form of access
- Parking is adequate and managed in a way that maintains pedestrian safety and the quality of the public domain and minimises traffic generation

- Parking is limited to minimise impacts on surrounding areas
- Parking below the maximum rates will not generally be accepted due to the impact that additional parking may have on surrounding residential streets.

Based on the travel questionnaire it is estimated that some 70% of all staff drive to School and park either on site or on street. This reflects the travel needs of staff which include early starts, late finishes and flexible / part time hours. This demand occurs despite the proximity of the School to good public transport.

The existing School on site parking provision equates to a parking rate of 1 space per 1.59 full-time staff (151 spaces for 240 full-time staff). (Note this ratio does not consider the additional part-time staff which brings the combined staff total up to about 390).

At the completion of Stage 3 parking provisions would provide parking at a ratio of 1 space / 1.46 staff members across the entire Shore School campus (including Graythwaite) (199 car spaces for 290 full-time staff across both sites). Note that the 6 spaces outside Graythwaite are for visitors only and are therefore not related to staff numbers.

In addition to the advantages of the proposed parking described above, there are local traffic benefits to be obtained by providing on site parking, namely that traffic that would otherwise circulate on local streets searching for on street parking can be accommodated on site with access for a local collector road (i.e. Union Street).

In summary, the proposed parking provision will not accommodate all existing and proposed parking demand on site, but will however reduce the potential demand for on street parking by staff of the Shore School.

The combination of a reliance on public transport for students and on site parking provision for staff and visitors is considered to be a responsible balance to encouraging public transport use, minimising the intrusion of staff related parking on the surrounding residential streets, and providing the benefits for staff and visitor efficiency within a densely occupied city location.

5.2.5 School Bus Operations

Designated School bus operations will continue to occur via the existing Mount Street bus stops.

For Stage 2 the number of buses typically generated within any one afternoon will increase. It is estimated that an increase from 8 buses to 9 buses.

This increase can be adequately accommodated within the existing road network capacity. Furthermore the School would have the ability to spread the load of buses over a greater length of time such that the demand at any one time would be maintained at existing levels.

5.2.6 Service and Emergency Vehicle Access Arrangements

No changes to the existing service vehicle access or on site facilities are proposed as part of Stage 2.

Emergency vehicle access to Graythwaite will be retained via Edward Street and Union Street at the completion of Stage 1 works and maintained for Stage 2.

Existing emergency vehicle access to the School campus will remain unchanged by Stage 2 works.

5.3 Stage 3 - New West Building

5.3.1 Changes to Travel Demand

At the completion of Stage 3, it is proposed that the School population will have increased above existing levels in the order of 500 students and 50 staff. This will be made up of some 100 Preparatory School students and 400 Senior School Students.

5.3.2 Traffic Generation Implications

The estimated traffic generation for Stage 3 is shown in Table 5.3. These traffic estimates have been used in the intersection analysis. The estimates are based on surveyed existing travel behaviour obtained by traffic and pedestrian counts and the travel questionnaire.

Table 5.3 – Stage 3 Traffic Generation (Cumulative of Stages 1, 2 and 3)

	Prep School	Senior School	Total
Student No. Increase	100	400	500
Rate of Vehicle Drop Off / Pick Up per student (One Way)	0.48 trips per student	0.24 trips per student	
Number of Student One Way Trips	48	96	144
Total Number of Student Trips (Inbound + Outbound)	96	192	288
Staff Trip Rate	0.5 trips / parking space	-	
No. of Staff Parking Spaces	41	-	
No. of Staff Trips	21	-	21
Total Vehicle Trips / Peak Hour	117	192	309

The distribution of the estimated Stage 3 traffic generation is shown in Appendix D. The estimated traffic generation for Stage 3 have been added to the surveyed traffic flows on the surrounding road network and re-analysed using SIDRA.

The results are presented in Table 5.4 and show that the additional traffic generation of Stage 3 options can be adequately accommodated within the existing road network capacity without significant adverse impacts to 'Level of Service' or average vehicle delays.

In particular the volume of traffic generated for Stage 2 / 3 accessing the School via Union Street (ie. staff accessing the additional on site parking under the East Building) would not be significant enough to change the existing vehicle delays and Level of Service along Union Street.

Furthermore, the assessment has assumed (as a worst case) that all additional preparatory school students are accommodated in Stage 2 with Stage 3 being Senior School students. Senior school students generate significantly less vehicle trips than Preparatory school students. Hence the relative change in impact is low as shown in Table 5.4.

Table 5.4 – Stage 3 Intersection Operations

	Existing				Stage 3			
	AM		PM		AM		PM	
	Ave Delay	LoS	Ave Delay	LoS	Ave Delay	LoS	Ave Delay	LoS
Edward St-Mount St	6	A	8	A	6	A	15	B
Edward St-Lord St	5	A	6	A	6	A	8	A
William St-Blue St	6	A	6	A	7	A	6	A
Union St-Chuter St	6	A	6	A	6	A	6	A
Union St-School Access	6	A	6	A	6	A	6	A
Union St-Blues Point Rd	26	B	25	B	27	B	26	B
Blue St-Miller St	27	B	17	B	33	C	18	B

As discussed for Stage 2 Option A, while the network operates satisfactorily it is noted that the average vehicle delays at the Edward Street / Mount Street intersection increase from 8 seconds to 15 seconds per vehicle in the PM peak hour for when the additional 100 Preparatory School students are accommodated.

This indicates that management of the Edward Street drop off / pick up facility will need to be considered and implemented when the Preparatory School population increases.

5.3.3 Site Access Arrangements

The site access arrangements for Stage 3 will remain unchanged from Stage 2. The implications of the proposed site access arrangements have been addressed as part of the Stage 2 described above.

5.3.4 Parking Provisions

No additional parking is proposed as part of Stage 3. Parking for Stage 3 is proposed to be constructed as part of Stage 2 and has been assessed above.

5.3.5 School Bus Operations

It is envisaged that designated School bus operations will continue to occur via the existing Mount Street bus stops as part of Stage 3.

For Stage 3 the number of buses typically generated within any one afternoon will increase as a result of additional students. It is estimated that an increase from 8 buses to 11 buses.

As discussed for Stage 2, this increase can be adequately accommodated within the existing road network capacity and furthermore the School would have the ability to spread the load of buses over a greater length of time such that the demand at any one time would be maintained at existing levels.

5.3.6 Service and Emergency Vehicle Access Arrangements

No changes to the existing service vehicle access or on-site facilities are proposed as part of Stage 3.

Emergency vehicle access to Graythwaite will be retained via Edward Street and Union Street at the completion of Stage 1 works and maintained for Stage 2 and Stage 3.

Existing emergency vehicle access to the School campus will remain unchanged by Stage 3 works.

5.4 Construction Traffic Management

The purpose of the following section of this report is to provide an overview of the likely construction methodology, identify issues which will need to be considered in detailed construction planning and general principles for vehicle and pedestrian management during construction.

It is noted that formal Construction Traffic Management Plans (CTMP) will be submitted for each development stage as part of the Construction Certification following Project Application approval. It is understood that the preparation of a CTMP for each stage is likely to be a condition of consent.

5.4.1 Overview of Construction Methodology

A Construction Management Plan (CMP) has been prepared by WSP Fitzwalter on behalf of the School as part of the Project Application for Stage 1 works.

Details of the construction arrangements for Stages 2 and 3 of the project are yet to be determined. The methodology would be finalised once Project Applications are submitted (and approved) and a contractor is appointed prior to construction certification.

Notwithstanding the above, it is proposed that construction will occur in stages, namely:

- Stage 1 – conservation of Graythwaite House, Coach House, Tom O'Neill building and associated garden area;
- Stage 2 – North and Eastern buildings
- Stage 3 – West building

It is estimated that during of construction activities for each stage would be in the order of:

- Stage 1: 12 months;
- Stage 2: 18 months; and
- Stage 3: 18 months.

It is estimated that the average construction work force during any of the stages would be in the order of 50 construction workers, peaking in the order of 90 workers.

During individual stages the volume of construction traffic generation will vary depending upon the activities being undertaken at any particular time. Peak construction traffic generation will occur during concrete pours and bulk excavation should material be required to be exported from the site.

5.4.2 Construction Vehicle Access

i. Stage 1 Works

It is proposed that all unloading and loading of construction vehicles will occur on site.

Vehicle access to building conservation works will be provided via Edward Street. However access via Edward Street would be restricted during the operating periods of the drop off / pick up facility at the Preparatory School (ie. 7:50am – 8:40am and 2:40pm – 3:20pm). During these periods access would be available via the Union Street access.

Construction vehicles associated with the drainage works would access the site from Union Street.

All vehicles would exit the site from Union Street. The site would have the ability to turn vehicles around such that all vehicles would enter and exit the site in a forward direction.

ii. Stage 2 and 3 Works

It is envisaged that construction vehicle access to and from Stages 2 and 3 works will be provided via Union Street.

5.4.3 Potential Construction Traffic Impacts

The potential impacts of construction activities and construction traffic with regard to traffic and parking include:

- Construction vehicle access arrangements:
  - Impact on adjacent properties and land uses
  - Impact on pedestrian access
  - Impact on typical School operations (travel demand)
- Degradation of amenity via construction traffic noise;
- Road network operation – loss of intersection capacity with additional construction vehicles;
- Safety implications for all road users as a result of additional heavy vehicle flows and new construction vehicle access arrangements; and
- Potential loss of available on street parking due to additional parking demand by construction workers;

5.4.4 Detailed Construction Traffic Management Plan

Detailed construction traffic management plan (CTMP) will need to be prepared and approved prior to construction works to address the potential impacts identified above. Essentially the CTMP sets out a plan to manage construction activities such that the potential implications are mitigated or appropriately managed.

This CTMP will need to include:

- Details of proposed works;
- Timing of proposed works;
- Hours of construction activities;

- Number of construction vehicles, particularly heavy vehicles to be used;
- Mitigation and management measures including use of stop / go signals, construction vehicle access arrangements and circulation; and
- Contact details for on site construction personnel.

The CTMP shall be prepared in accordance with RTA guidelines.

5.4.5 Construction Vehicle Routes

Vehicle access to and from the site will be generally restricted to the proposed access routes to and from the site.

It is recommended that, to the maximum extent possible, materials delivered to or extracted from the site with larger vehicles be undertaken via Union Street which is a higher order road than Edward Street.

5.4.6 Amenity Impacts

The amenity impacts associated with construction traffic are principally associated with noise, vibration and safety issues.

It is suggested that the hours of operation for construction vehicle movements be restricted to agreed hours so that the impacts of construction vehicle noise on amenity can be mitigated for sensitive times (ie. night time, weekends).

