Kapau Holdings Pty Ltd

617 - 621 Pacific Highway, St Leonards

Traffic Impact Assessment

Rev C | 12 December 2016

Job number 247097

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Contents

Appendices

1 Introduction

1.1 Project background

Arup was engaged by KannFinch Architects on behalf of Kapau Holdings Pty Ltd to provide traffic engineering services for the proposed mixed use residential development site located at 617 – 621 Pacific Highway, St Leonards. The proposal is for the development of a high rise building which will include two levels of retail on the ground and lower ground floors, five levels of community facilities/commercial office spaces and 41 levels of residential apartments.

1.2 Scope of work

This traffic impact assessment supports the Planning Proposal (PP) for the proposed development at 617 – 621 Pacific Highway, St Leonards and will address the following:

- Generation of pedestrian and car trips
- Public transport accessibility
- Upgrade requirements for Oxley Street / Pacific Highway intersection
- Car parking arrangements
- Pedestrian and bicycle access
- Green initiatives

2 Existing conditions

2.1 Site description

The proposed development site has a site area is 1,067m^2 and is located at 617 – 621 Pacific Highway, St Leonards which is shown in Figure 1. The site is located within the North Sydney Council LGA and is currently occupied by a 12 storey commercial building at 621 Pacific Highway and a 7 storey commercial building at 619 Pacific Highway.

St Leonards is identified as a strategic centre by the NSW Government in 'A Plan for Growing Sydney' (the new Metropolitan Strategy for Sydney) due to the area's accessibility to public transport. The area surrounding the site has a mixture of high density residential, commercial and retail uses.

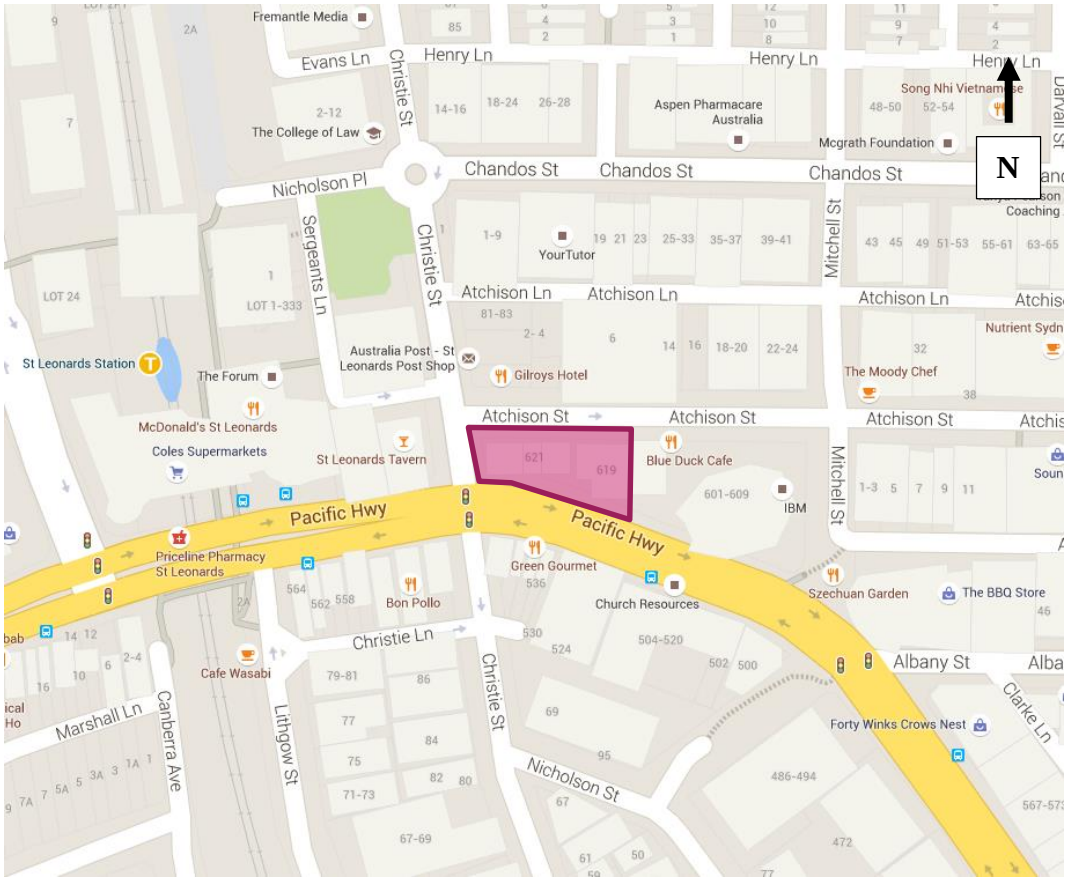


Figure 1: Site location

2.2 Road network

The main roads surrounding the site are Pacific Highway to the south, Atchison Street to the north and Christie Street to the west.

Christie Street is a collector road north of Pacific Highway operating with a 50km/h speed restriction.

Atchison Street operates as a one-way eastbound local street with parking on both sides and includes a line marked contra-flow bicycle lane. Atchison Street runs parallel to Pacific Highway and provides the access driveways to the site and adjacent properties.

Pacific Highway is a divided six-lane, two-way arterial road with restricted parking opportunities available on each side of the road outside of the peak periods. The Pacific Highway within the vicinity of the site connects the North Sydney CBD to the Northern Suburbs and various motorways including the M1 Sydney to Newcastle Freeway, M2 Lane Cove Tunnel/Gore Hill Freeway and M1 Warringah Freeway/Bradfield Highway. It is a major bus corridor servicing a large number of bus routes connecting the Sydney CBD to the Northern suburbs. There are 60km/h speed restrictions in the section of Pacific Highway relevant to the study area.

2.3 Existing traffic volumes

Traffic count data for the purposes of the analysis was sourced from two previous studies, namely the St Leonards South Strategy, Paramics Base Model – AM Peak, Calibration and Validation Report and St Leonards South Strategy, Paramics Base Model – PM Peak, Calibration and Validation Report for this section of the Pacific Highway (Lane Cove Council, 2013). This data was used for the Pacific Highway / Oxley Street intersection.

Additional data for streets surrounding the site were obtained from a previous traffic impact assessment, Traffic, Parking and Accessibility Report (Brown, 2014), which accompanied a planning proposal for Leighton and Charter Hall's development sites to the east of the site. Existing mid-block traffic volumes during the AM and PM peak periods are shown in Figure 2 and Figure 3.

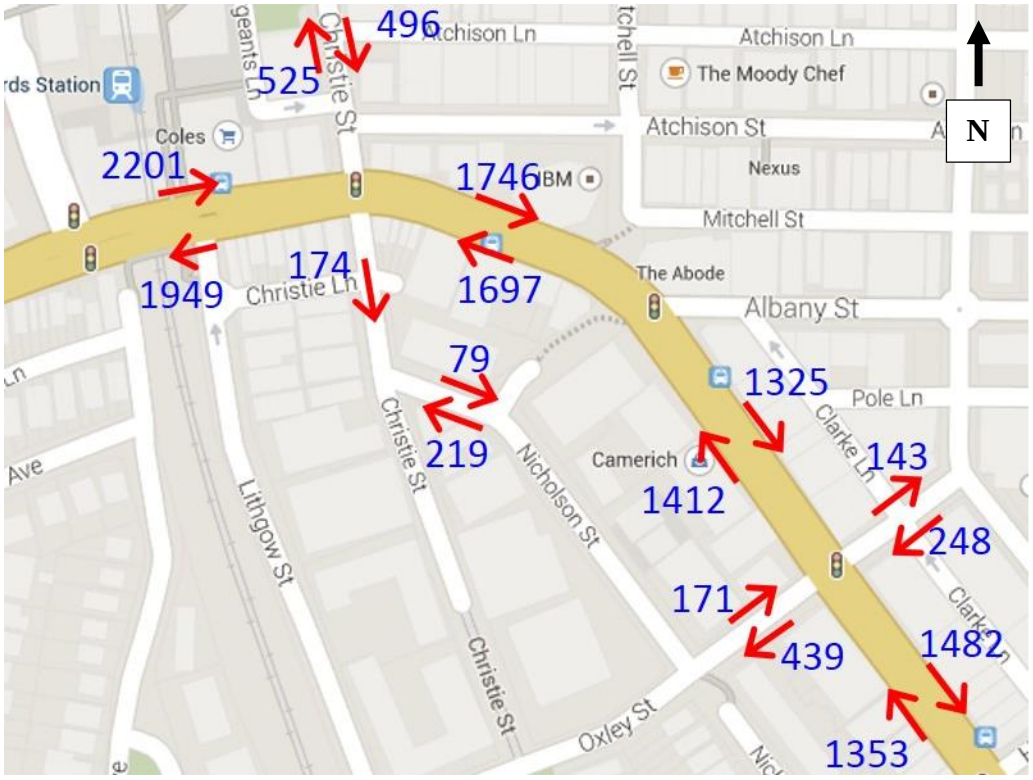


Figure 2: Existing AM peak mid-block traffic volumes

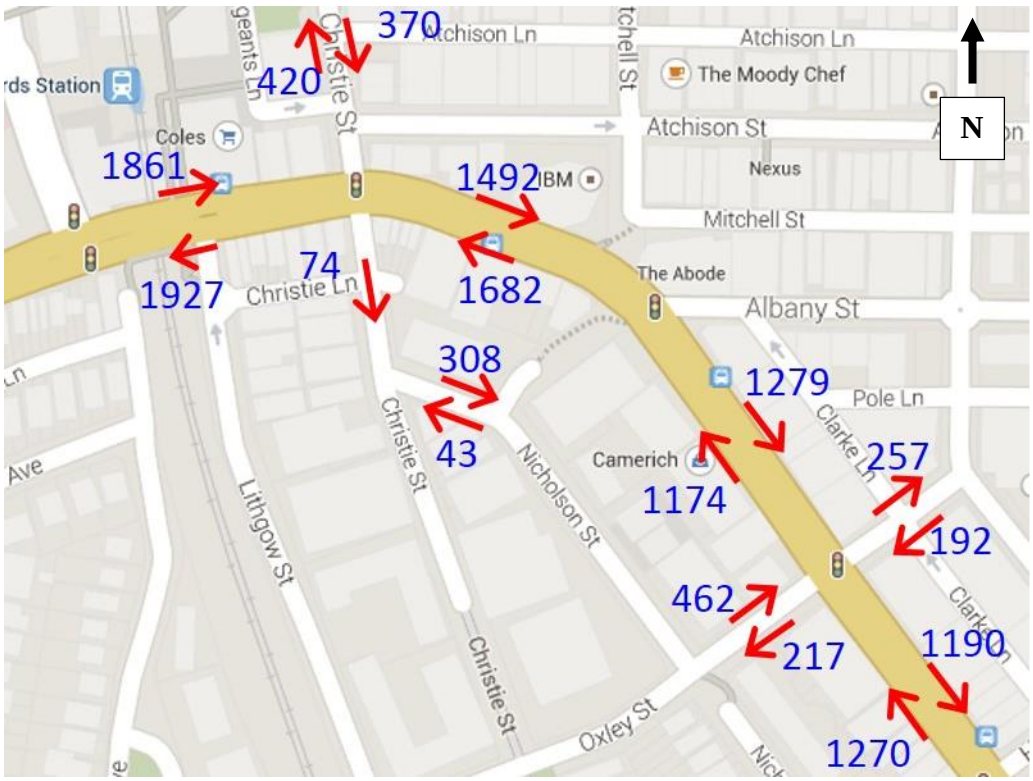


Figure 3: Existing PM peak mid-block traffic volumes

2.4 Public transport

The site has good access to public transport and is located within 100m walking distance from St Leonards Station and within 100m walking distance from bus stops located on Pacific Highway which are illustrated in Figure 4.

Figure 4: 400m radius circle from site

St Leonards Station services the T1 North Shore and Northern lines, and the Central Coast and Newcastle lines. The station is well connected to other major stations such as Central Station, Chatswood Station and Epping Station. The station is well served by trains with services every 3 minutes during the peak periods in both directions of travel.

The bus routes connecting to the bus stops shown in Figure 4 are summarised in Table 1. Buses connect the local area to the Sydney CBD, Chatswood CBD, Crows Nest, Epping, Lane Cove and surrounding suburbs. The bus stops are well served, with frequent services throughout the day and express buses operating during the peak periods.

Table 1: Bus routes

Bus Route	Service description
Route 143, Manly and Macquarie University	Services every 30 minutes throughout the day in each direction.
Route 144, Chatswood and manly via Royal North Shore Hospital	Services every 30 minutes throughout the day in each direction.
Route 252, Lane Cove West and City via Pacific Highway	Services every 30 minutes throughout the day in each direction.
Route 254, Riverview and City via Pacific Highway	Services every 30 minutes throughout the day in each direction.
Route 257, Chatswood to Balmoral Beach	Services every 30 minutes throughout the day in each direction.
Route 265, McMahons Point and Lane Cove via Greenwich Wharf	Services every 30 minutes throughout the day in each direction.
Route 286, Denistone East and City via Pacific Highway	Services every 30 minutes during the peak periods between Monday to Friday
Route 287, Ryde and Milsons Point via Pacific Highway and North Sydney	Services every 30 minutes during the peak periods between Monday and Friday in each direction
Route 290, Epping and City via Macquarie Centre and Pacific Highway	Services every 15 minutes during the peak periods between Monday and Friday in each direction Services every hour at all other times.
M20, Botany and Gore Hill	Services every 10 minutes during the peak periods in each direction. Services every 15 minutes at all other times.

2.5 Site access

Access to the existing site is provided from a driveway on Atchison Street. Traffic signals have recently been installed at the intersection of Sergeants Lane with Christie Street to improve pedestrian access to the railway station. Drivers entering Atchison Street are limited to left turn entry only after passing through the Sergeants Lane traffic signals.

Due to the lack of right turn opportunities off Pacific Highway, vehicles accessing the site that are travelling on the Pacific Highway from either direction must turn left or right into Albany Street and access the site via Chandos Street. Furthermore, as Atchison Street is one-way travelling east, vehicles will mostly use Oxley Street to access to Chandos Street or the Pacific Highway. Vehicle access routes are illustrated in Figure 5.