Safety issues will need to be addressed with the implementation of appropriate Traffic Control Plans (TCPs) which will need to be developed in accordance with RTA guidelines. The TCP's will include details of advance warning signage, traffic flow management and pedestrian management measures.

5.4.7 On Street Parking Impacts

To further mitigate on street parking implications, dedicated temporary parking spaces should be provided on site (where possible) for construction workers vehicles. Contractors shall be encouraged to utilise public transport or car share arrangements.

5.5 Assessment of Specific DGR Transport Issues

The DGRs for both the Concept Application and the Stage 1 Project Application have identified a number of specific assessment requirements. While these have been generally considered in the above assessment of the proposed development, specific consideration of the issues is provided below.

A summary of the specific transport issues associated with the Concept Application and the Stage 1 Project Application assessment of the proposal with regard to these issues is provided in Table 5.5.

Table 5.5 - Response to DGR – Specific Transport Issues

	Transport Issue to be Assessed	Response
Concept Application		
1.	As part of the Transport and Accessibility Impact Assessment demonstrate a minimal approach to on-site car parking having regard to the site's accessibility to public transport (note: The Department supports reduced parking provisions, if adequate public transport is available to access the site).	Shore has an existing high utilisation of public transport, particularly amongst the senior school students which is anticipated to grow by 400 students at the completion of Stage 3. Existing non-private car modes of travel for all School uses varies between 54% and 67% (for AM and PM peak). These levels will increase with additional senior school students. The Concept Plan application seeks to provide a net increase in the number of on site parking spaces on the combined Shore School and Graythwaite site by 23 spaces. This net increase includes the removal of existing parking on the Graythwaite site (net loss of 18 spaces) and the construction of new basement parking (41 new spaces). Shore School proposes to increase the number of parking spaces available for School uses (ie. it's on site parking supply) by 31% (151 to 199 spaces) compared with an increase student population of 34% (1430 to 1930 students). It is considered that this provision reflects the various state and local planning objectives of minimising parking provision for new development.

		The combination of a reliance on public transport for students and on site parking provision for staff and visitors is considered to be a responsible balance to encouraging public transport use, minimising the intrusion of staff related parking on the surrounding residential streets, and providing the benefits for staff and visitor efficiency within a densely occupied city location.
2	Details of the proposed access, parking provisions and service vehicle movements associated with the development.	The proposed access, parking provisions and service vehicle movements has been addressed in this report.
3	Provide an estimate of the total trips anticipated by the proposed development and identify measures to manage travel demand, increase use of public and non-car transport modes, and assist in achieving the objectives and targets set out in the NSW State Plan 2010.	The traffic generation potential of the various stages of the Concept Plan have been detailed and assessed in this report in accordance with the RTA's Guide to Traffic Generating Developments. A detailed travel survey of Shore's student and staff travel behaviour has been undertaken as part of the EA process. This travel demand survey provides details of existing travel modes. The existing travel behaviour is not expected to change significantly however the increase in student numbers (proposed) will predominately be from Senior School students which will have the effect of increasing the total number and proportion of non private vehicle trips made to and from the School compared to the existing conditions. This outcome is

		consistent with the various state and local transport planning policies listed in the DGRs.
4	Identify daily and peak traffic movements likely to be generated by the proposed development, including the impact on nearby intersections and the need for associated upgrading of the network (if required).	The traffic generation of the proposed development have been estimated and assessed in accordance with the RTA's Guide to Traffic Generating Developments. The assessment indicated that additional site traffic flows can be adequately accommodated without the need for upgrading or improvement works to the surrounding road network.
5	The EA should examine opportunities to improve access for pedestrians between the site and the North Sydney Rail Station to the east, and nearby bus services. The study should address bicycle connections from the site to the surrounding bicycle network and bicycle parking in the proposed development (if relevant).	Shore is located within close proximity to the North Sydney railway station and bus interchange. The pedestrian linkages to these service is convenient and of a good standard. No physical works to improve the connections are proposed. The incorporation of the Graythwaite site into the School will improve pedestrian access and linkages within the site. It is noted that the School currently supervises and manages student flows to and from the railway station and bus stops. This will continue to occur. It is also noted that the School is planning to install bicycle parking facilities within the existing School site and thus do not form part of the Concept Application for Graythwaite.

Stage 1 Project Application		
6	Demonstrate how users of the development will be able to make travel choices that support the achievement of relevant State Plan targets, if the proposal will generate any additional staff or students	The Stage 1 Project Application involves the restoration of Graythwaite House. No additional student or staff numbers will be associated with Stage 1 works.
7	Detail the existing pedestrian and cycle movements within the vicinity of the site and determine the adequacy of the proposal to meet the likely future demand for increased public transport and pedestrian and cycle access, if the proposal will generate any additional staff or students	The site is located within close proximity to the North Sydney railway station and bus stops with good pedestrian linkages. There is an existing cycle route along the School's Mount Street frontage. Cycling as a mode of transport to and from the School is relatively low (4%) however the provision of additional on site bicycle parking has the potential to encourage increased cycle use. No upgrades are proposed to the external pedestrian or cycle facilities as part of the application nor are upgrades considered to be necessary.
8	Identify potential traffic impacts during the construction stage of the project, and measures to mitigate these impacts	As detailed in the RTA's correspondence in response to the request for DGRs, a detailed construction traffic management plan will need to be prepared prior to construction activities. It is considered that the appropriate time to prepare the CTMP is prior to the construction certification (ie. condition of consent).

		Notwithstanding the above, the principles for construction management have been detailed in this report.
9	Describe the measures to be implemented to promote sustainable means of transport including public transport usage and pedestrian and bicycle linkages in addition to addressing the potential for implementing a location specific sustainable travel plan, if the proposal will generate any additional staff or students.	The Stage 1 proposal will not increase student or staff numbers.
10	Daily and peak traffic movements likely to be generated by the proposed development, including the impact on nearby intersections and the need / associated funding for upgrading or road improvement works (if required)	The Stage 1 proposal will not increase student or staff numbers. Consideration of the traffic implications associated with modified site access arrangements (ie. use of the Graythwaite site driveway) have been considered in this report).
11	Details of the proposed access, impacts on the existing parking provisions of the school.	The proposed access and parking provisions have been detailed in this report.

12	Minimal levels of on site car parking for the proposed development having regard to the public transport accessibility of the site, opportunities for car sharing, local planning controls and RTA guidelines (note: The Department supports reduced parking provisions, if adequate public transport is available to access the site), if the proposal will generate any additional staff or students.	The Stage 1 proposal will not increase student or staff numbers. However it is noted that the Stage 1 development will reduce the overall on site parking provision from 25 to 7 spaces.

6 Conclusions

This transport report has considered the transport implications associated with the proposed Concept Application and Stage 1 Project Application for the Graythwaite site at North Sydney.

Graythwaite which was purchased by the adjacent Shore School will be incorporated into a combined campus. It is proposed that the campus will be developed in stages to provide capacity to accommodate an additional 500 students and 50 staff within the combined Shore School / Graythwaite site.

The Project Application for Stage 1 will not include additional student or staff on the site but essentially allow the existing Graythwaite buildings to be conserved and restored to allow the relocation of existing administrative roles to be relocated to the Graythwaite building. The traffic and parking implications of the Stage 1 works will not adversely impact on the existing conditions of the surrounding road network.

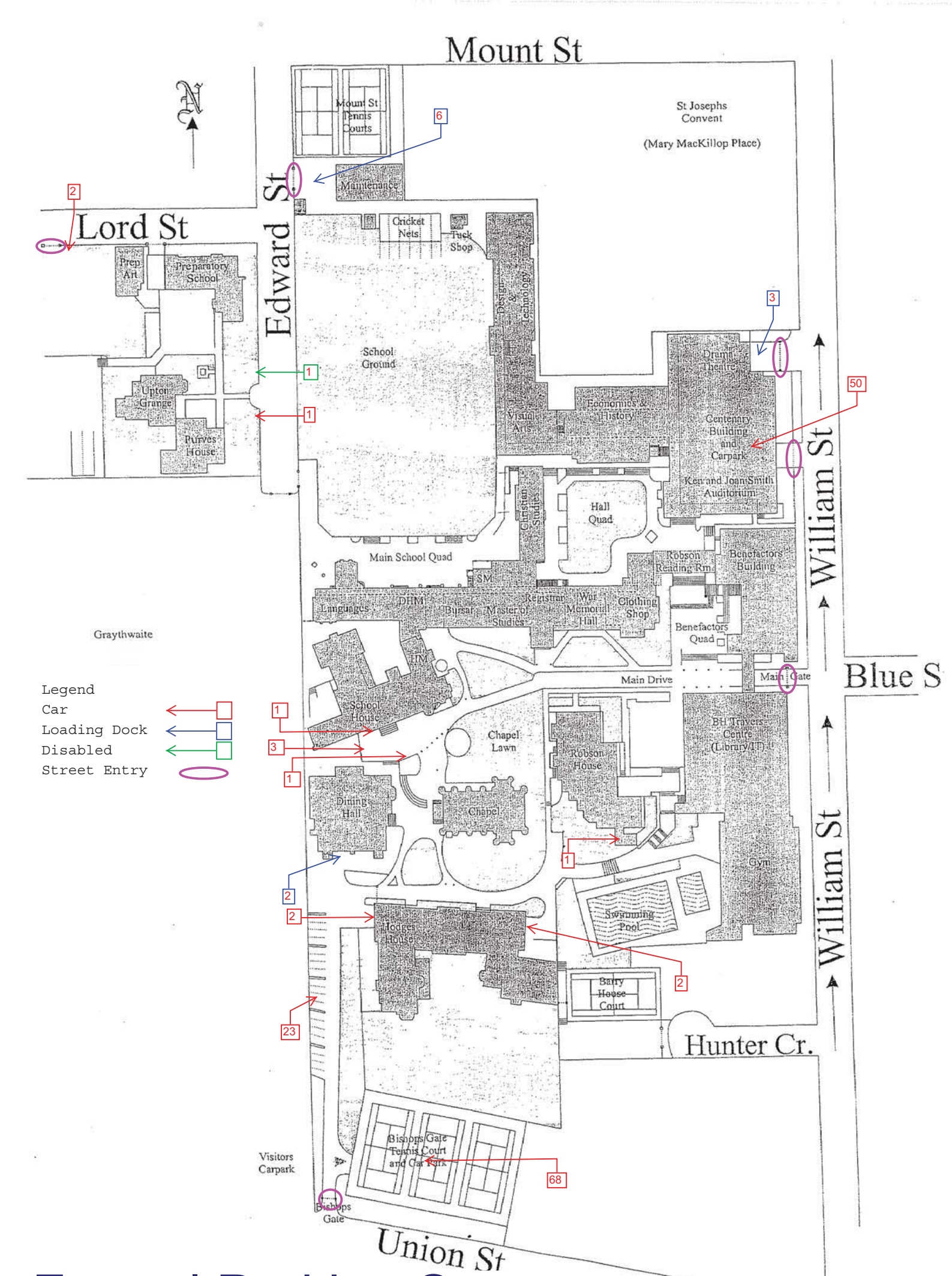
It is noted that Project Applications for Stages 2 and 3 of the Master Plan for Graythwaite will be submitted for approval at a later date.

However the assessment provided in this report has concluded that the proposed Master Plan as represented in the Concept Application can be adequately accommodated with regard to traffic and parking implications to the surrounding road network.

It is noted that management measures will need to be enhanced if the Stage 2 and Stage 3 development includes expansion of the Preparatory School enrolment as this may have an impact on the drop off / pick up facility in Edward Street. These measures will need to consider appropriate measures to reduce peak loads on the existing capacity of the facility and potential congestion at local intersections.

Appendix A Existing School Access and Parking

Source: WSP Environment and Energy

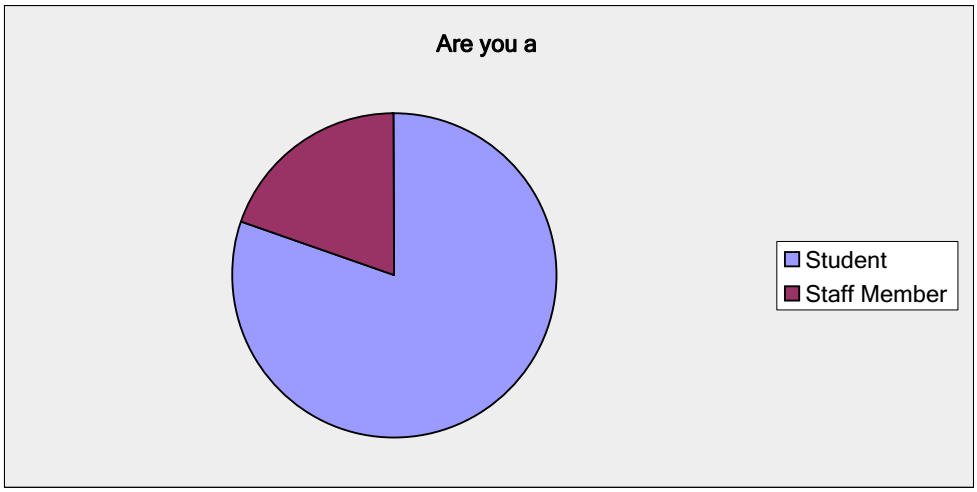


Formal Parking Spaces

Appendix B Shore School Travel Demand Analysis (2010)

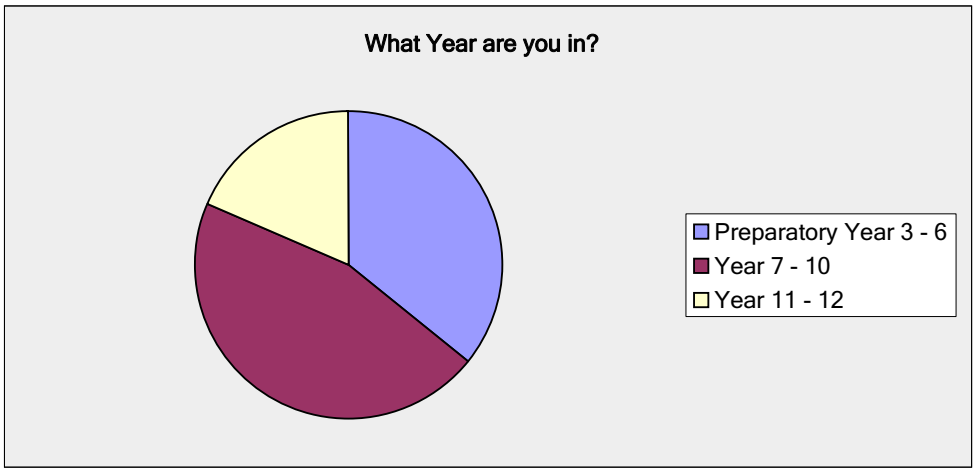
Travel Survey

Are you a		
Answer Options	**Response Percent**	**Response Count**
Student	80.4%	667
Staff Member	19.6%	163
	answered question	**830**
	skipped question	**0**



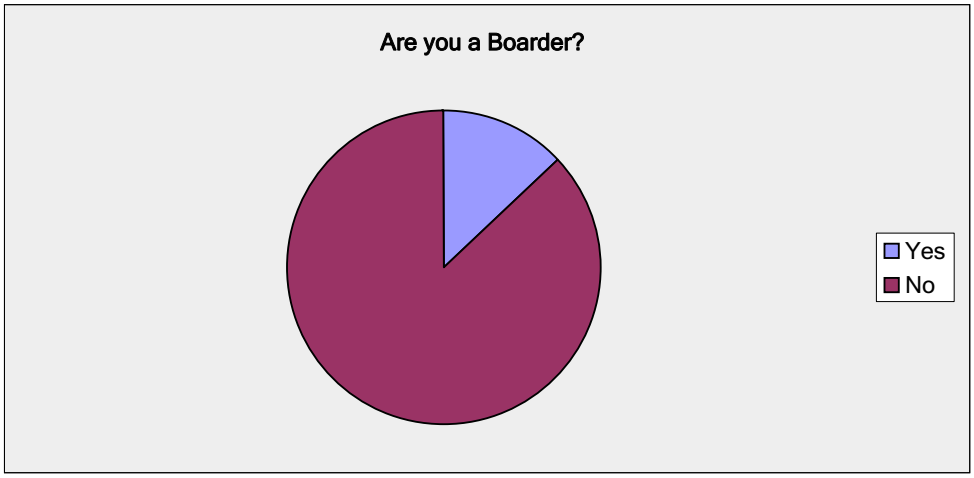
Travel Survey

What Year are you in?		
Answer Options	**Response Percent**	**Response Count**
Preparatory Year 3 - 6	35.8%	235
Year 7 - 10	45.6%	299
Year 11 - 12	18.6%	122
	answered question	**656**
	skipped question	**174**



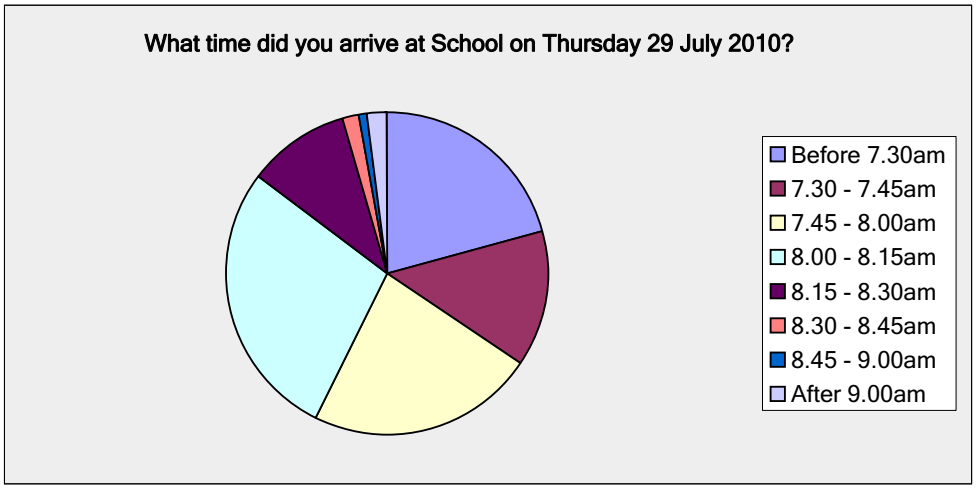
Travel Survey

Are you a Boarder?		
Answer Options	**Response Percent**	**Response Count**
Yes	13.1%	86
No	86.9%	570
	answered question	**656**
	skipped question	**174**



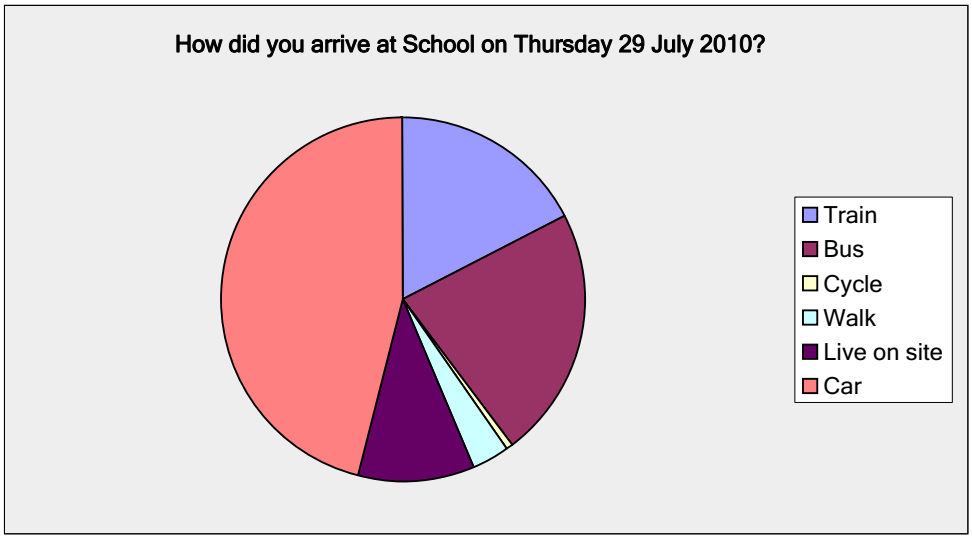
Travel Survey

What time did you arrive at School on Thursday 29 July 2010?		
Answer Options	**Response Percent**	**Response Count**
Before 7.30am	20.9%	169
7.30 - 7.45am	13.5%	109
7.45 - 8.00am	22.7%	183
8.00 - 8.15am	28.1%	227
8.15 - 8.30am	10.4%	84
8.30 - 8.45am	1.6%	13
8.45 - 9.00am	0.9%	7
After 9.00am	1.9%	15
answered question		**807**
skipped question		**23**