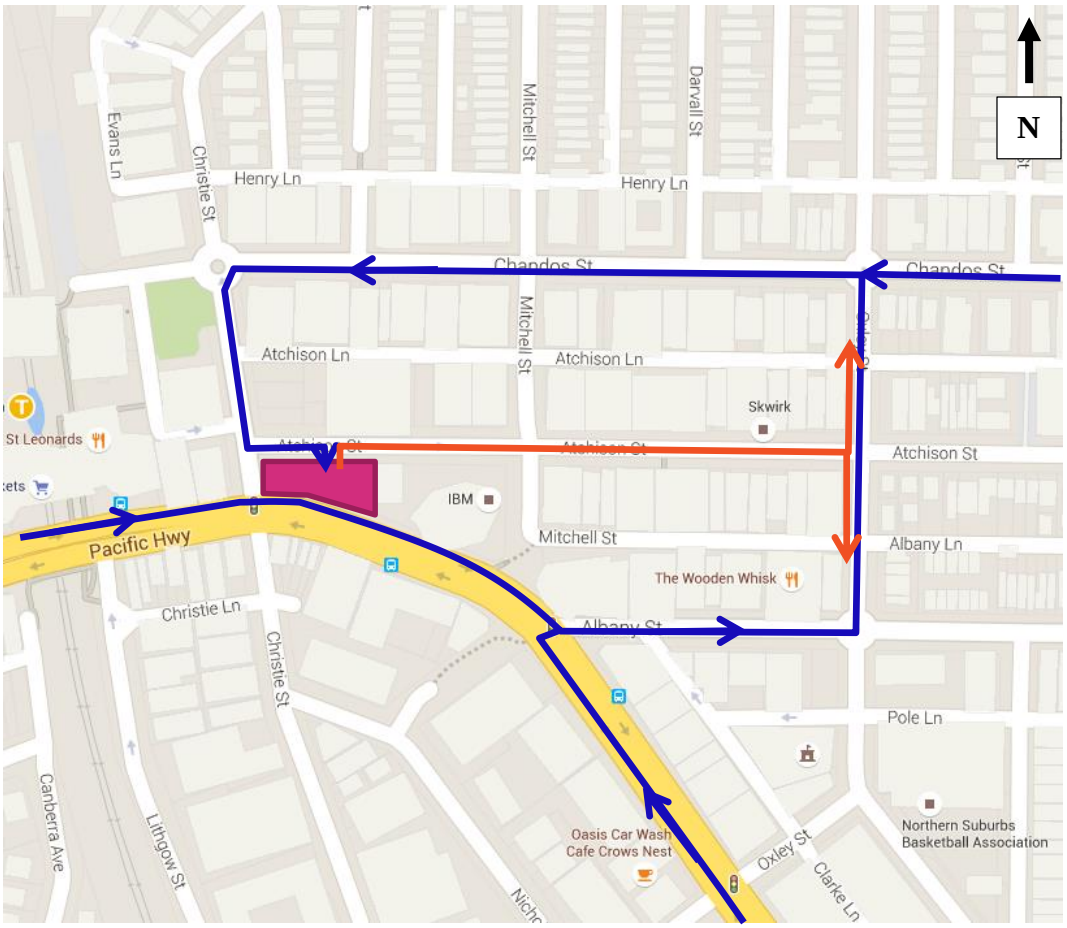


Figure 5: Vehicle access and egress routes

2.6 Pedestrian and cycling facilities

The site is located within the commercial core of St Leonards and is well served by a good network of local footpaths. Paved footpaths and kerb ramps are provided on all streets. All roads on the walking route from the proposed development site to St Leonards transport interchange possess paved footpaths and kerb ramps on both sides of the road. Sections of Pacific Highway and Herbert Street are covered to protect pedestrians during rainy weather. There are signalised pedestrian crossings across Christie Street at the Pacific Highway intersection as well as the Sergeants Lane intersection.

The site is well connected to a number of cycling routes which consist of both off-road cycling paths as well as on-road marked paths. The on-road bike path on Pacific Highway provides a safe and efficient connection to the Sydney Harbour Bridge as well as a connection to the northern suburbs. The local cycling routes also connect to the Warringah Freeway cycleway which provides connections to Lane Cove, North Ryde and Chatswood.

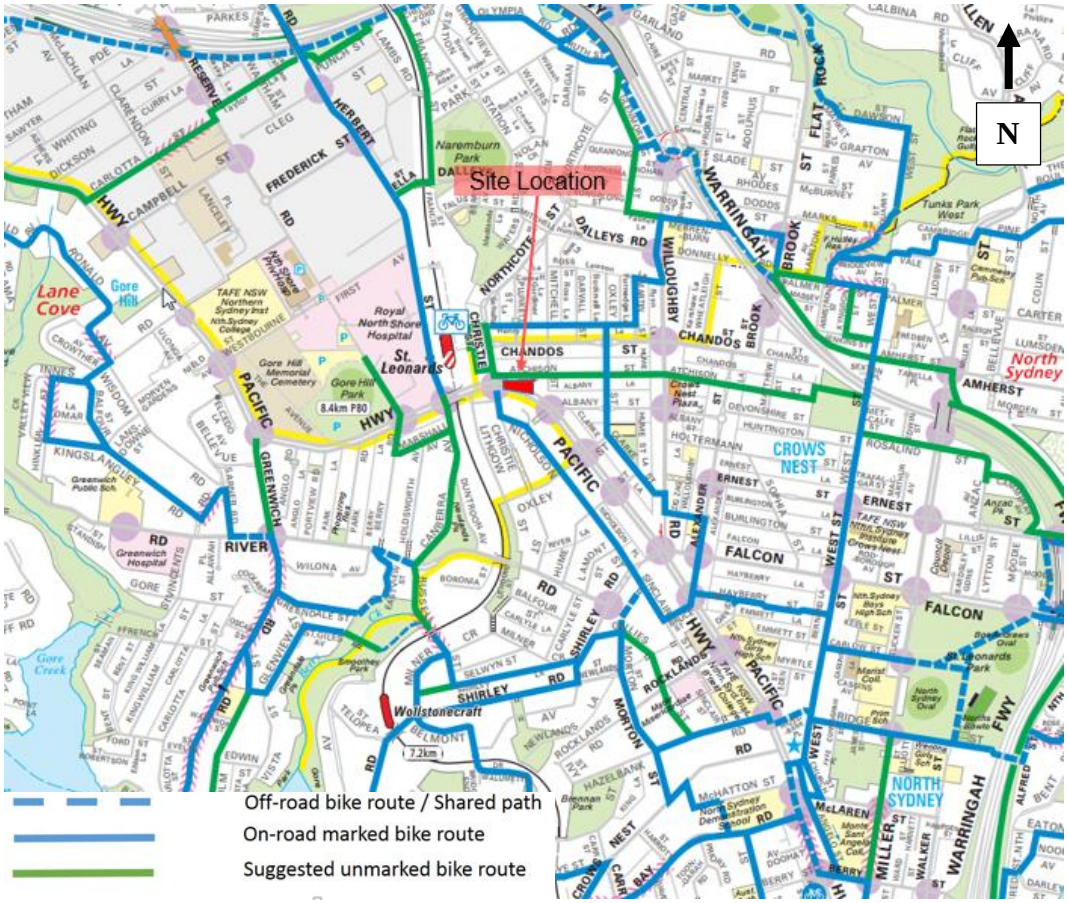


Figure 6: Bike paths

2.7 Travel characteristics

Mode share patterns at the site were analysed using 2011 Journey to Work (JTW) Census data from the Bureau of Transport Statistics. The JTW data for travel zone 1844 was used to assess the likely mode of peak hour trips to and from the site. The location and the coverage of travel zone 1844 is shown in Figure 7. The results of the analysis are shown in Table 2.

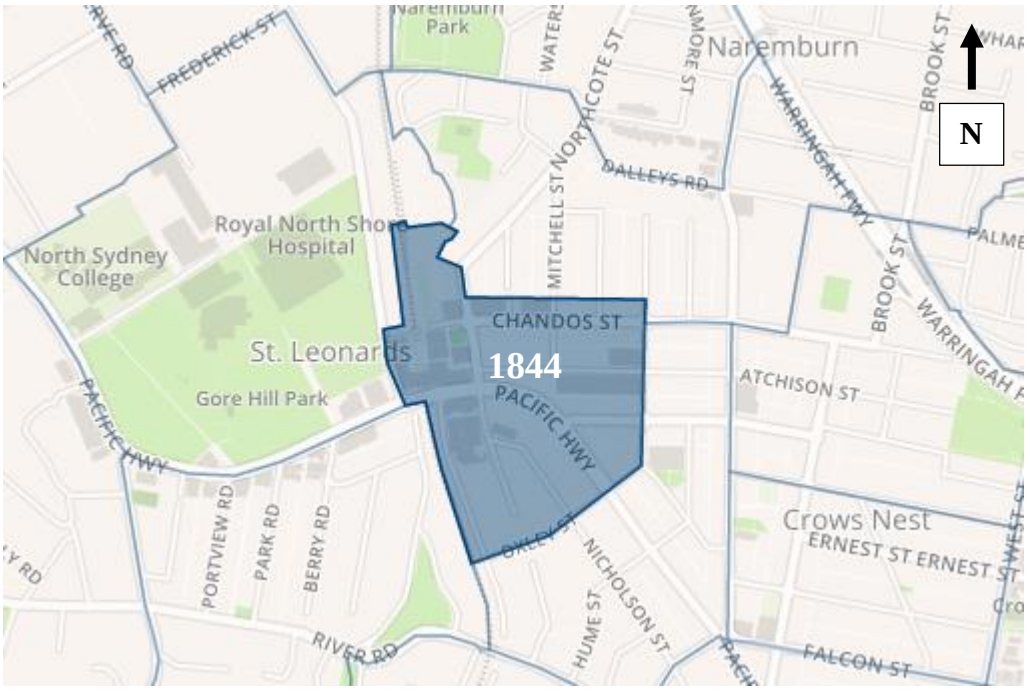


Figure 7: Journey to Work travel zone coverage
Source: BTS, 2011

Table 2: Journey to Work travel patterns

Mode	Inbound trips to work	Outbound trips to work
Train	37%	49%
Bus	8%	7%
Car	47%	27%
Walk	5%	15%
Other	2%	2%
Mode not stated	1%	0%
Total trips	10,938	1,959

Source: BTS, 2011

The JTW data shows that residents of travel zone 1844 rely primarily on public transport to commute to work. The data reveals that commuting to work by train is the most heavily used mode of transport at 49%. This can be attributed to the close proximity of St Leonards Station and the frequency of services to the Sydney CBD and Chatswood CBD.

The JTW data reveals that commuters travelling to travel zone 1844 rely more heavily on car trip modes which makes up 48% of inbound trips. Commuters

travelling to work by train make up 35% of inbound trips and trips made by bus make up 8%.

2.7.1 Private vehicle users

Travel zone 1844 was used to assess where residents living in the area, work at. The most common work destinations of private vehicle users are shown in Table 3. A majority of the residents who use private vehicles as a form of commute, work at Chatswood and the CBD.

Table 3: Where private vehicle users work at

Mode	Outbound trips to work by private vehicles
Chatswood - Lane Cove	20%
Sydney Inner City	19%
Ryde - Hunters Hill	12%
North Sydney - Mosman	12%
Warringah	5%
Botany	3%
Ku-ring-gai	3%
Baulkham Hills	2%
Auburn	2%
Hurstville	2%
Total	80%

3 Planning proposal

3.1 Proposed concept development

The proposed development at 617-621 Pacific Highway would comprise basement level car parking, two levels of retail space and five levels of commercial/ community space (approximately 5,100 m^2 GFA). Above these podium levels would be forty one levels of residential apartments accommodating approximately 195 apartments.

The residential component of the development comprises of 1-bedroom, 2-bedroom and 3-bedroom apartments. The total number of each type of apartment is summarised in Table 4.

Table 4: Residential apartment schedule

1 bedroom	2 bedroom	3 bedroom	Total
41	144	10	195

3.2 Car parking

The proposed development will provide five levels of car parking which will consist of 80 car parking spaces. Access to the basement will be via 2 car lifts from lower ground floor. A summary of the total number of parking spaces on each floor is summarised in Table 5. Plans for each level are shown in Figure 8, Figure 9 and Figure 10.

Table 5: Proposed number of car parking spaces on each level

Level	Number of spaces
B1	6 commercial 5 car share 5 residential
B2 – B5	64 residential (16/level)
Total	80 car spaces

3.3 Site access

It is proposed that access to the development site will be via a driveway from Atchison Street as shown in Figure 8.

3.4 Service vehicle access

Both access in and egress out of the site for service vehicles will be via the driveway on Atchison Street. Service vehicles will be provided separate bays and a turn table to manoeuvre. Vehicle turning paths are contained in Appendix A.