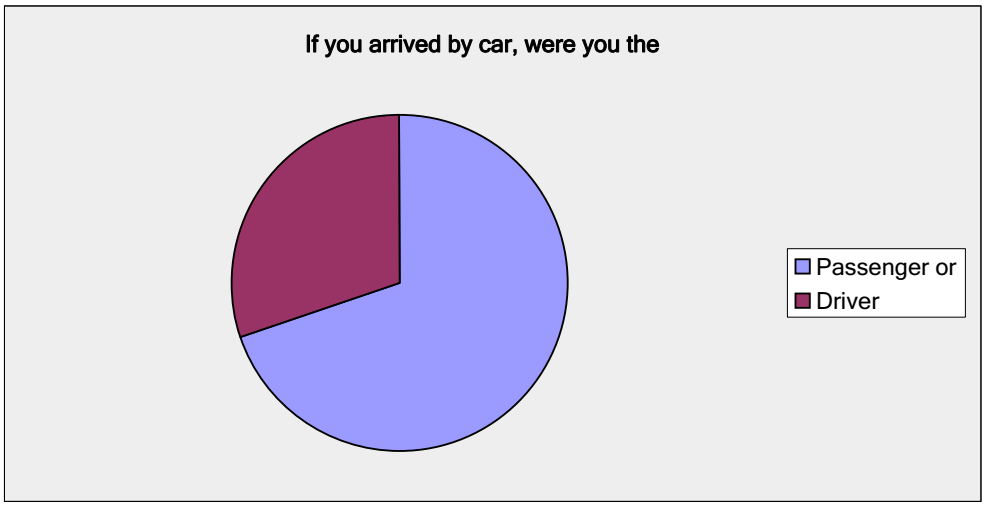
Travel Survey

How did you arrive at School on Thursday 29 July 2010?		
Answer Options	**Response Percent**	**Response Count**
Train	17.6%	142
Bus	22.2%	179
Cycle	0.5%	4
Walk	3.2%	26
Live on site	10.4%	84
Car	46.1%	372
	answered question	**807**
	skipped question	**23**



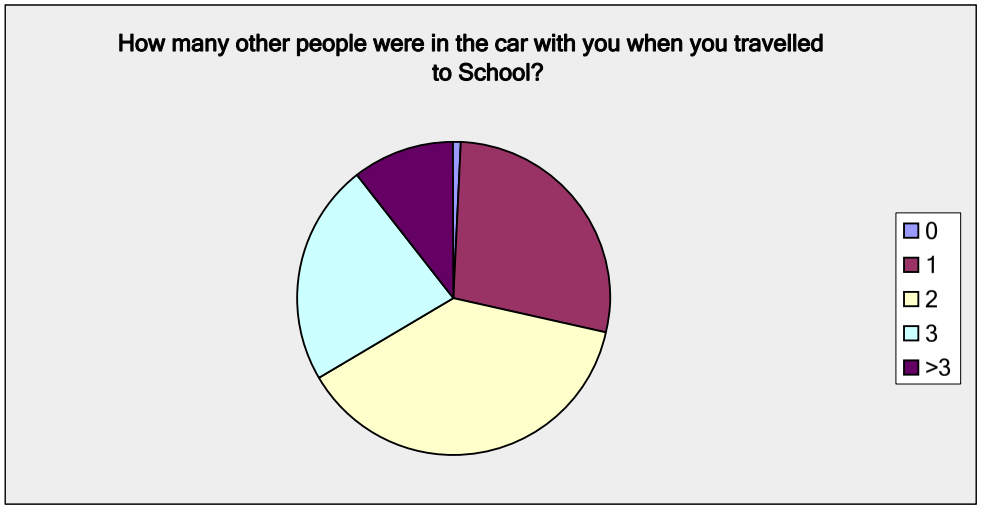
Travel Survey

If you arrived by car, were you the		
Answer Options	**Response Percent**	**Response Count**
Passenger or	69.6%	257
Driver	30.4%	112
	answered question	369
	skipped question	461



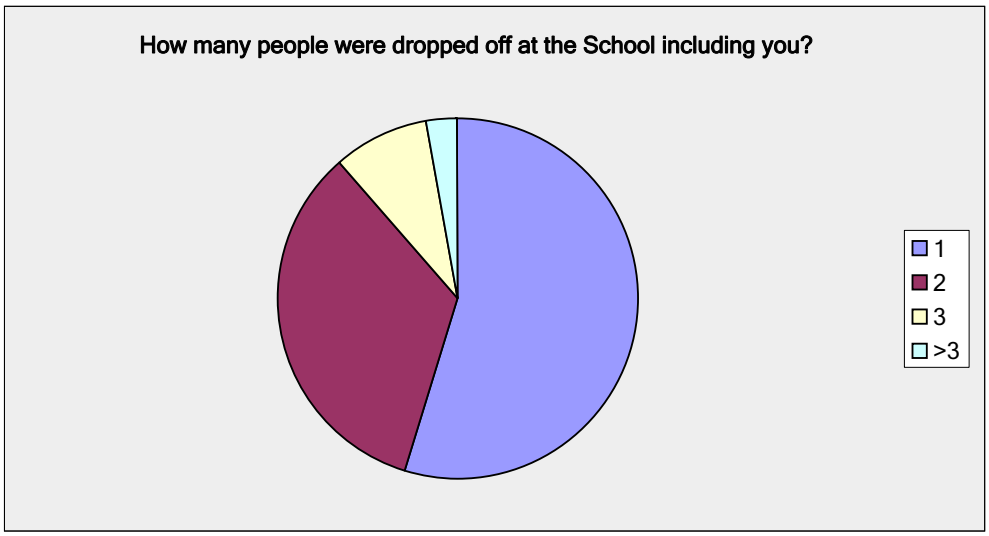
Travel Survey

How many other people were in the car with you when you travelled to School?		
Answer Options	Response Percent	Response Count
0	0.8%	2
1	27.7%	71
2	37.9%	97
3	23.0%	59
>3	10.5%	27
answered question		256
skipped question		574



Travel Survey

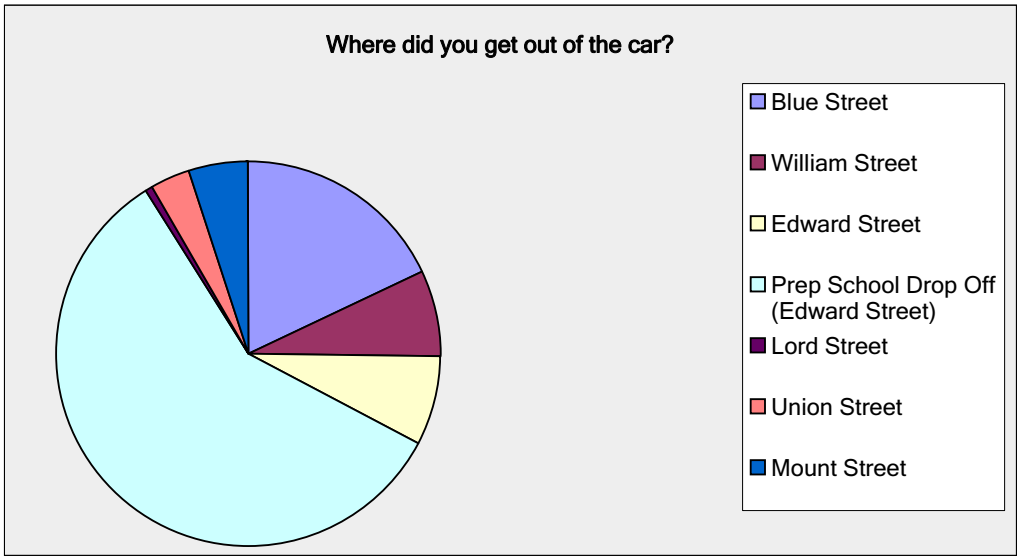
How many people were dropped off at the School including you?		
Answer Options	**Response Percent**	**Response Count**
1	54.7%	140
2	34.0%	87
3	8.6%	22
>3	2.7%	7
	answered question	**256**
	skipped question	**574**



Travel Survey

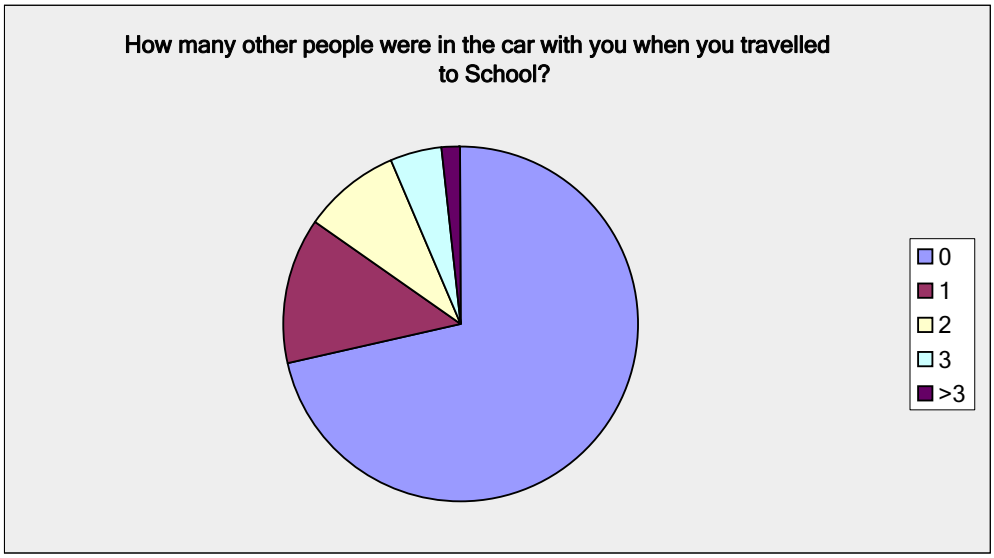
Where did you get out of the car?		
Answer Options	**Response Percent**	**Response Count**
Blue Street	18.0%	46
William Street	7.4%	19
Edward Street	7.4%	19
Prep School Drop Off (Edward Street)	58.2%	149
Lord Street	0.8%	2
Union Street	3.1%	8
Mount Street	5.1%	13
Other (please specify)		12
	answered question	256
	skipped question	574

Number	Response Date	Other (please specify)
1	Jul 29, 2010 3:18 AM	In the staff car park
2	Jul 29, 2010 3:44 AM	Arthur St, North Sydney
3	Jul 29, 2010 9:10 AM	Inside the school, through the main gates and
4	Jul 29, 2010 10:03 PM	waverton
5	Jul 30, 2010 1:41 AM	Post Office (Corner of William and Edward)
6	Aug 1, 2010 12:56 AM	Centenary Car Park
7	Aug 1, 2010 4:31 AM	Miller Street
8	Aug 1, 2010 7:13 AM	Staff parking under music Dep.
9	Aug 2, 2010 2:53 AM	miller st
10	Aug 2, 2010 3:05 AM	Senior Staff Carpark
11	Aug 2, 2010 4:04 AM	Miller Street
12	Aug 2, 2010 5:20 AM	turning circle