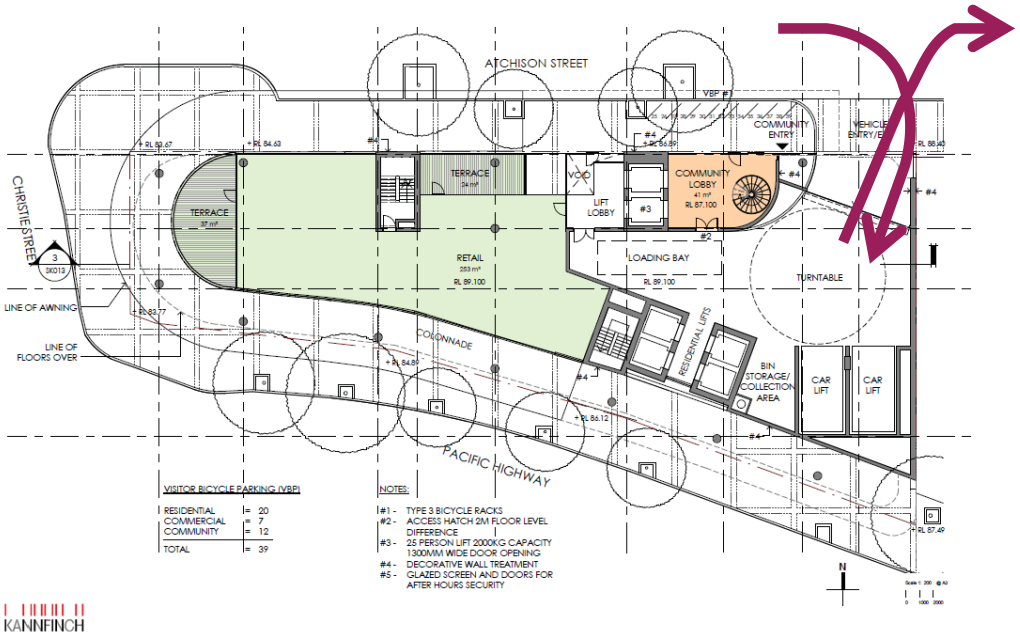


Figure 8: Ground Floor Level

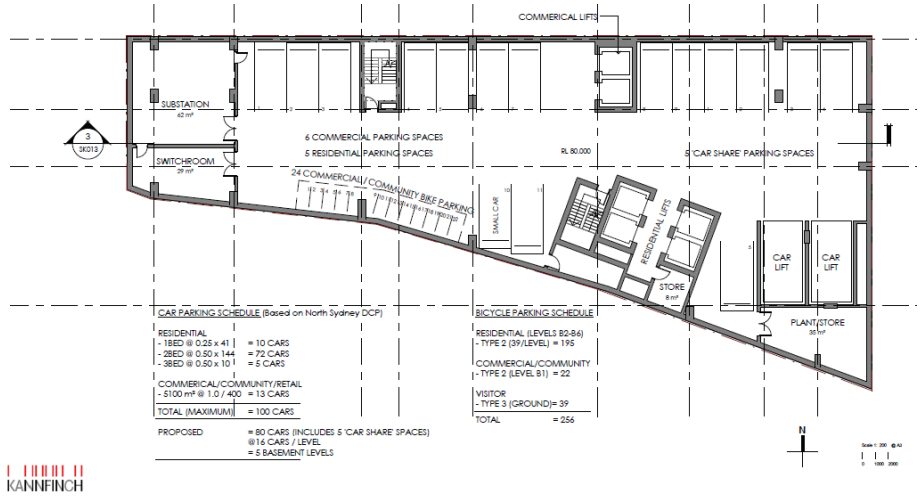


Figure 9: Basement Level 1 – Commercial / Car Share

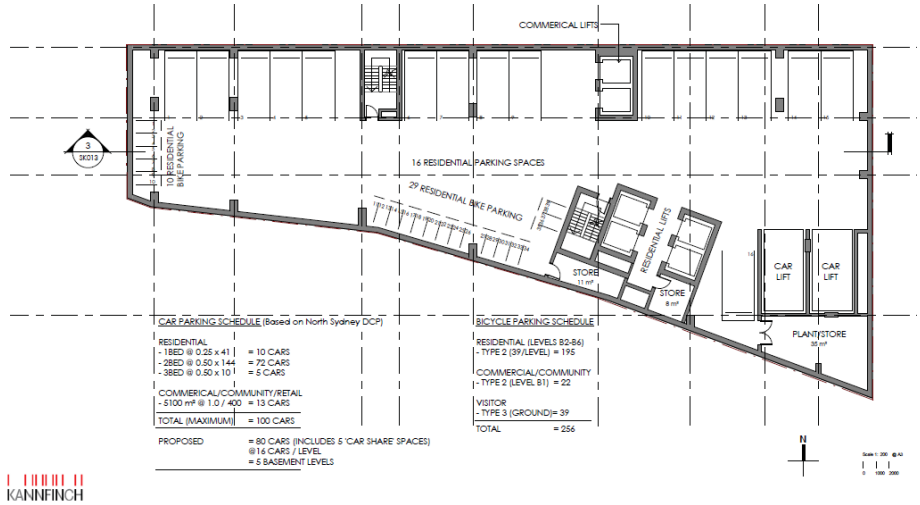


Figure 10: Typical Basement Level – Residential

4 Traffic assessment

4.1 Trip generation

4.1.1 Vehicle trip generation

The Roads and Maritime Services (RMS) Technical Direction TDT 2013/04a provides an update on land use traffic generation. For high density residential flat dwellings, eight buildings were surveyed in Sydney including one in St Leonards. Rates can be applied for the car parking provision which is relevant to this site where a low provision rate is anticipated when compared to the number of apartments. Based on 195 residential apartments and a reduced total of 80 car spaces, the Sydney average rates have been applied to be conservative as shown in Table 6.

Table 6: Residential traffic generation

Residential	**St Leonards**	**Sydney Average**	
	Trips per car space	Trips per car space	Peak hour trips
AM Peak	0.10	0.15	15
PM Peak	0.05	0.12	12
Saturday Peak	0.23	0.21	20

It is assumed that the retail component of the development will not be a key generator of both vehicle and pedestrian trips, but will likely serve as an ancillary function for residents and workers.

The development will contain 4,830 m^2 GFA of non-residential area. As the existing site contains two commercial office buildings with a total approximate GFA of 9,000 m^2, new trips will not be generated by the commercial component of the proposed development.

A peak split of 80/20 is used for vehicle arrivals and departures in the weekday peaks and a 50/50 split is used for the Saturday peak as shown in Table 7.

Table 7: Total traffic generation

	In	**Out**
AM Peak	2	6
PM Peak	3	1
Saturday Peak	9	9

4.1.2 Total people trips generated

Total trips generated accounts for the total person trips generated by the development site across all modes of transport. The total trip generation rate has been adopted from the RMS Technical Direction (TDT 2013/4a) which has been summarised below in Table 8.

Table 8: Peak hour total person trip generation rates

Land use	**Peak hour generation rate (RMS, 2013)**	
High density residential (per apartment)	Weekday AM	0.64
	Weekday PM	0.54
Office blocks (per 100m^2 of GFA)	Weekday AM	1.26
	Weekday PM	1.08

The total trips generated for the development site has been calculated for typical weekday AM and PM peak periods and has been summarised below in Table 9

Table 9: Peak hour total person trips generated

Land use	**Weekday AM peak hour trips**	**Weekday PM peak hour trips**
Residential	122	103
Office	58	50
Total trips	180	153

4.2 Traffic distribution

A traffic distribution profile for residents is shown in the figures below. These were based on existing journey to work data discussed in section 2.7.1 and the general location of the destination in relation to the site.

Figure 11: Trip distribution of residents leaving the site

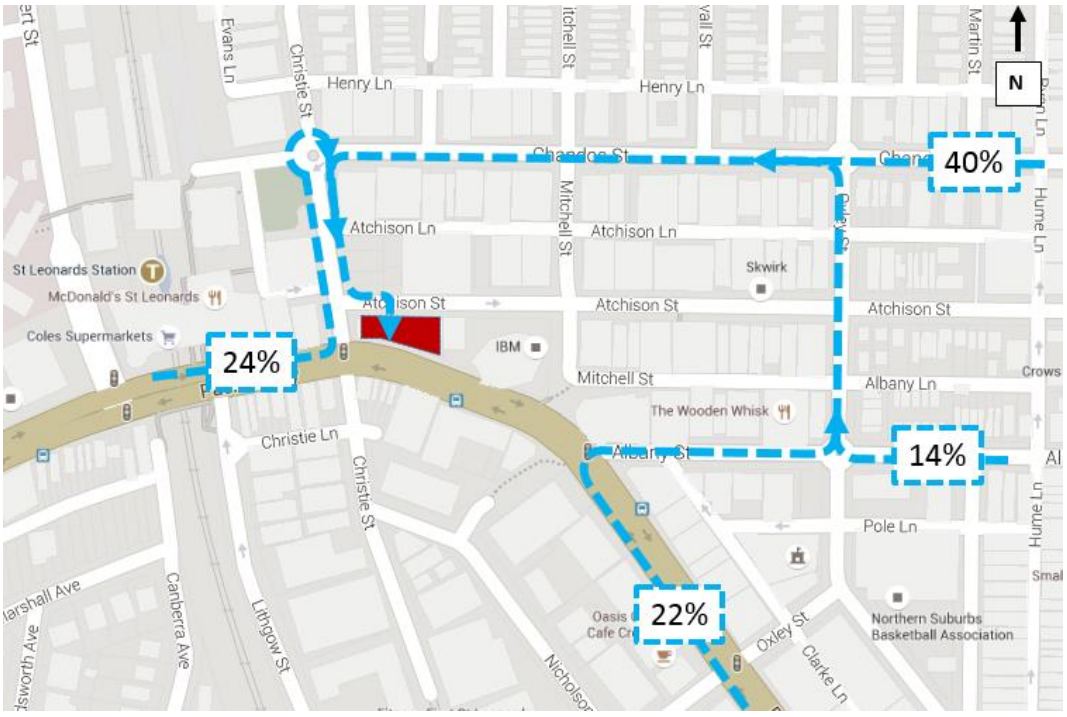


Figure 12: Trip distribution of residents entering the site

4.3 Road network impacts

Based on the traffic distribution and generation assumptions in sections 4.2 and 4.1.1, the likely increase in traffic from the site is shown in the figures below.

Figure 13: Traffic increase from residents leaving the site

Figure 14: Traffic increase from residents entering the site

The existing site contains two commercial office buildings, traffic would therefore only be generated from the new, proposed 195 residential units, of which the site would only provide 80 (inclusive of carshare) off-street parking bays.

The analysis indicates that the increase in traffic is negligible and is not envisaged to affect the existing intersection performances adversely.

Christie Street / Pacific Highway and Albany Street / Pacific Highway intersections are currently operating near practical capacity. However, these intersections still operate efficiently, by prioritising the Pacific Highway corridor. Completion of the site would increase traffic on these intersections by approximately 2 vehicles in the AM, 4 in the PM and 4 on the weekends.

5 Parking assessment

5.1 On street parking

As the site is located within the commercial core of St Leonards there are only metered restricted parking opportunities available on surrounding streets. Christie Street and Atchison Street are all metered with a 2 hour restriction between 8.30am and 6pm, Monday to Friday and 8.30am- 12.30pm Saturday. The section of Pacific Highway within the vicinity of the site operates as a T3 transit lane during 3pm to 7pm Monday to Friday and has a 1 hour restriction at other times.

Due to the lack of unrestricted parking opportunities on surrounding streets, residents are discouraged from parking on streets.

5.2 Off street parking

The required parking provisions are outlined in the existing North Sydney DCP 2013 - car parking for B4 mixed use zone in St Leonards Precinct 2&3. The relevant parking rates and the required parking for this development have been summarised in Table 10.

Table 10: North Sydney Council car parking rates Precinct 2&3

Development type		**DCP requirement**
Residential	Studio	0.25 spaces per apartment
	1 bedroom	0.25 spaces per apartment
	2 bedrooms	0.5 space per apartment
	3+ bedrooms	0.5 spaces per apartment
	Visitor parking	Not required
Commercial	Office or businesses premises	1 space per 400m^2 of GFA

The total required parking spaces and the proposed parking spaces are outlined in Table 11. The proposed number of parking spaces (80), meets the requirements.

Table 11: Parking requirements and provisions

Development type		**Number of apartments / GFA**	**DCP required parking**
Residential	Studio	0	0
	1 bedroom	41	10
	2 bedrooms	144	72
	3 bedrooms	10	5
	Visitor parking	NA	0
Commercial	Office or business premises	5,100m^2	13
Total			100*

*Proposed number of parking spaces to be provided has been reduced to 80

5.3 Motorcycle parking

Motorcycle 1 space / 10 car spaces = 8 motorcycle spaces. These will be allocated in the final planning of the basements.

5.4 Accessible parking

1-2% of all non-residential parking spaces are to be designated as accessible = 1 space.

5.5 Bicycle parking

5.5.1 Apartments

Occupants: 1 space / dwelling = 195 lockers (Class 1 preferred) or racks in locked room (Class 2)

Visitors/ customers: 1 space / 10 dwellings = 19 racks (Class 3)

Where an apartment in a residential building has a basement storage area on title that is large enough to accommodate a bike and being no smaller than a Class 1 bike locker, then additional bike parking for that apartment is not required

5.5.2 Commercial

Occupants: 1 space / 150m^2 = 34 racks in locked room (Class 2)

Visitors/ customers: 1 space / 400m^2 = 13 racks (Class 3)

5.5.3 Bicycle parking provision

The Class 3 bicycle rails have been provided in Atchison Street as part of the public domain. Rails suitable for 39 bicycles are shown, however we suggest that the implementation of these rails be coordinated with the remainder of the centres on-street rails and possible staged to suit usage. This will limit the impact of the rails on the public domain.

Bicycle parking has been provided at all basement levels for use by residents and commercial/community facilities as appropriate.

A total of 256 bicycle parking spaces are provided by the development.

5.6 Car share

The installation of car share parking to replace general off-street parking is optional and at the discretion of the developer. It is proposed to provide 6 car share spaces.

5.7 Loading and servicing

The development footprint allows for loading to occur at lower basement level with direct access from Atchison Street. A turntable is proposed which provides

access for SRV and MRV trucks to access and park within the site, entering and exiting in a forward direction. The proposed truck bay provides access for garbage trucks, furniture and goods delivery vans and service vehicles. A booking system will be implemented for managing residents moving in and out of the building.

5.8 Car lifts assessment

Two car lifts are proposed to be constructed to provide access for vehicles to the five basement car parking levels. A conservative door open and close time of 8 seconds has been assumed as well as a loading / unloading time of 14 seconds.

The operation of the car lifts has been tested using the Elevate lift simulation tool. The results are contained in Appendix B. The AM Peak has been tested as the busiest two-way peak and Saturday has been tested as the busiest entry peak.

The vehicle movements used are shown in Table 12. The commercial movements are to B1 only with residential spread over B2 to B5.

Table 12: Vehicle movements for car lift assessment

	IN			OUT		
	Residential	Commercial	Total	Residential	Commercial	Total
AM Peak	2	5	7	6	1	7
PM Peak	3	1	4	1	5	6
Saturday Peak	10	0	10	10	0	10

Assumptions:

- Floor to floor height of 3.0m
- Five basement levels
- Commercial parking at Basement Level 1
- Lift speed 0.5m/sec
- Residential demand spread randomly across all basement levels.

The anticipated service rates are provided in Table 13.

Table 13: Vehicle lift service times

	AM Peak	Weekend Peak
Average waiting time	14.8 seconds	22.4 seconds
Worst waiting time	68.7 seconds	47.8 seconds
Vehicle queue at ground level	2 cars	3 cars

These waiting times are acceptable for this development.

The vehicle queue can be accommodated at ground level.

6 Public transport assessment

Arup investigated the cumulative impact of the following proposed developments to the public transport network including:

- 617 - 621 Pacific Highway, St Leonards
- 472-486 Pacific Highway, St Leonards;
- 500 & 504-520 Pacific Highway, St Leonards;
- 88 Christie Street, St Leonards;
- St Leonards South Strategy;
- St Leonards Central; and
- 1-13A Marshall Avenue.

6.1 Person trip generation

Trip rates have been obtained from the RMS Technical Direction (TDT 2013/4a) Guide to Traffic Generating Developments Updated Traffic Surveys for high density residential developments. A Sydney average rate for person trips per unit has been used to calculate the total person trips generated. The average AM and PM peak hour person trips for Sydney Metropolitan areas are 0.66 and 0.56 per unit respectively. People trips account for both vehicle and pedestrian trips generated by the development (for all modes). The total trips generated by the developments listed in above is calculated and shown in Table 14.

Table 14: Person trips generated

Development	Number of apartments	Trips generated	
		AM peak	PM peak
617 - 621 Pacific Highway, St Leonards	195	180	134
472-486 Pacific Highway	570	377	211
500 & 504-520 Pacific Highway	460	304	170
88 Christie Street	450	298	166
St Leonards South Strategy	2,000	1,323	739
St Leonards Central	1,300	860	480
1-13A Marshall Avenue	271	179	100
Total	**5,417**	**3,579**	**2,000**

6.2 Travel characteristics

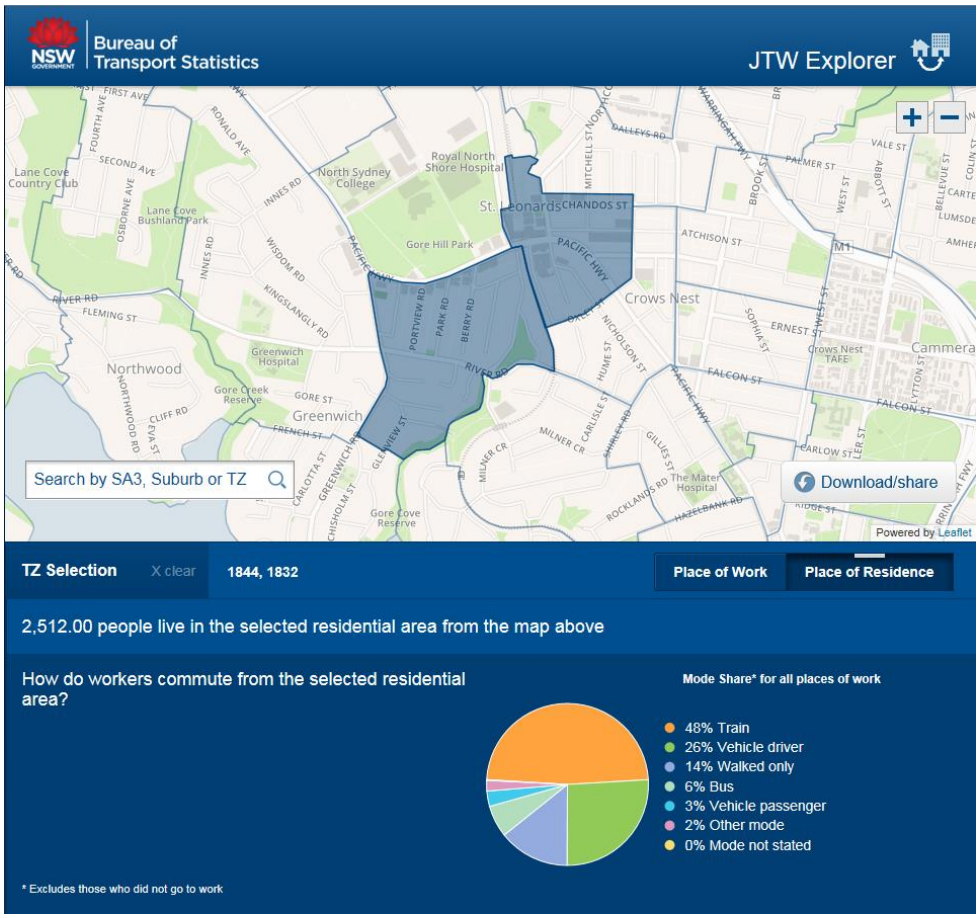
Mode share patterns for St Leonards were analysed using 2011 Journey to Work (JTW) Census data from the Bureau of Transport Statistics. The JTW data for travel zones 1832 and 1844, were used to assess the likely mode of peak hour trips to and from the site. Journey to work data is summarised in Table 2.

Table 15: Journey to Work travel patterns

Mode	Outbound trips to work
Train	48%
Bus	6%
Car	29%
Walk	14%
Other	2%
Mode not stated	0%
Total trips	2512

Source: BTS, 2011

The JTW data shows that residents of travel zones 1832 and 1844 rely primarily on public transport to commute to work. The data reveals that most residents travelling to work from the study area do so via train (48%). This can be attributed to the close proximity of St Leonards Station and the frequency of services to the Sydney CBD and Chatswood CBD.



6.2.1 Public transport trips

The JTW data shows that 54% of residents living in travel zones 1832 and 1844 travel to work via public transport with 48% traveling via train and 6% via bus. Table 16 shows the surveyed number of train and bus trips during the *2011 Census*. This equates to an additional 1695 train trips and 212 bus trips during the AM peak (7:00am-8:00am) and an additional 948 train trips and 118 bus trips during the PM peak (5:00pm-6:00pm).

Table 16: JTW train and bus trips

Destination	Train	Bus
Botany	0.8%	0%
Marrickville - Sydenham – Petersham	0.3%	0%
Sydney Inner City	66.5%	50.3%
Eastern Suburbs – North	0.7%	0%
Eastern Suburbs – South	0.8%	0%
Kogarah – Rockdale	0.4%	0%
Canada Bay	1.5%	0%
Leichhardt	0.3%	0%
Strathfield - Burwood – Ashfield	0.6%	0%
Chatswood - Lane Cove	7.2%	13.8%
Hornsby	0.3%	0%
Ku-ring-gai	0.8%	0%
North Sydney – Mosman	8.3%	31.0%
Manly	0.3%	4.8%
Warringah	0.4%	0%
Auburn	0.3%	0%
Merrylands – Guildford	0.4%	0%
Parramatta	1.1%	0%
Pennant Hills – Epping	0.7%	0%
Ryde - Hunters Hill	8.0%	0%
Fairfield	0.4%	0%

Source: BTS, 2011

These percentages have been applied to determine the destinations of the additional trips generated by the development (i.e. direction that the passengers will travel on the train services). It was found that 18% travel north and 82% travel south during the AM peak hour.

6.2.2 Train trips

All commuters travelling to work via train from these travel zones where the proposed developments are located are expected to use St Leonards Station which is served by the T1 North Shore Line, Northern Line and the Western Line. The frequency of each service during the AM and PM peak hours is shown in Table 17. It is assumed that each service will generate the same demand for trips during the AM peak hour. Trips were assigned to each service based on destination.

Table 17: Frequency of peak train services (southbound direction)

Line and destination	Train services per hour	
	AM peak	PM peak
North Shore Line	15	14
Penrith / Blacktown / Richmond via City		
Northern Line	4	4
Epping/Hornsby via City and Strathfield		
Total	**19**	**18**

Table 18: Frequency of peak train services (northbound direction)

Line and destination	Train services per hour	
	AM peak	PM peak
North Shore Line	10	12
Penrith / Blacktown / Richmond via City		
Northern Line	8	4
Epping/Hornsby via City and Strathfield		
Total	**18**	**16**

The expected trips generated for each service is calculated in Table 19. This has assumed an even distribution of trips generated across the peak hour.

Table 19: Expected train trips

Average person trips generated per service	Travelling northbound	Travelling southbound
AM peak hour	17	73
PM peak hour	43	11

Based on 8 carriages per train, the expected maximum amount of persons generated above is approximately 10 persons per carriage in the AM peak hour.

6.2.3 Bus trips

The frequency of services for bus routes connecting to the expected destination areas for commuters travelling from St Leonards during the AM peak hour (7:00am-8:00am) are listed in Table 20.

Table 20: Bus routes

Destination	Bus route	Frequency/ hour
Sydney Inner City	252	2
	254	1
	286	2
	290	4
	M20	6
	total	**15**
Chatswood – Lane Cove	143	2
	144	3
	200	2
	273	4
	total	**11**
North Sydney	200	3
	252	2
	254	1
	286	2
	287	3
	290	3
	612X	8
	622	2
	653	3
	total	**27**
Manly	143	2
	144	2
	total	**4**

The expected trips generated for each service is calculated in Table 21. It was assumed that each service will generate the same demand for trips during the AM peak hour.

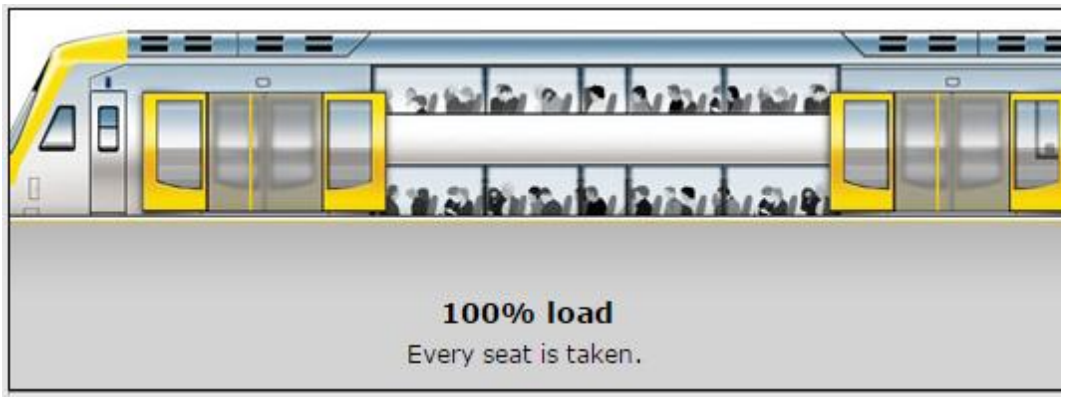
Table 21: Expected bus trips.

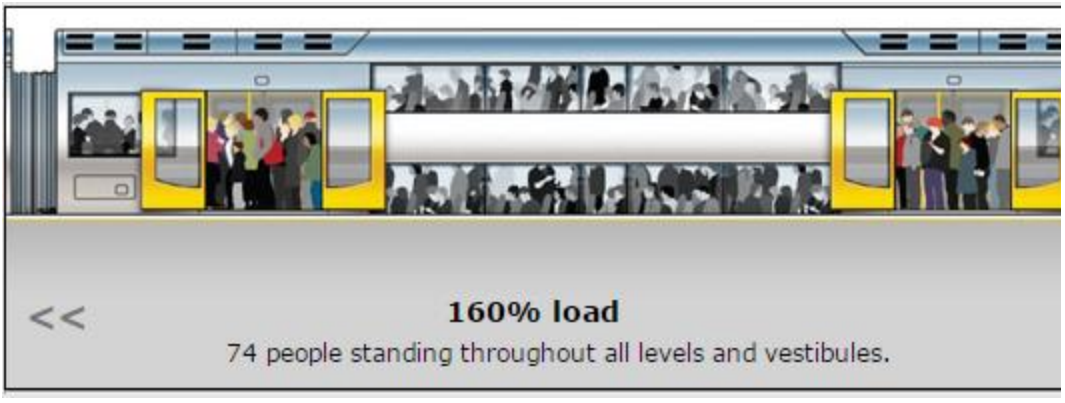
Destination	Total bus trips	Buses / hour	Average trips generated per bus service
Sydney Inner City	107	15	7
Chatswood	29	11	3
North Sydney	66	27	3
Manly	10	4	3
Total	**212**	**57**	

6.3 Public transport impacts

6.3.1 Train Capacity

Sydney Trains reports spare capacity on its trains on the T1 Northern, T1 North Shore and T1 Western Lines during the AM and PM peak periods. Percentages of train capacity are based on seated capacity and are shown below.





The report was last generated in March 2015 and measured at key stations including Wynyard, Milsons Point, North Sydney and Chatswood. It is assumed that these loads have been taken in the peak direction (i.e. towards City in the AM peak and away from the City in the PM peak).

The results of the train load surveys at each of these stations through the peak hours are shown for the North Shore Line in Figure 15 and Figure 16 and for the Northern Line in Figure 17 and Figure 18.