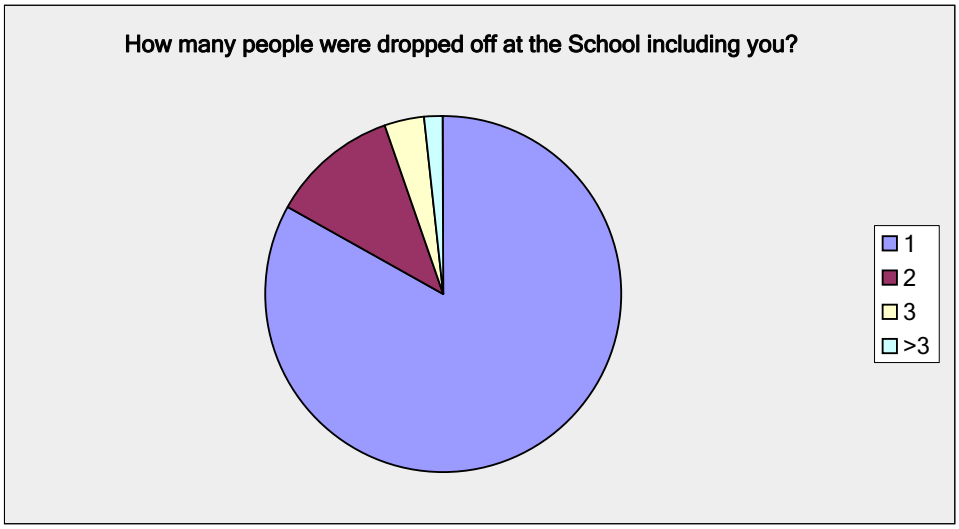
Travel Survey

How many other people were in the car with you when you travelled to School?		
Answer Options	**Response Percent**	**Response Count**
0	71.4%	80
1	13.4%	15
2	8.9%	10
3	4.5%	5
>3	1.8%	2
	answered question	**112**
	skipped question	**718**



Travel Survey

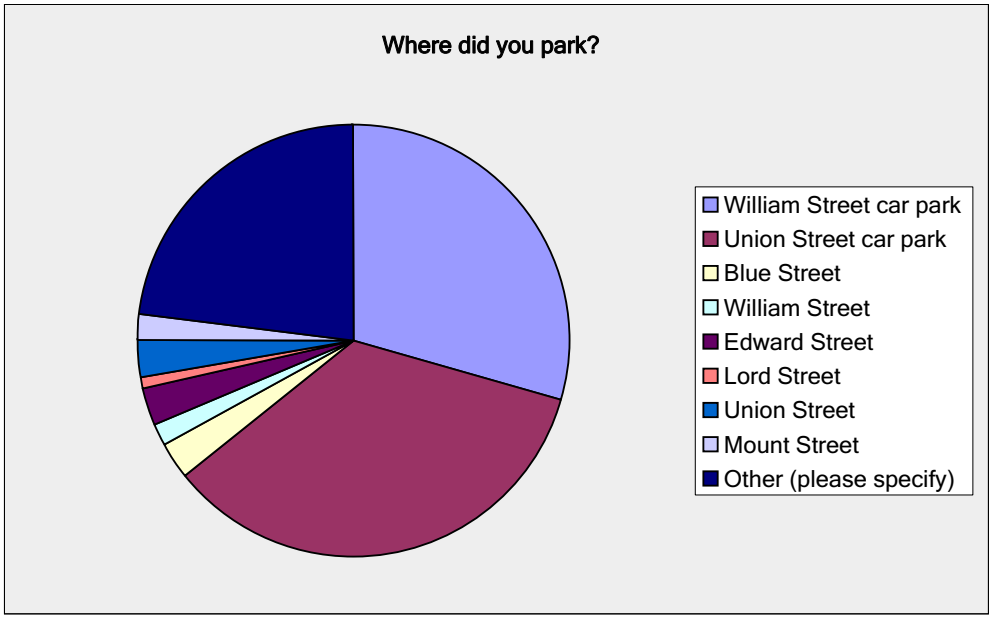
How many people were dropped off at the School including you?		
Answer Options	**Response Percent**	**Response Count**
1	83.0%	93
2	11.6%	13
3	3.6%	4
>3	1.8%	2
	answered question	**112**
	skipped question	**718**



Travel Survey

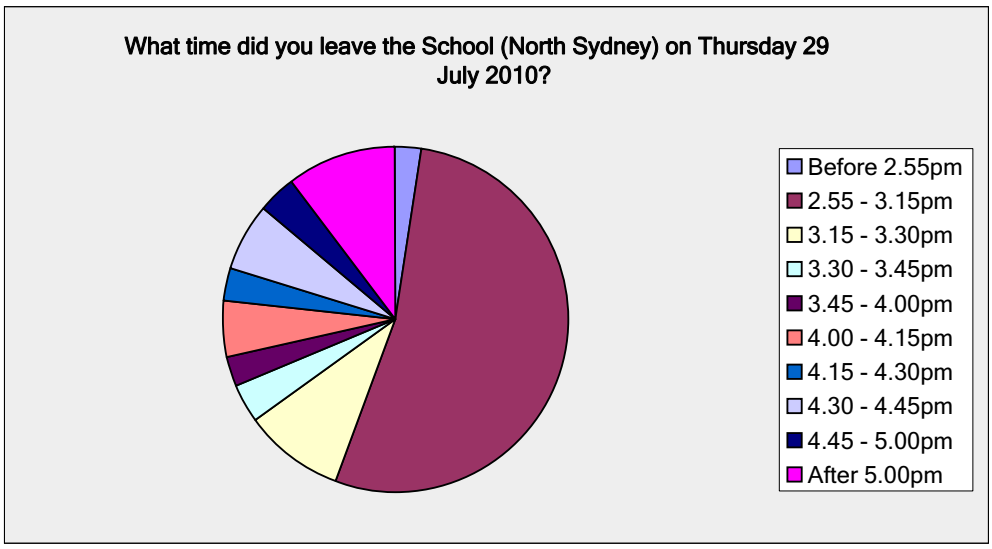
Where did you park?		
Answer Options	**Response Percent**	**Response Count**
William Street car park	29.5%	33
Union Street car park	34.8%	39
Blue Street	2.7%	3
William Street	1.8%	2
Edward Street	2.7%	3
Lord Street	0.9%	1
Union Street	2.7%	3
Mount Street	1.8%	2
Other (please specify)	23.2%	26
	answered question	112
	skipped question	718

Number	Response Date	Other (please specify)
1	Jul 29, 2010 1:47 AM	Adjacent Maintenance Workshops off Edward
2	Jul 29, 2010 1:52 AM	Prep Grounds (Head of Prep)
3	Jul 29, 2010 1:53 AM	Waverton
4	Jul 29, 2010 1:54 AM	school car park under the auditorium
5	Jul 29, 2010 2:11 AM	Grass verge - Union Street entrance
6	Jul 29, 2010 2:23 AM	grassed area near the tennis courts
7	Jul 29, 2010 2:48 AM	Prep school
8	Jul 29, 2010 3:04 AM	school
9	Jul 29, 2010 3:05 AM	Bishopsgate Driveway grass verge
10	Jul 29, 2010 4:11 AM	Learner Dropped Off
11	Jul 29, 2010 4:39 AM	Thomas Street
12	Jul 29, 2010 4:41 AM	Bank Street
13	Jul 29, 2010 4:50 AM	bank
14	Jul 29, 2010 6:51 AM	Commodore Lane
15	Jul 29, 2010 8:31 AM	school drive
16	Jul 30, 2010 5:49 AM	thomas street
17	Jul 30, 2010 5:49 AM	Thomas Street
18	Jul 30, 2010 6:01 AM	Did nto park changed drivers
19	Jul 30, 2010 6:48 AM	Commodore Crescent
20	Jul 30, 2010 11:50 PM	john st
21	Aug 1, 2010 1:04 AM	John Street
22	Aug 1, 2010 12:38 PM	Commodore Crescent
23	Aug 1, 2010 11:41 PM	Larkin street
24	Aug 2, 2010 1:11 AM	bank street
25	Aug 2, 2010 3:26 AM	waverton
26	Aug 2, 2010 5:21 AM	Commodore Close


Where did you park?
William Street car park
Union Street car park
Blue Street
William Street
Edward Street
Lord Street
Union Street
Mount Street
Other (please specify)

Travel Survey

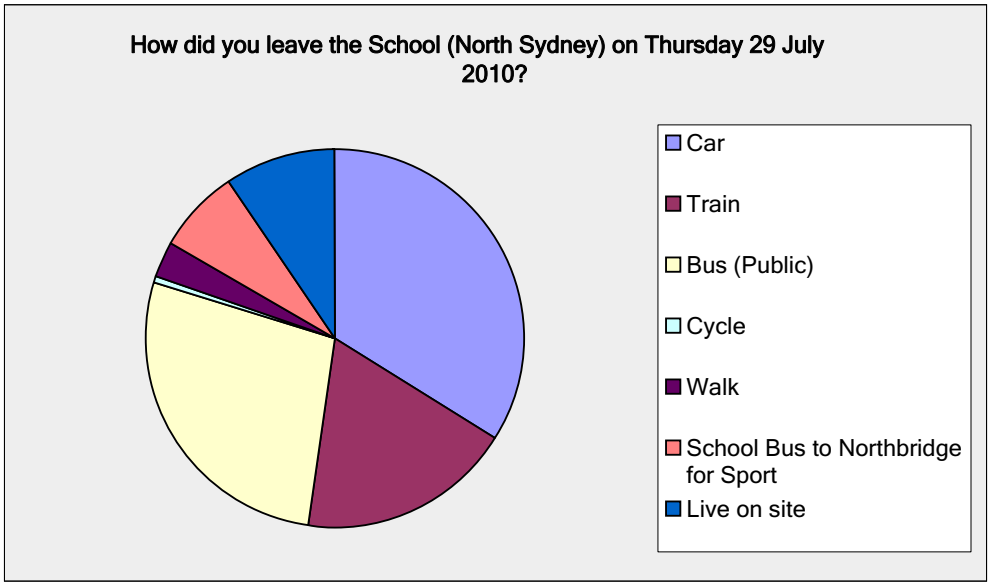
What time did you leave the School (North Sydney) on Thursday 29 July 2010?		
Answer Options	**Response Percent**	**Response Count**
Before 2.55pm	2.6%	20
2.55 - 3.15pm	52.9%	413
3.15 - 3.30pm	9.6%	75
3.30 - 3.45pm	3.5%	27
3.45 - 4.00pm	2.8%	22
4.00 - 4.15pm	5.3%	41
4.15 - 4.30pm	3.1%	24
4.30 - 4.45pm	6.3%	49
4.45 - 5.00pm	3.6%	28
After 5.00pm	10.4%	81
	answered question	**780**
	skipped question	**50**