6.3.2 North Shore Line

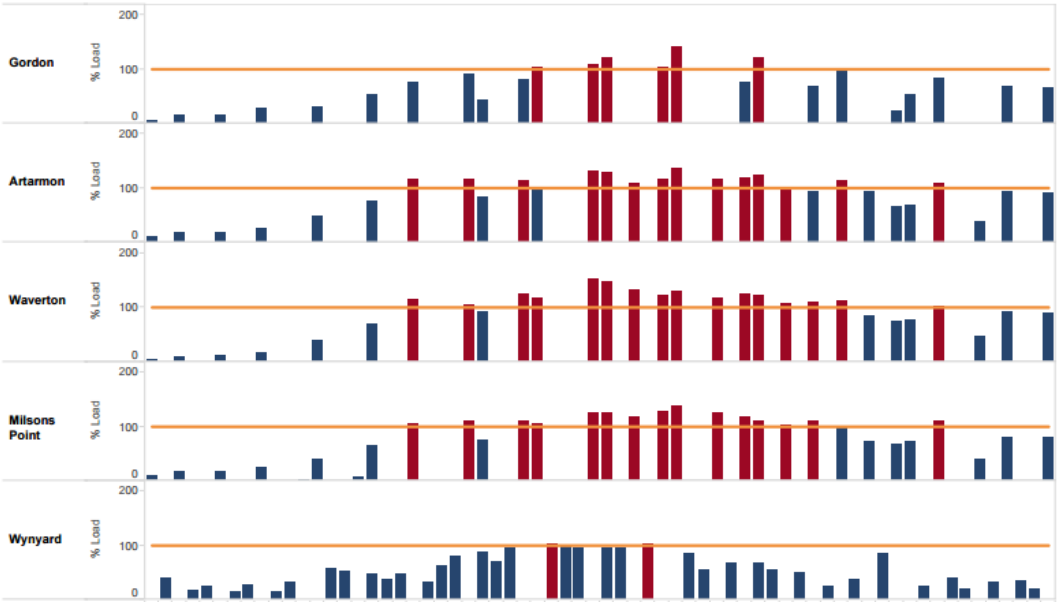


Figure 15: AM peak (North Shore Line)

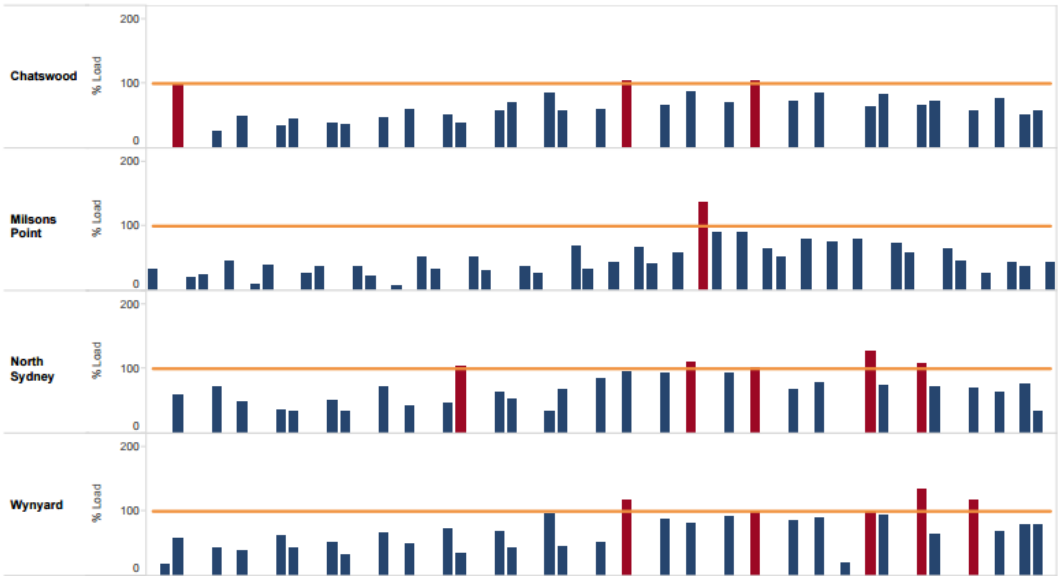


Figure 16: PM peak (North Shore Line)

6.3.3 Northern Line

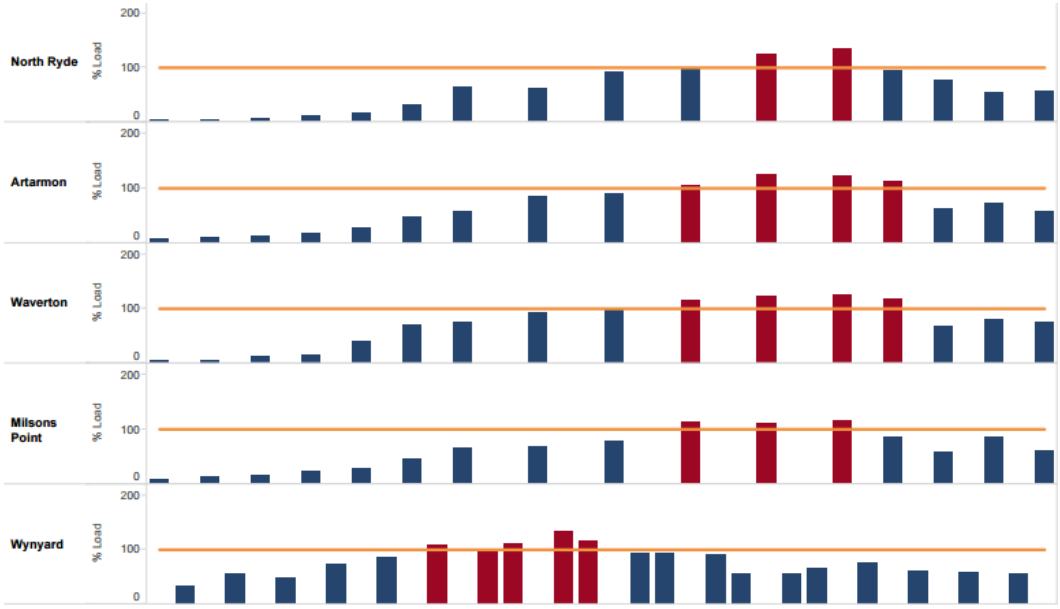


Figure 17: AM peak (Northern via Macquarie Park Line)

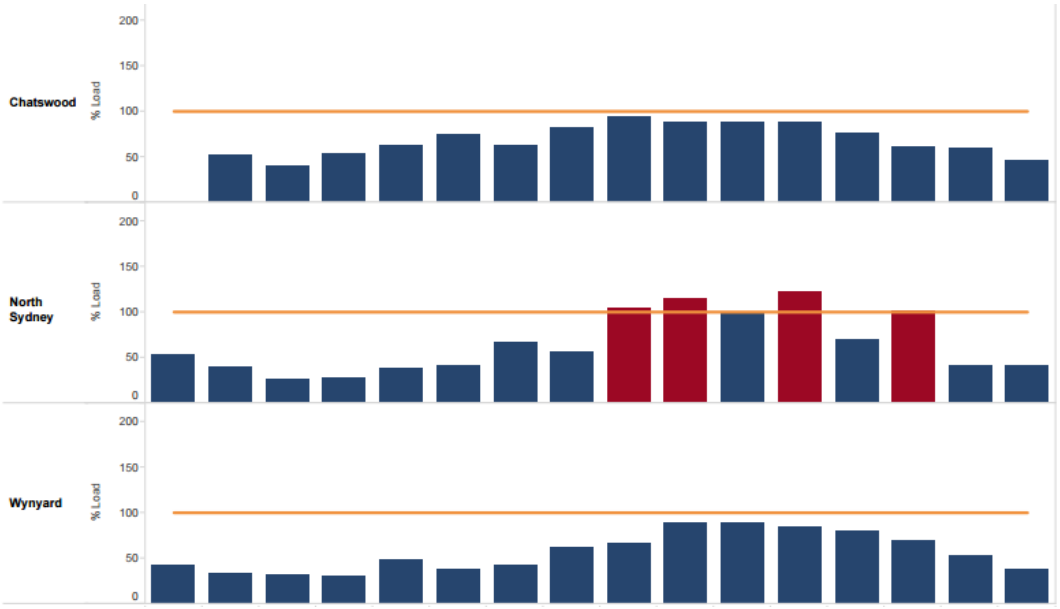


Figure 18: PM peak (Northern via Macquarie Park Line)

6.4 Train loading due to cumulative development

This data indicates that the majority of train services are over 100% seated capacity between Chatswood and Wynyard during the AM peak hour. The average load recorded at Milsons Point Station (closest on the line before the City) is approximately 111%. The service at 8:33am was the most congested, with loading at 138% recorded at Milsons Point; indicating a full service. It should be noted however that considerable capacity is available on services either before or after. The PM peak hour has similar readings leaving the City, however there is considerable scope to increase the frequency of these services.

As indicated by the train load surveys, the average load over the peak hour is approximately 111% at Milsons Point, indicating spare standing capacity on the majority of train services. This equates to an average of approximately 66 spare standing spaces per carriage. The development is expected to generate an additional 73 passengers per train (or approximately 10 passengers per carriage) towards the city during the AM peak.

Notably, the higher capacity readings are recorded at Milsons Point Station and there is additional train capacity available at St Leonards due to the proximity to the City. Therefore, impacts will more likely be felt at stations closer to the City as it is likely that persons from St Leonards will be able to board more easily (as trains were emptier further from the City). However, it is envisaged that if the train is full, then passengers will wait for the following service to the City. Given that there is enough spare capacity at Milsons Point to accommodate the proposed development, this should be a rare occurrence.

6.5 Bus loading due to cumulative development

Additionally, the developments are expected to generate an additional 212 bus trips in the AM Peak which results in 7 passengers per bus on services towards the Sydney CBD and 3 additional passengers per bus for services towards Manly and Chatswood. For trips towards the city, it is likely that additional bus services would be added to provide for increasing demand as development occurs over time.

6.5.1 Summary

The existing train services will provide adequate capacity for the additional train patronage resulting from the proposed levels of residential development in St Leonards. Bus services will be able to respond to growing demand and could attract some patronage from train as peak loadings increase.

7 Travel demand management

7.1 Green travel plan

A Green Travel Plan (GTP) is a tool to minimise the negative impact of private vehicle travel on the environment. The Plan is a package of measures put in place to encourage more sustainable travel. GTP describes ways in which the use of sustainable transport may be encouraged. Using public transport, cycling, walking, working from home, carpooling, making business vehicles more fuel efficient and the use alternative fuels are all more sustainable means of transport than single occupant driving. A Green Travel Plan framework document is attached as Appendix C.

More generally, the principles of a GTP are applied to all people travelling to and from a site. The main objectives of the Green Travel Plan are to reduce the need to travel and promotion of sustainable means of transport.

The more specific objectives include:

- To reduce the level of single occupancy car borne trips associated with commuting.
- To facilitate the sustainable and safe travel of visitors to the site.
- To reduce site traffic congestion and associated pollution in order to enhance, improve and make safe journeys of minority/sustainable transport mode users.
- To work in partnership with neighbouring organisations/developments, local authorities, retailers and other relevant bodies in achieving the maximum mode shift away from the private car.
- To continually develop, implement, monitor, evaluate and review the progress of the travel plan strategy.
- To facilitate all residents' access to key facilities such as retail, leisure, health and education.

7.2 Green Travel Plan Measures

In order to meet the objectives and targets of the Green Travel Plan, the following physical and management measures should be implemented.

- Travel packs
- General marketing and promotion
- Car sharing
- Alternatives to travel during the day
- Cycling
- Public transport
- Walking
- Residents' travel plan group

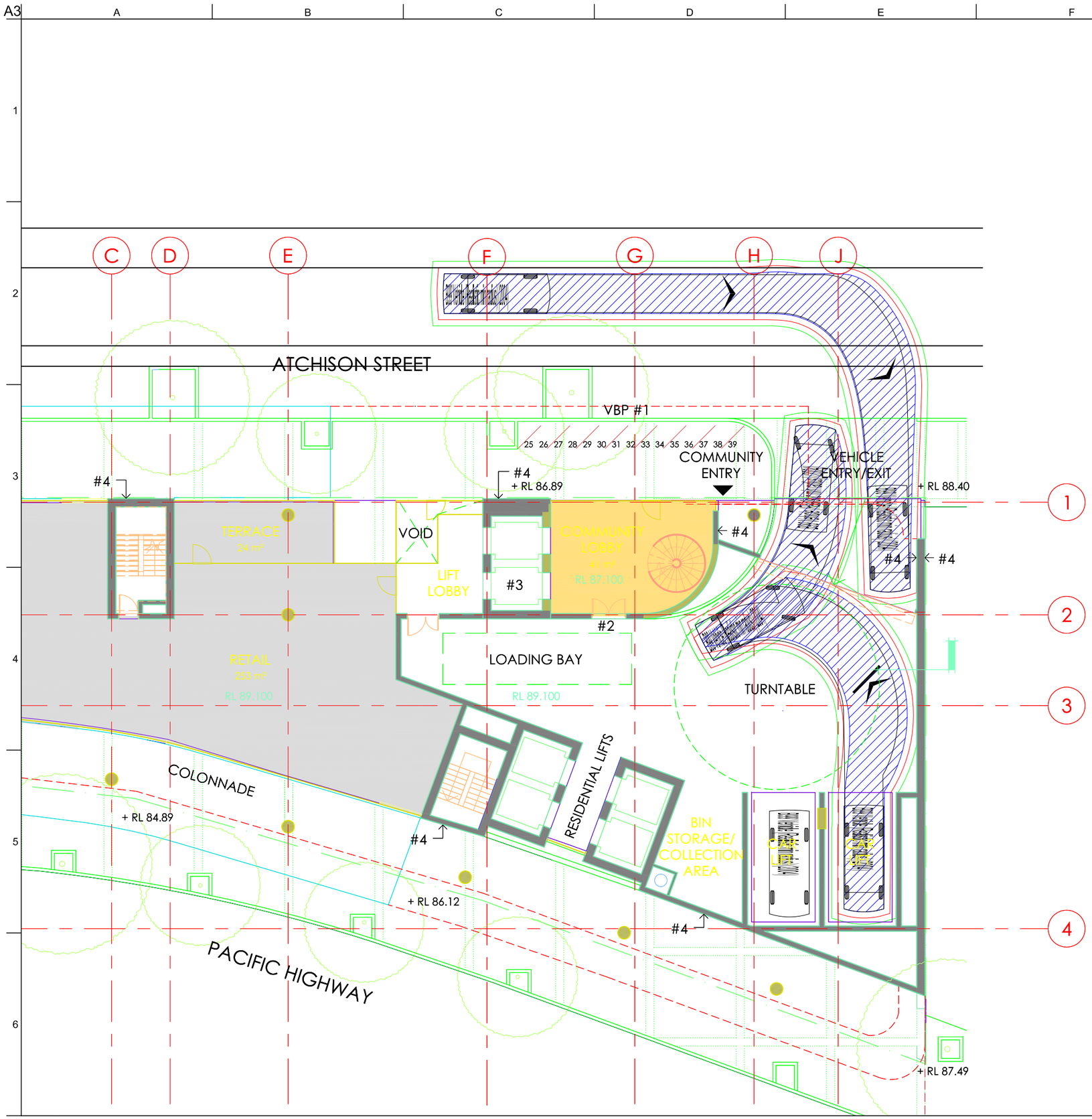
8 Conclusion

This review has described the potential traffic and transport impacts of the proposed conceptual mixed use development at 617 – 621 Pacific Highway, St Leonards. Key findings of the review are as follows:

- The site is located within the commercial core of St Leonards, parking in this area is restricted discouraging residents from parking on-street;
- A total of 80 off-street parking bays, inclusive of carshare (with accessible parking provision) are proposed. The development is located within 100m of various modes of St Leonards Station and bus stops thus the development is expected to not generate a large parking demand;
- Based on the traffic distribution and generation assumptions, the analysis indicates that the increase in traffic is negligible and is not envisaged to affect the existing intersection performances adversely;
- The proposed car lifts are sufficient to service the arrival and departure rate of vehicles;
- The development would be responsible for a small increase in peak hour traffic flows along surrounding key roads. Due to the small increase in development traffic, it is expected that surrounding key roads will continue to operate in the same way;
- Secure bicycle parking is to be provided as a component of the proposed development; and
- Travel demand management measures have been suggested to improve the mode share of public transport and active transport.