Travel Survey

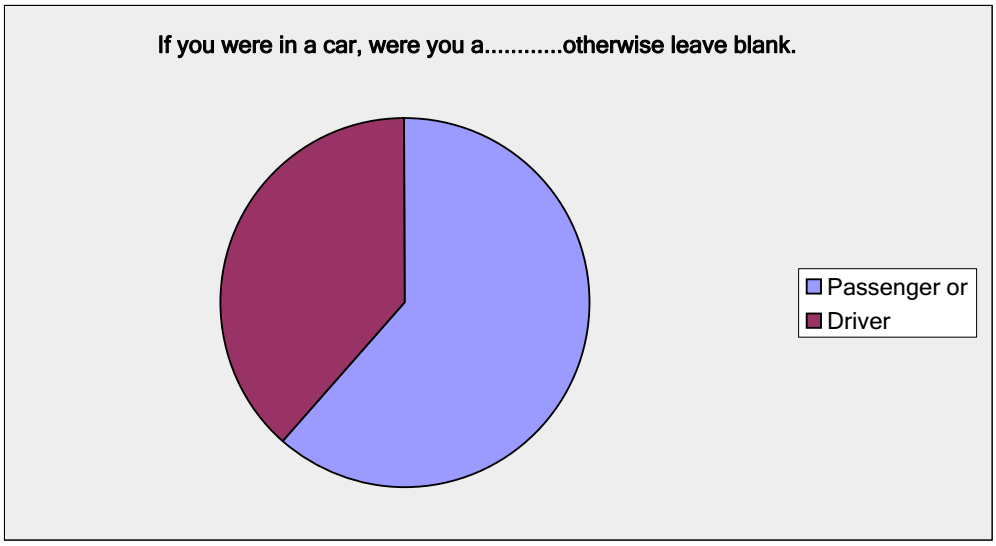
How did you leave the School (North Sydney) on Thursday 29 July 2010?		
Answer Options	**Response Percent**	**Response Count**
Car	34.0%	265
Train	18.3%	143
Bus (Public)	27.6%	215
Cycle	0.4%	3
Walk	3.1%	24
School Bus to Northbridge for Sport	7.3%	57
Live on site	9.4%	73
Other (please specify)		20
	answered question	**780**
	skipped question	**50**

Number	Response Date	Other (please specify)
1	Jul 29, 2010 2:04 AM	Left car in garage and travelled to Narrabri Bc
2	Jul 29, 2010 2:08 AM	bus to koola
3	Jul 29, 2010 2:09 AM	school bus to koola for sport
4	Jul 29, 2010 3:22 AM	Train to Turramurra, then car
5	Jul 29, 2010 3:45 AM	Shore Vehicle to Rock Climbing training
6	Jul 29, 2010 4:02 AM	mosman
7	Jul 29, 2010 4:27 AM	School bus
8	Jul 29, 2010 4:52 AM	I have a lot of mates
9	Jul 29, 2010 10:43 PM	School Bus Home
10	Jul 29, 2010 11:47 PM	School bus to st lennards for rockclimbing
11	Jul 30, 2010 12:03 AM	School Bus
12	Jul 30, 2010 1:53 AM	school bus to Koola for sport
13	Jul 30, 2010 3:46 AM	School Bus
14	Jul 30, 2010 4:16 AM	School Bus to Mosman
15	Aug 1, 2010 7:14 AM	Sport Bus
16	Aug 1, 2010 12:39 PM	Car to Northbridge for sport
17	Aug 2, 2010 3:41 AM	and public bus
18	Aug 2, 2010 4:03 AM	ferry
19	Aug 2, 2010 4:28 AM	GETS BUS TO SCHOOL AND DROPPED AT
20	Aug 2, 2010 5:35 AM	Plus ferry both to and from school


How did you leave the School (North Sydney) on Thursday 29 July 2010?
Car
Train
Bus (Public)
Cycle
Walk
School Bus to Northbridge for Sport
Live on site

Travel Survey

If you were in a car, were you a.....otherwise leave blank.		
Answer Options	**Response Percent**	**Response Count**
Passenger or	61.5%	185
Driver	38.5%	116
	answered question	301
	skipped question	529

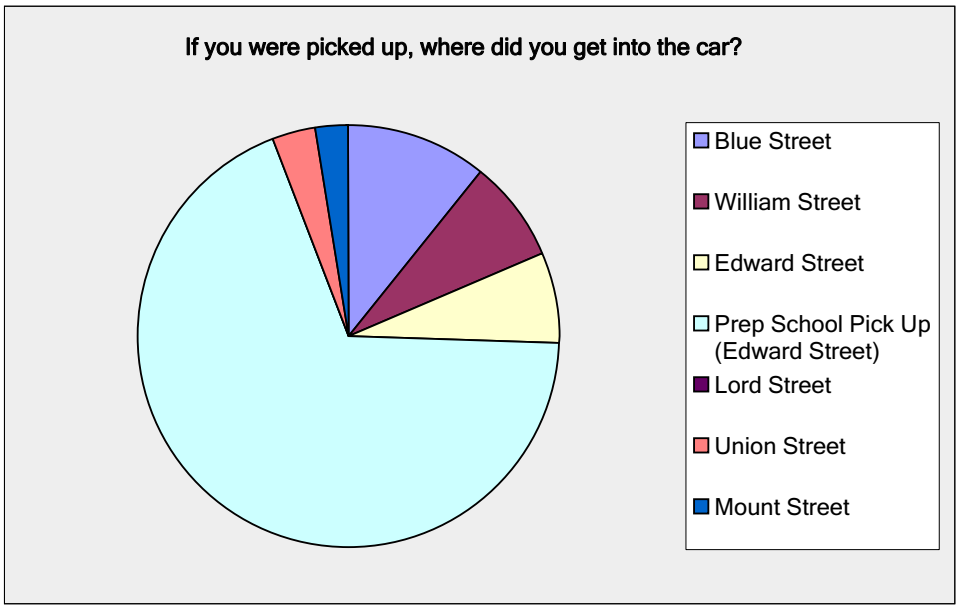


Travel Survey

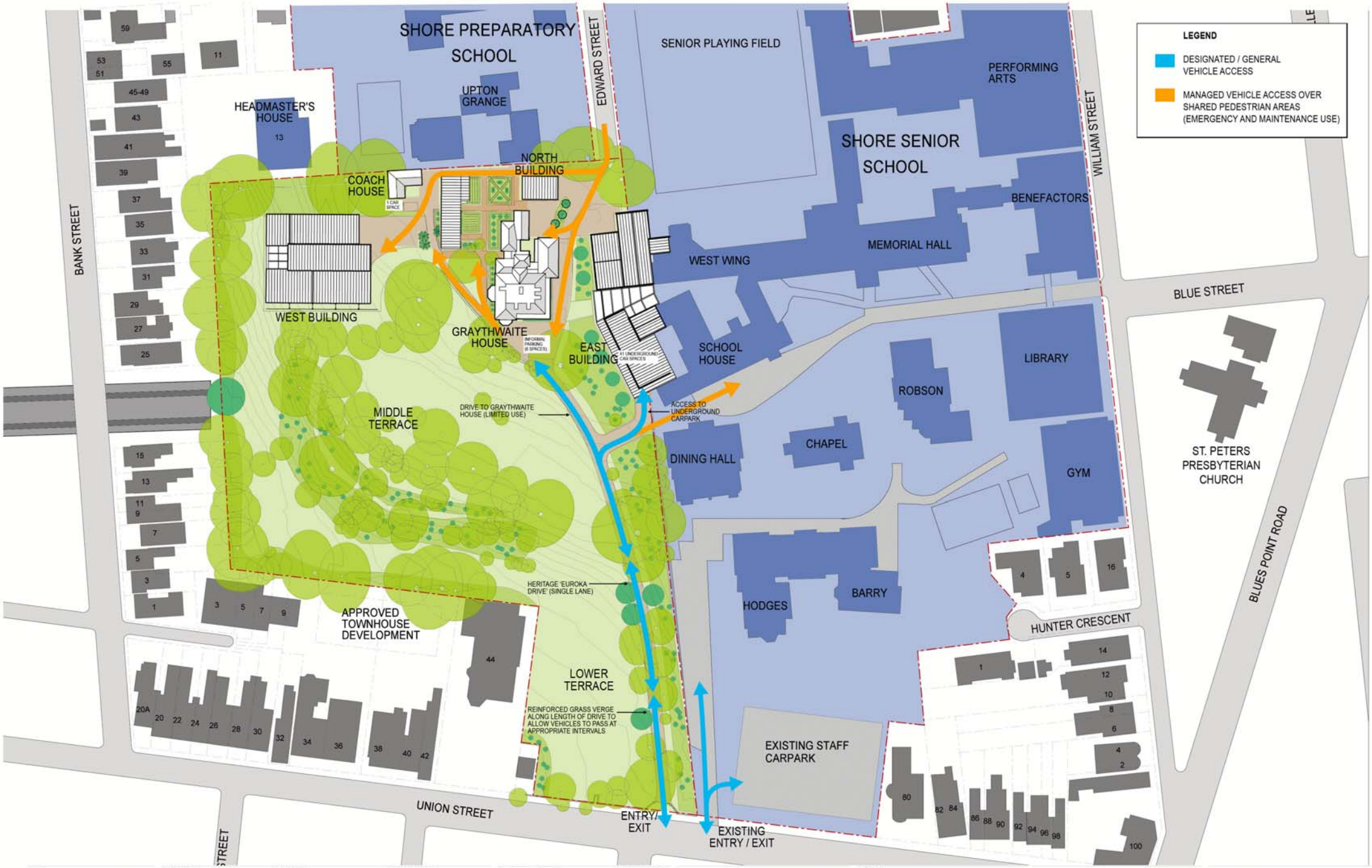
If you were picked up, where did you get into the car?

Answer Options	Response Percent	Response Count
Blue Street	10.9%	17
William Street	7.7%	12
Edward Street	7.1%	11
Prep School Pick Up (Edward Street)	68.6%	107
Lord Street	0.0%	0
Union Street	3.2%	5
Mount Street	2.6%	4
Other (please specify)		8
answered question		156
skipped question		674

Number	Response Date	Other (please specify)
1	Jul 29, 2010 1:42 AM	William St Car Park
2	Jul 29, 2010 1:49 AM	Staff carpark
3	Jul 29, 2010 3:45 AM	Arthur St, North Sydney
4	Jul 29, 2010 6:25 AM	Bishopgate Carpark
5	Jul 29, 2010 11:29 AM	Bank Street
6	Aug 2, 2010 3:06 AM	Senior Staff Carpark
7	Aug 2, 2010 5:20 AM	turning circle
8	Aug 2, 2010 5:46 AM	Riley Street



Appendix C Master Plan Concept Traffic and Pedestrian Access



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Rev.	Date	Description	Checked	Auth.
P4	24.09.10	ISSUED TO PROJECT MANAGER	JS	PM
P5	27.09.10	ISSUED TO PROJECT MANAGER	JS	PM

Proj. Dir. PM
Proj. Arch. JS
Drawn TL
Job No. 0910
Date
Scale 1:600 @ A1

NSW Nominated Architects.
Peter Mayoh
Arthur Gartrell
Registration No. 3788
Registration No. 4040

Do not scale drawings. Verify all dimensions on site. Notify architect of all discrepancies.

Project
GRAYTHWAITE - CONCEPT APPLICATION
SYDNEY CHURCH OF ENGLAND GRAMMAR SCHOOL (SHORE)

Drawing Title
VEHICLE ACCESS PLAN

Drawing No. A.003
Revision P5

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Rev.	Date	Description	Checked	Auth.
P1	22.09.10	BUILDING COMMITTEE PRESENTATION	JS	PM
P2	24.09.10	ISSUED FOR CONSULTANTS	JS	PM
F3	27.09.10	ISSUED TO PROJECT MANAGER	JS	PM

Proj. Dir. PM
Proj. Arch. JS
Drawn TL
Job No. 0910
Date
Scale 1:600 @ A1
NSW Nominated Architects:
Peter Mayoh
Registration No. 3788
Arthur Gartrell
Registration No. 4040
Do not scale drawings. Verify all dimensions on site. Notify architect of all discrepancies.

Project
GRAYTHWAITE - CONCEPT APPLICATION
SYDNEY CHURCH OF ENGLAND
GRAMMAR SCHOOL (SHORE)

Drawing Title
PEDESTRIAN ACCESS PLAN

Drawing No. A.004
Revision P2

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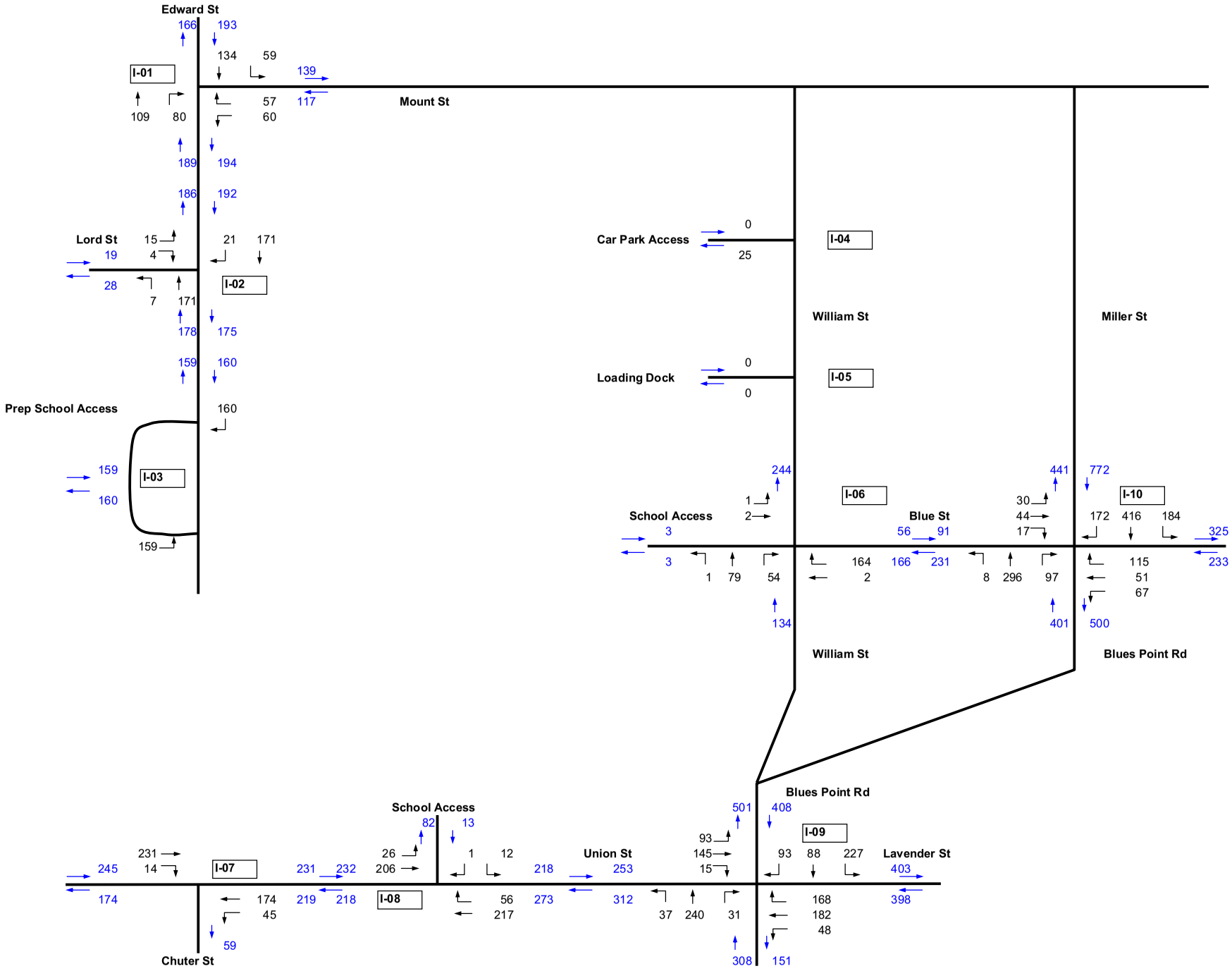
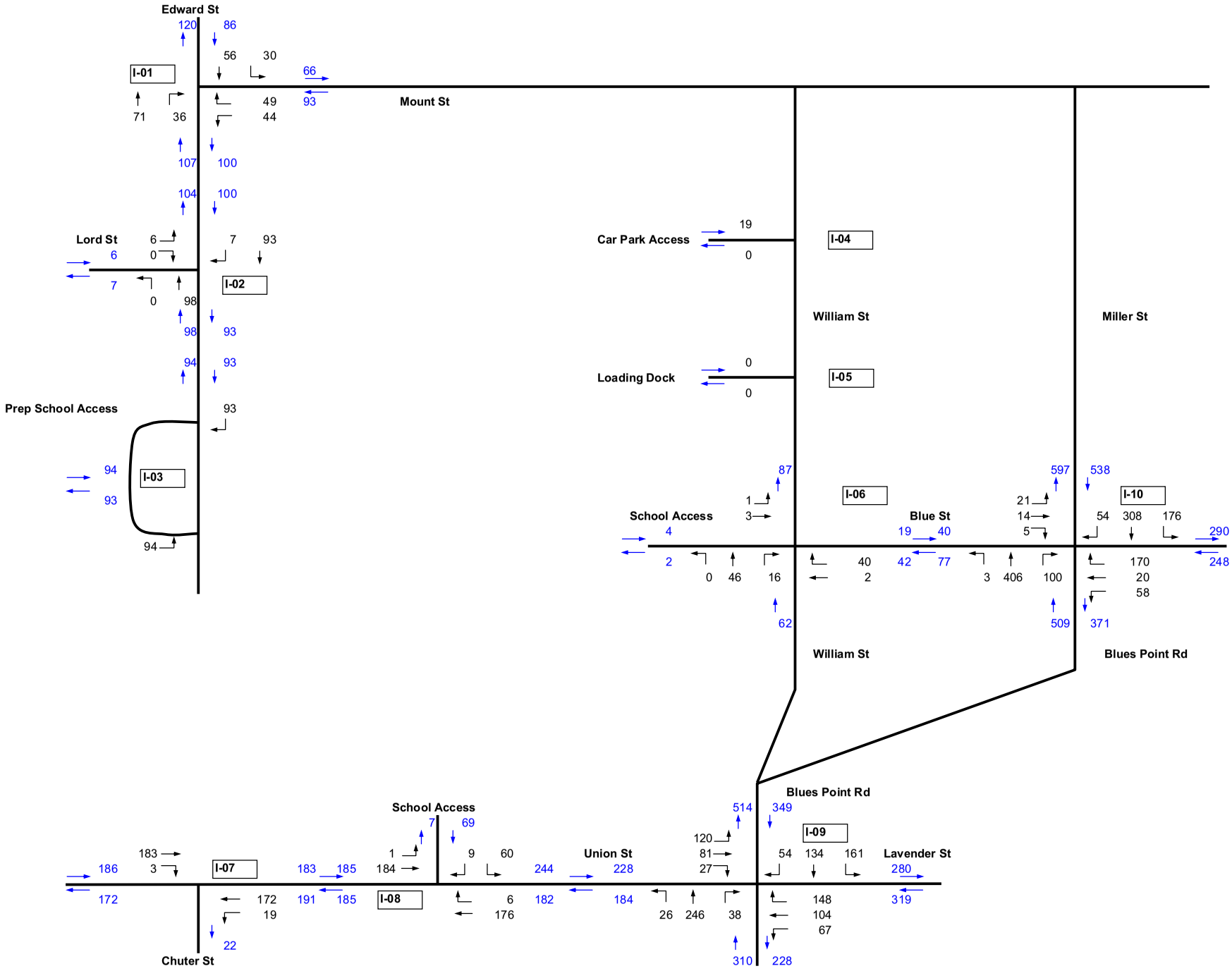
Appendix D Stage 2 and Stage 3 - Traffic Generation Distribution