Appendix A

Vehicle Turning Paths



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- 600mm Envelope
- Wheel Envelope

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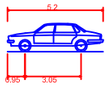

B99 Car

Overall Length	5.200m
Overall Width	1.940m
Overall Body Height	1.527m
Min Body Ground Clearance	0.312m
Track Width	1.840m
Lock to Lock Time	4.00 sec
Curb to Curb Turning Radius	6.250m

Issue	Date	By	Chkd	Appd
F	09/12/16	RW	JT	AH
	Proposed plans			
E	07/11/16	RW	JT	AH
	Proposed plans			
D	27/10/16	RW	JT	AH
	Updated plans			
C	30/05/16	JT	AH	AH
	Updated plans			
B	18/02/16	JT	JT	AH
	For Information			
A	18/12/15	JL	JT	AH
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Client
KANNFINCH

Job Title
617-621 Pacific Highway
St Leonards

Drawing Title
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Modified layout

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1:200

Discipline
Transport

Drawing Status
Draft

Job No	Drawing No	Issue
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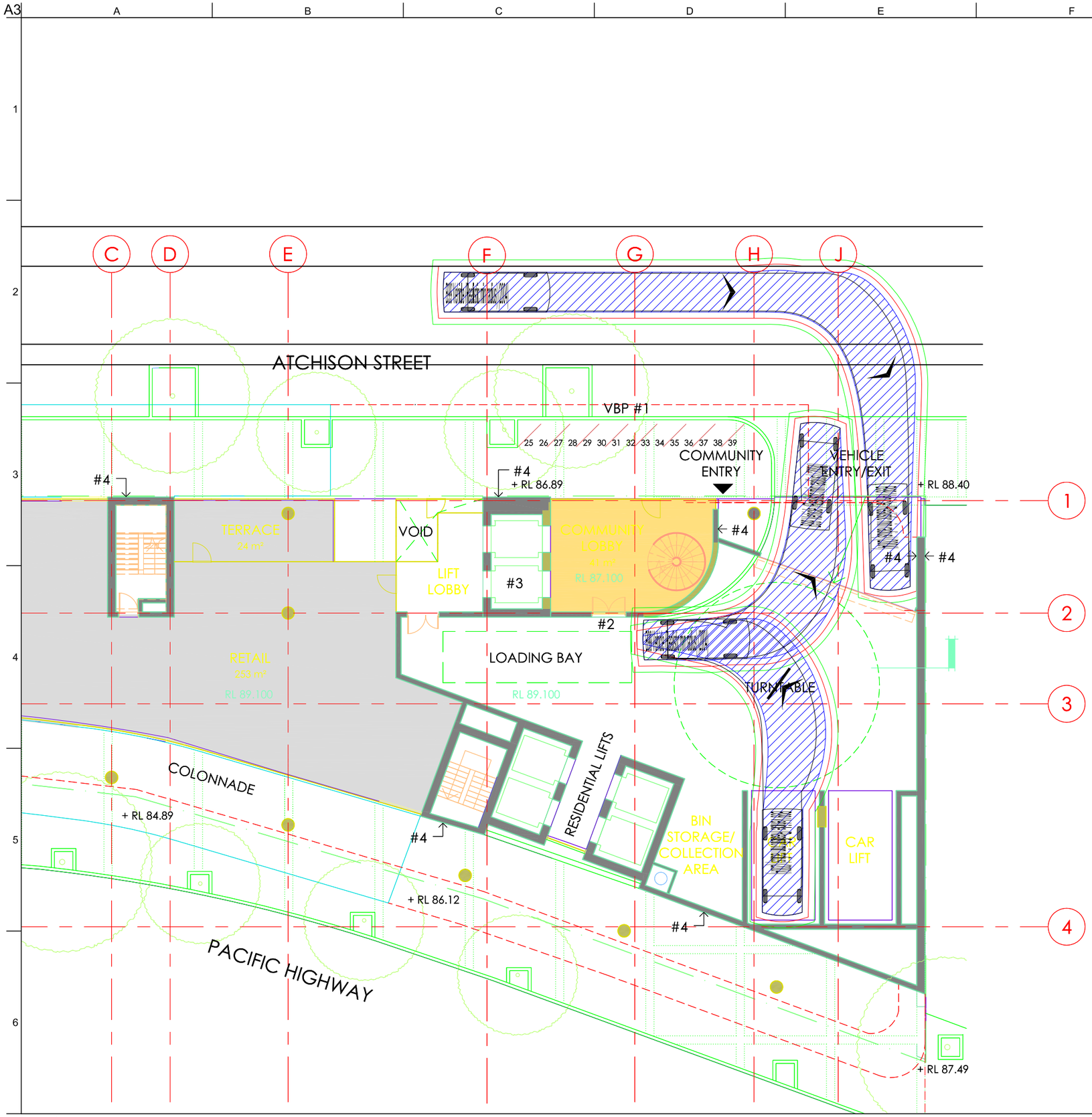

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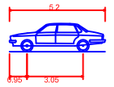
Design Vehicle(s)



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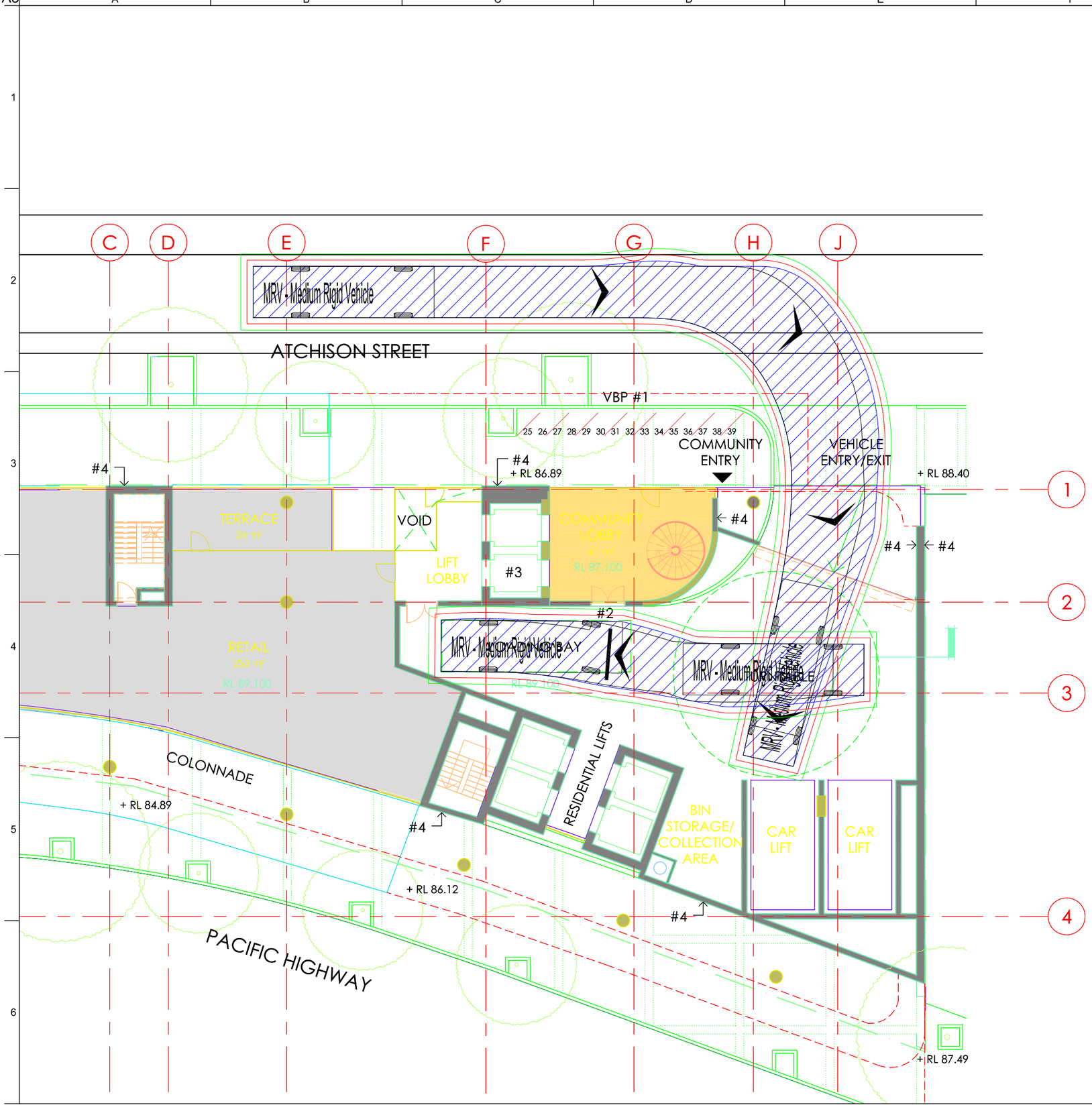

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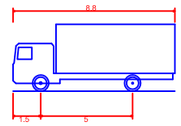

MRV - Medium Rigid Vehicle

Overall Length	8.800m
Overall Width	2.500m
Overall Body Height	3.633m
Min Body Ground Clearance	0.428m
Track Width	2.500m
Lock to Lock Time	4.00 sec
Curb to Curb Turning Radius	10.000m

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Job No	Drawing No	Issue
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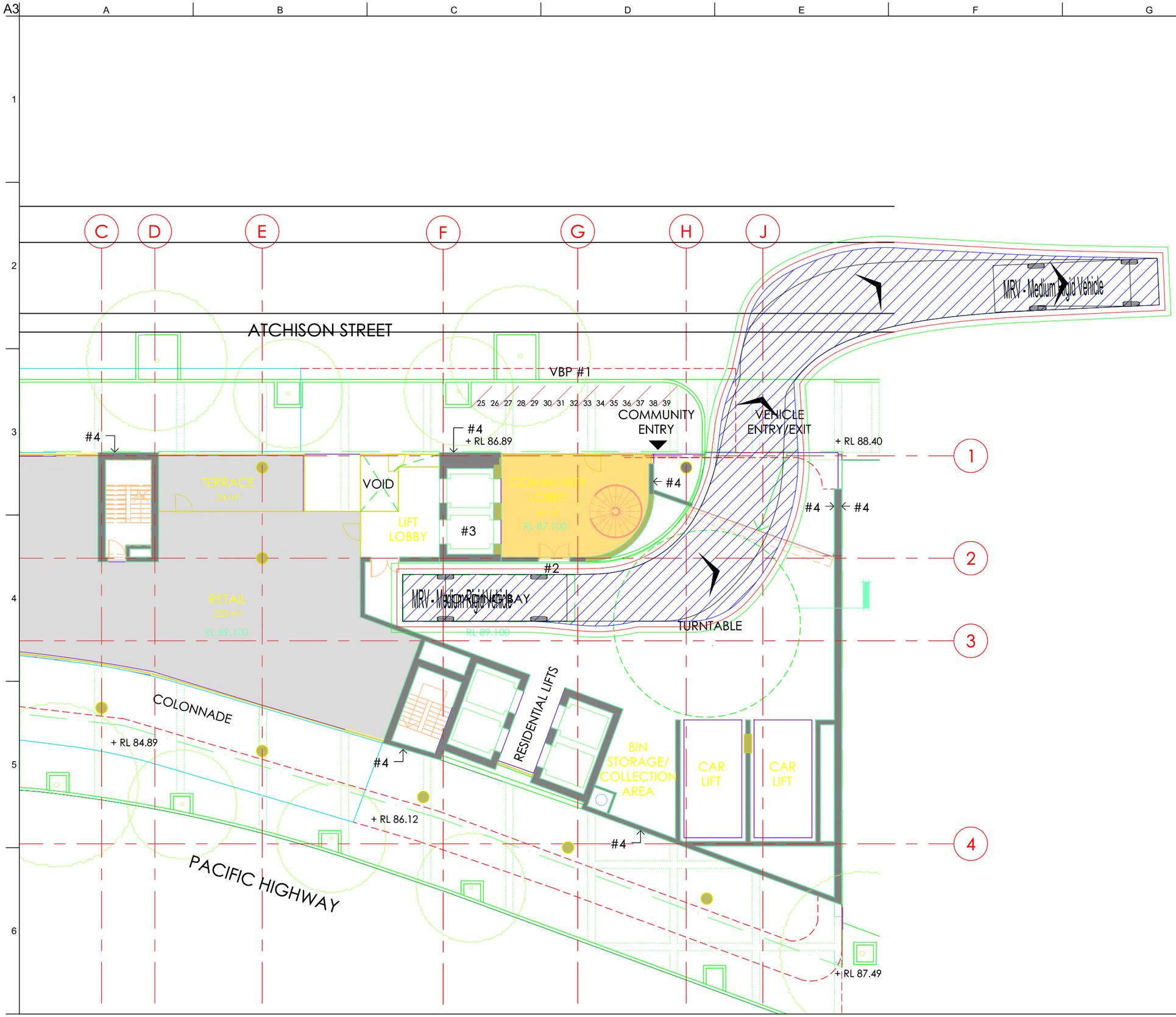