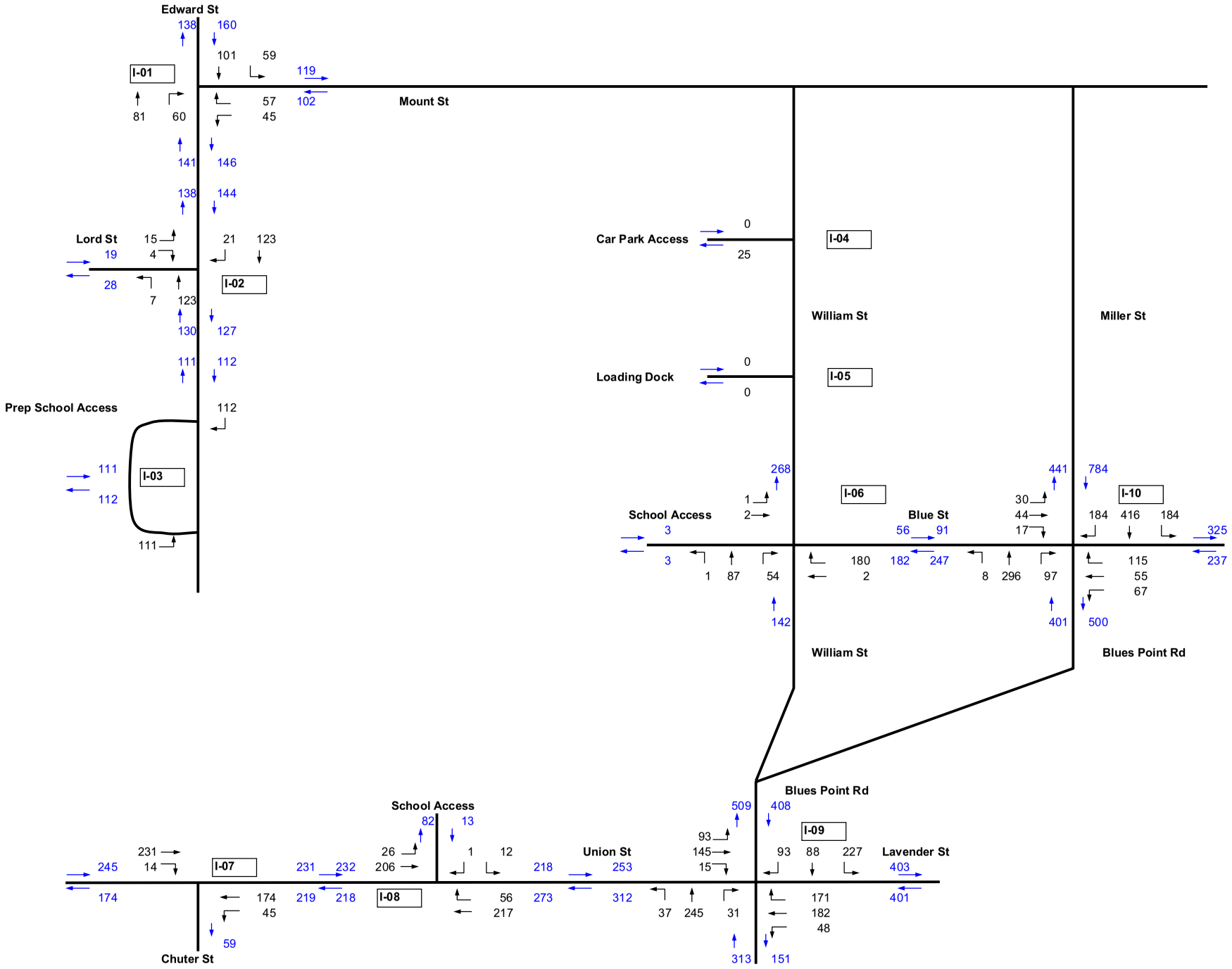
Existing + Stage 2 Option A Trips
AM Peak Hour



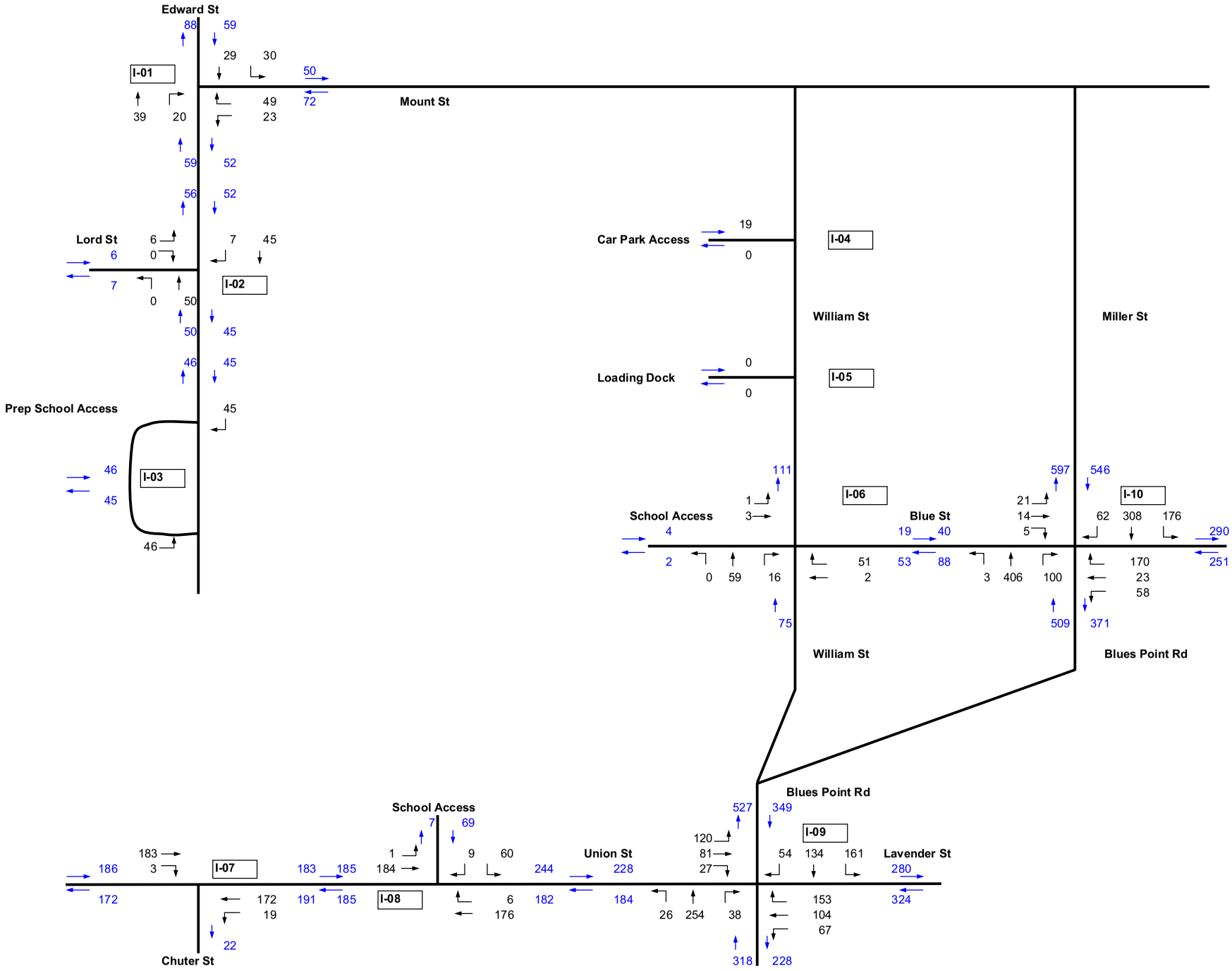
Existing + Stage 2 Option A Trips
PM Peak Hour



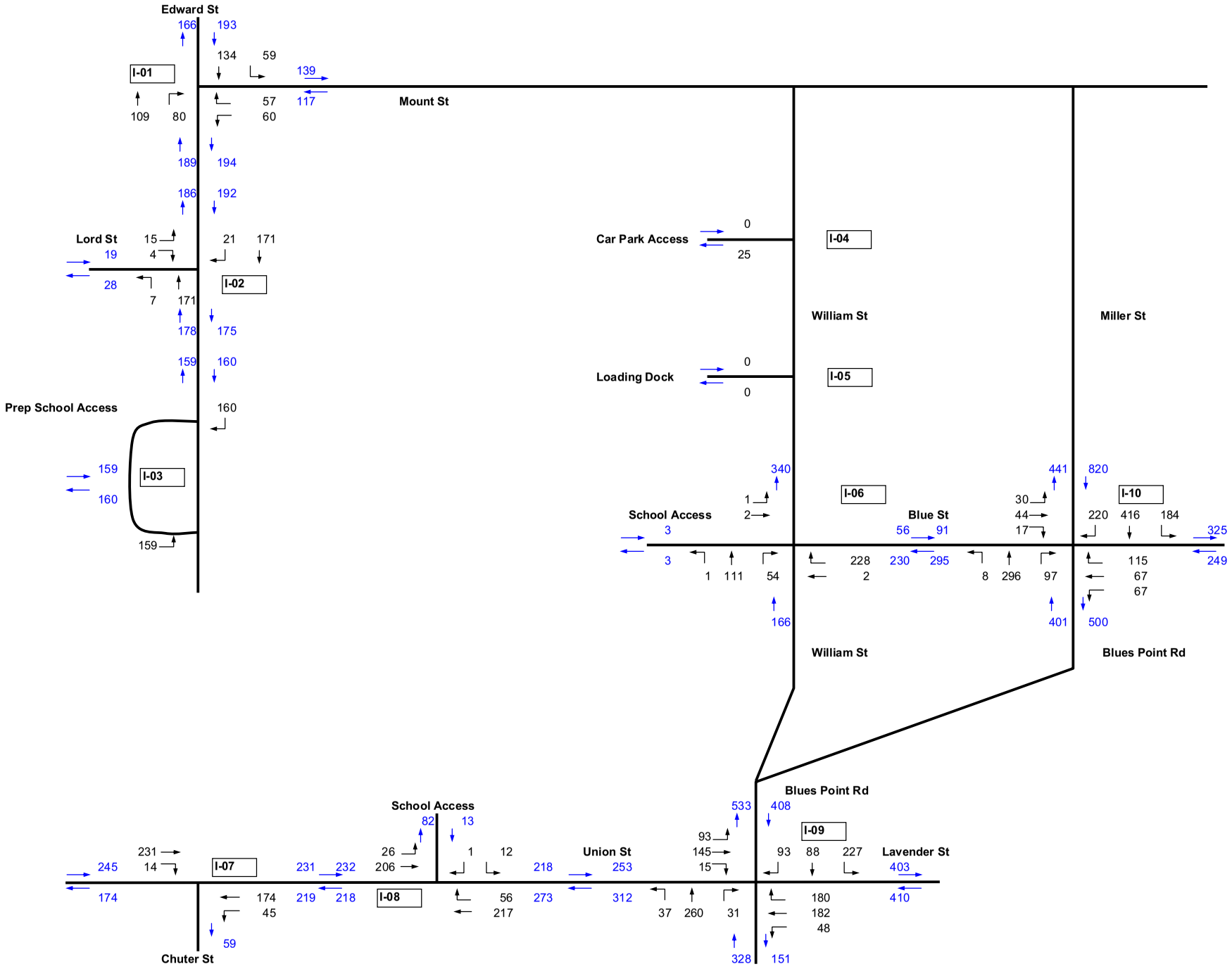
Existing + Stage 2 Option B Trips
AM Peak Hour



Existing + Stage 2 Option B Trips
PM Peak Hour



Existing + Stage 3 Trips
AM Peak Hour



Existing + Stage 3 Trips
PM Peak Hour