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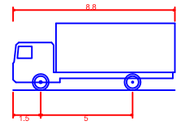
- Wheel Envelope

Design Vehicle(s)



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Job No	Drawing No	Issue
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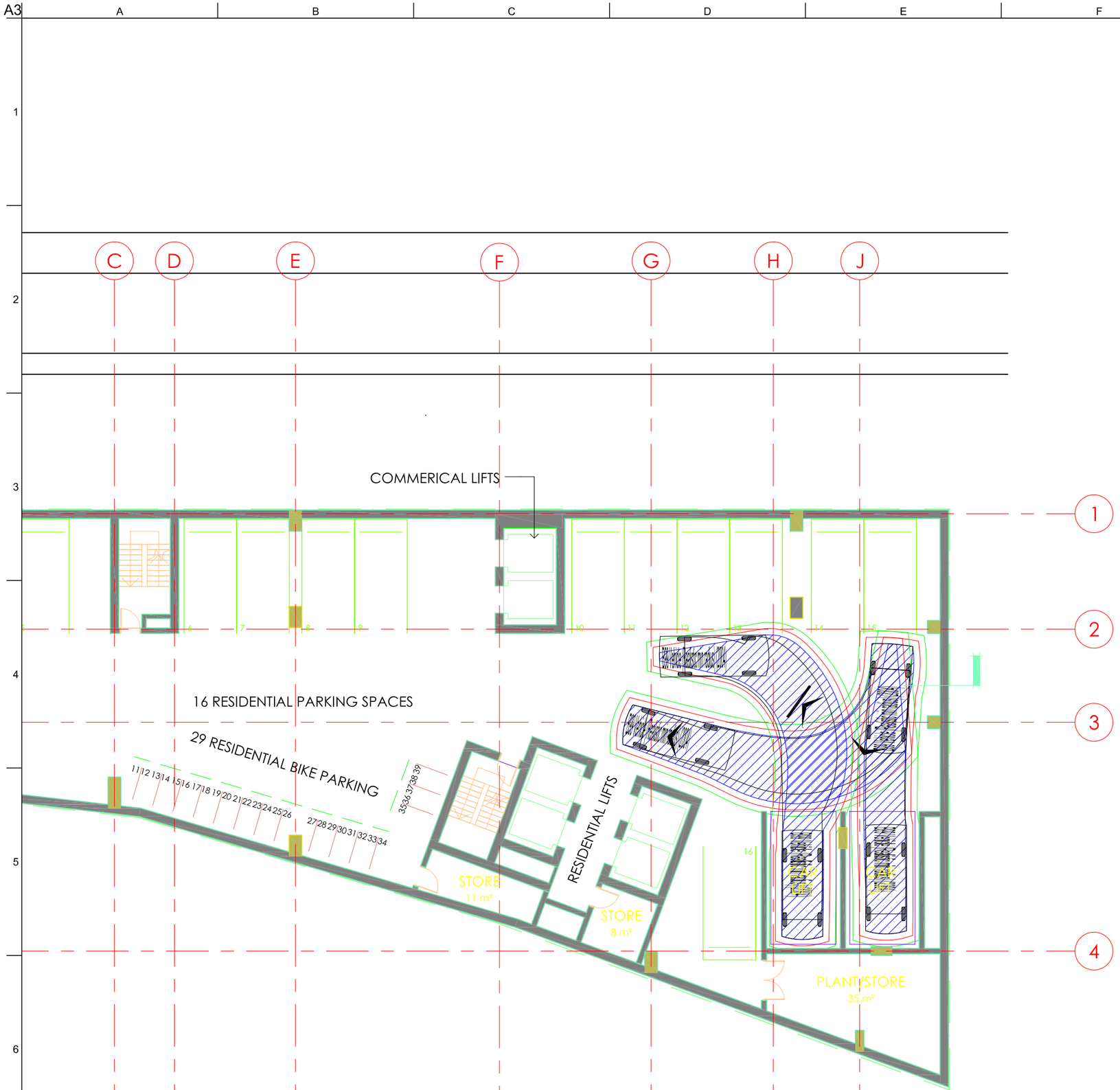

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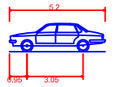

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Job No	Drawing No	Issue
247097	**SKT018**	**F**

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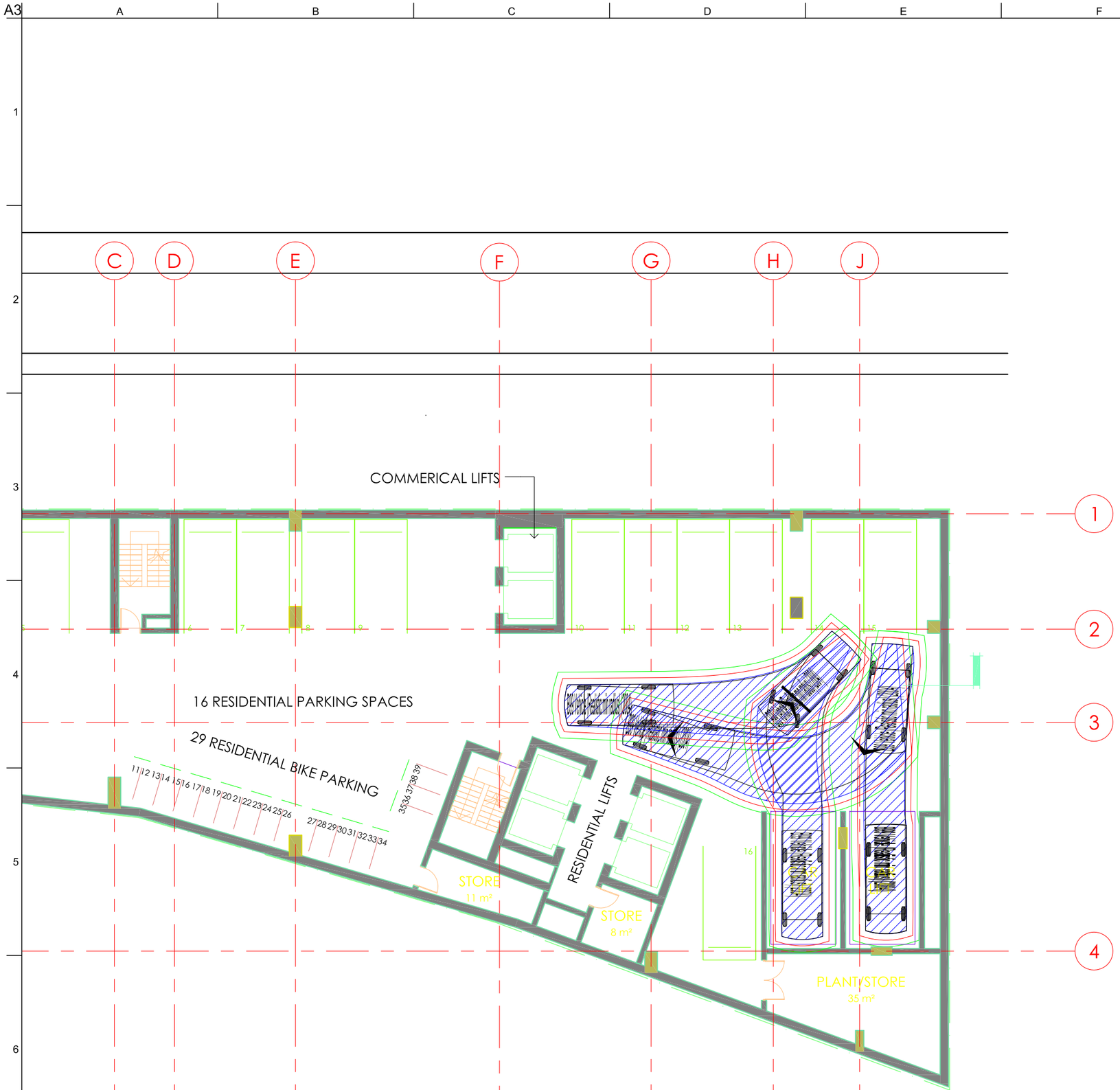

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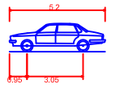
Design Vehicle(s)



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Job No	Drawing No	Issue
247097	**SKT019**	**F**

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Appendix B

Elevate Lift Simulation

ANALYSIS DATA

Analysis Type	Simulation
Measurement system	Metric
Dispatcher Algorithm	Group Collective Traffic mode: Normal
Time slice between simulation calculations (s)	0.10
No of time slices between screen updates	10
No of simulations to run for each configuration	5
Random number seed for passenger generator	1
Energy Model	Off

BUILDING DATA

Floor Name	Floor Height (m)	No of people	Area (m²)	Area/person	Entrance Floor
G	3.80	0	-	-	Yes
B1	3.00	6	-	-	No
B2	3.00	3	-	-	No
B3	3.00	3	-	-	No
B4	3.00	3	-	-	No
B5		3	-	-	No

Absenteeism (%)	0.00

ELEVATOR DATA

No of Elevators	2
Type	Single Deck
Capacity (kg)	2800
Car area (m²)	5.41
Door Pre-opening Time (s)	0.00
Door Open Time (s)	8.00
Door Close Time (s)	8.00
Door Dwell 1 (s)	10.00
Door Dwell 2 (s)	10.00
Speed (m/s)	0.50
Acceleration (m/s²)	0.50
Jerk (m/s³)	0.50
Start Delay (s)	1.50
Levelling Delay (s)	1.00
Home Floor	G

PASSENGER DATA

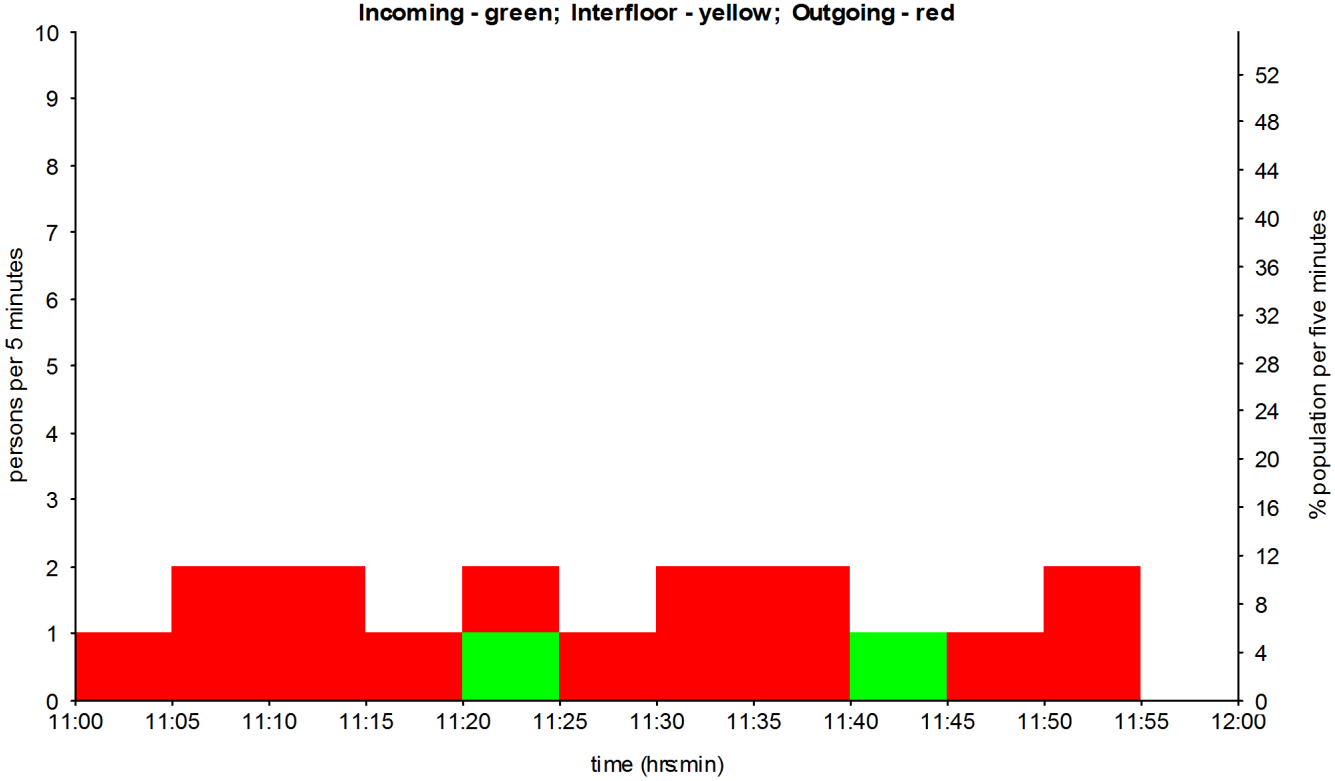
Arrangement	Conventional for Single Deck elevators
Template	Constant traffic (% building pop per 5 mins)
Demand (% pop per 5 mins)	10.00
Incoming (%)	38.00
Outgoing (%)	62.00
Interfloor (%)	0.00
Start Time (hrs:mins)	11:00
End Time (hrs:mins)	12:00
Passenger Mass (kg)	2000
Passenger Area (m²)	0.00
Loading Time (s)	12.00
Unloading Time (s)	6.00
Stair Factor (%)	0.00
Capacity Factor by Mass (%)	80.00
Capacity Factor by Area (%)	100.00

Floor Name	Entrance Bias
G	100.00

2 No. 2800 kg elevators @ 0.50 m/s
Average of all runs

Total Passenger Activity

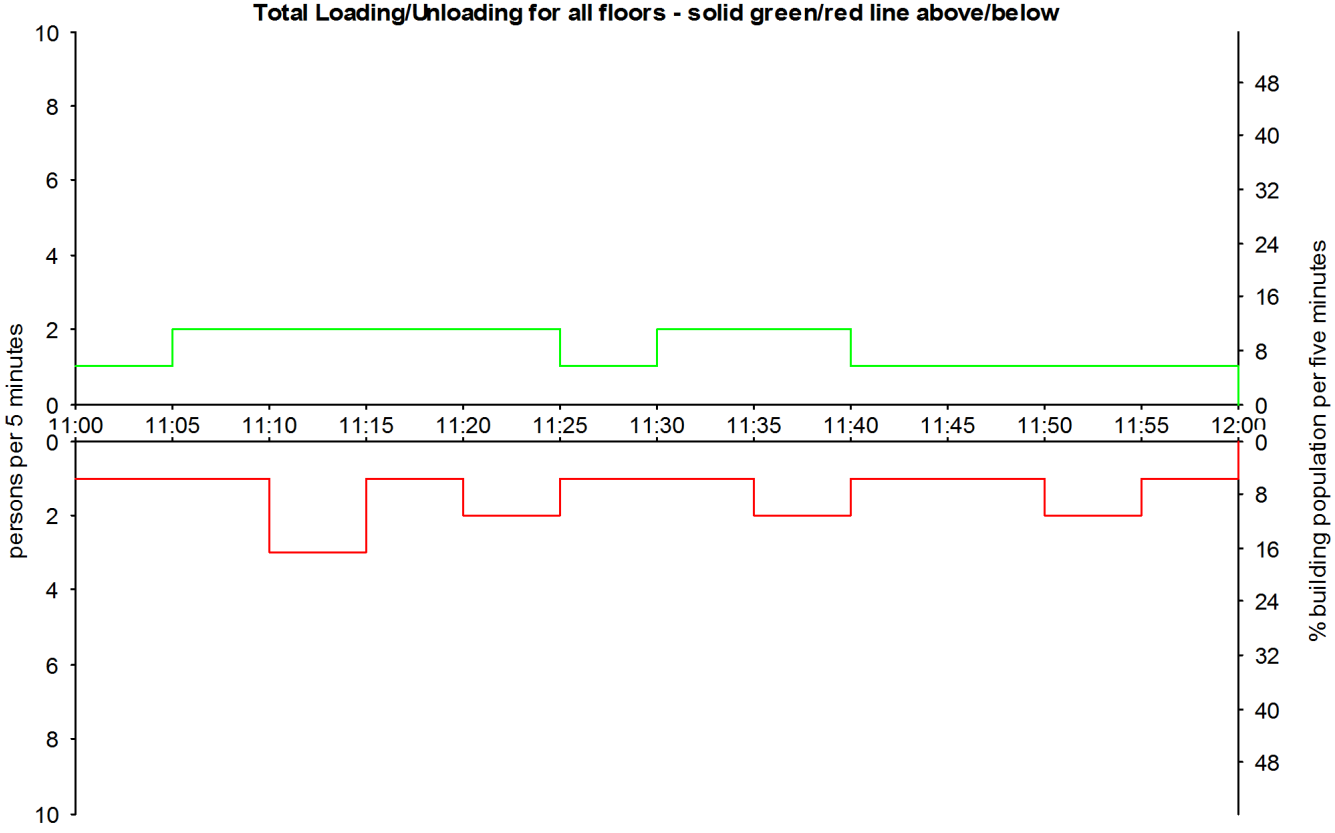
Incoming - green; Interfloor - yellow; Outgoing - red



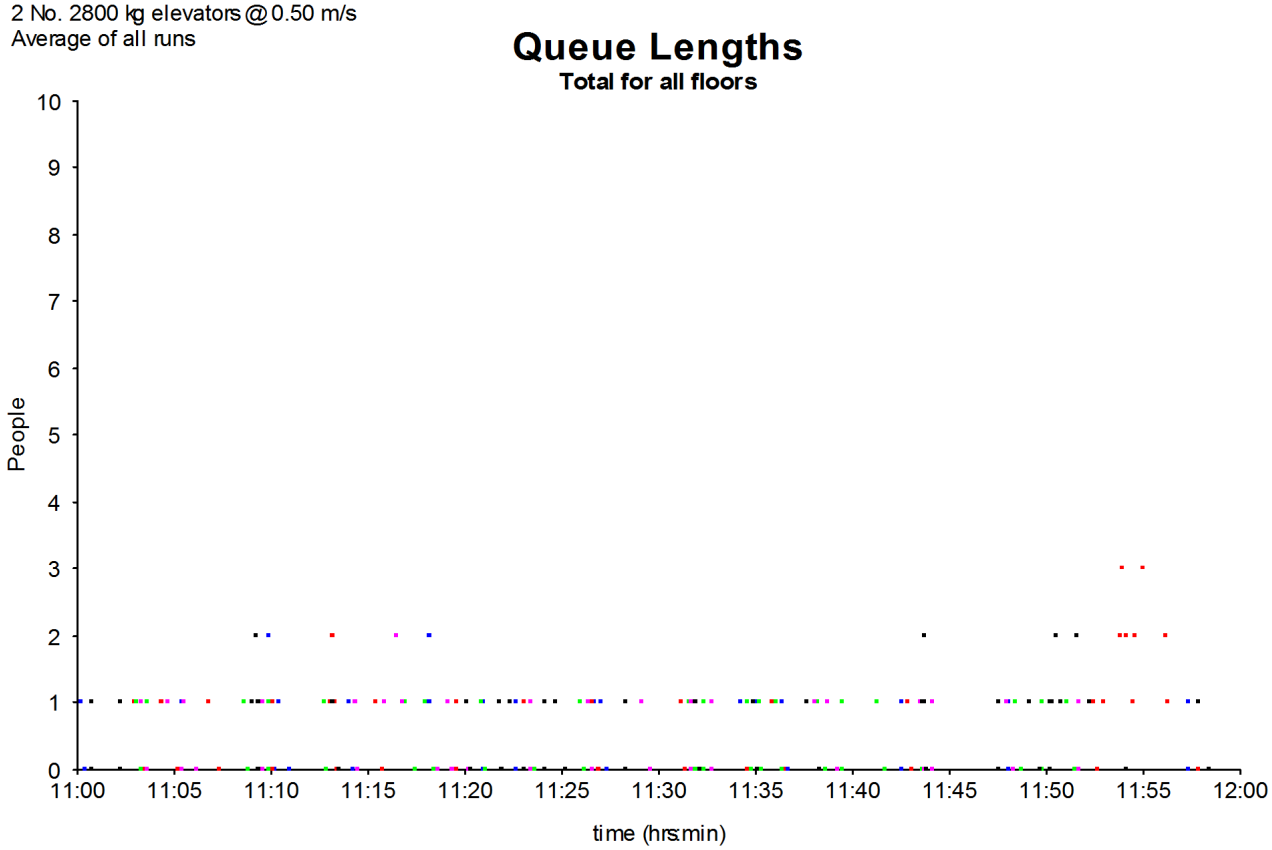
2 No. 2800 kg elevators @ 0.50 m/s
Average of all runs

Passenger Transfer by Floor

Total Loading/Unloading for all floors - solid green/red line above/below

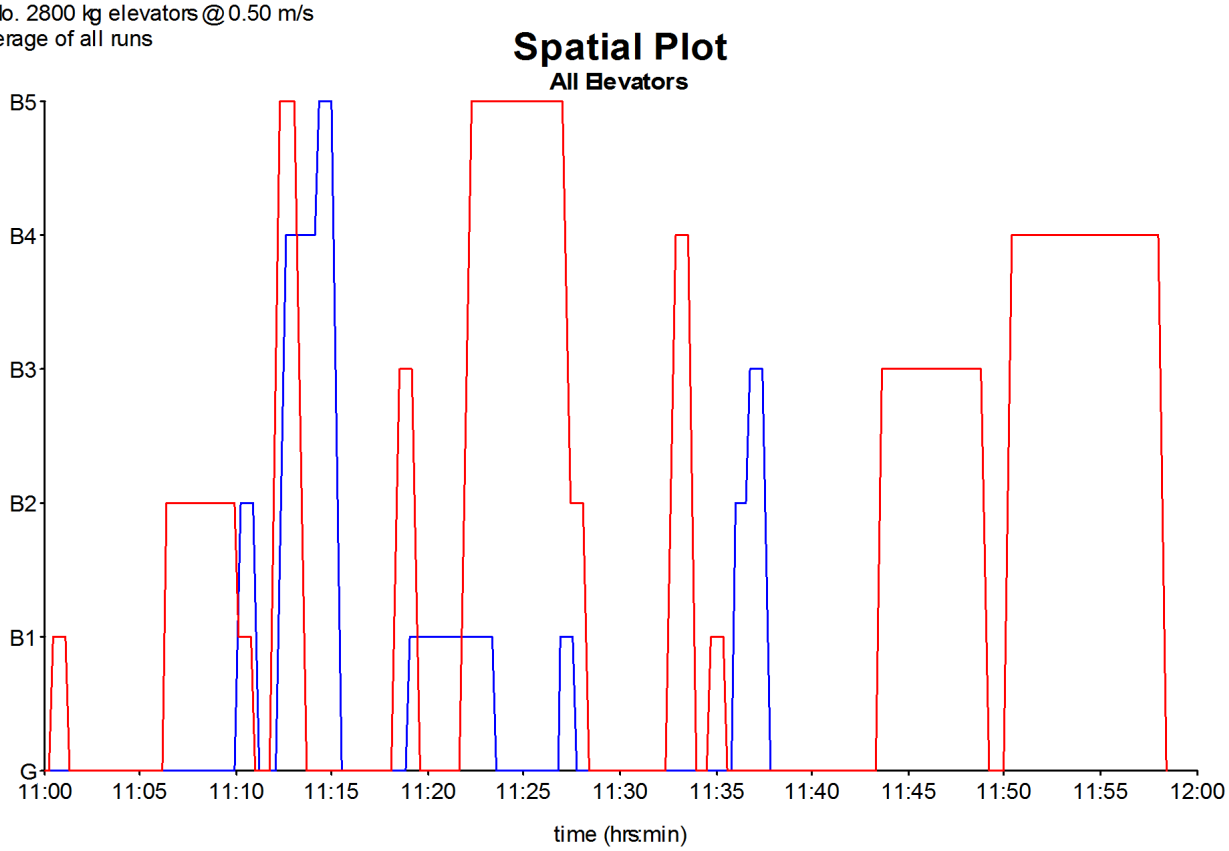


2 No. 2800 kg elevators @ 0.50 m/s
Average of all runs



No average of Queue Length so results for all runs plotted together

2 No. 2800 kg elevators @ 0.50 m/s
Average of all runs

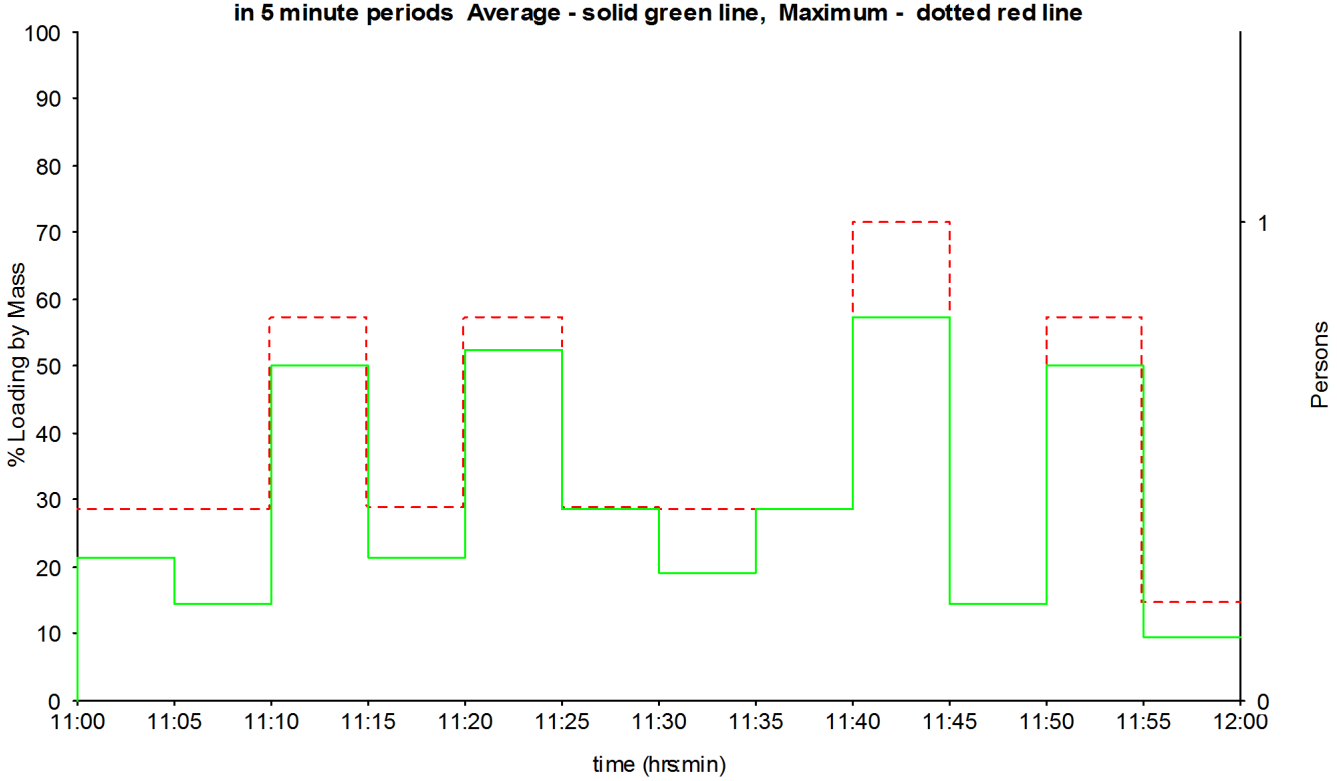


No average of Spatial Plots available, so using Run 1

2 No. 2800 kg elevators @ 0.50 m/s
Average of all runs

Car Loading on Departure from Home Floor

in 5 minute periods Average - solid green line, Maximum - dotted red line

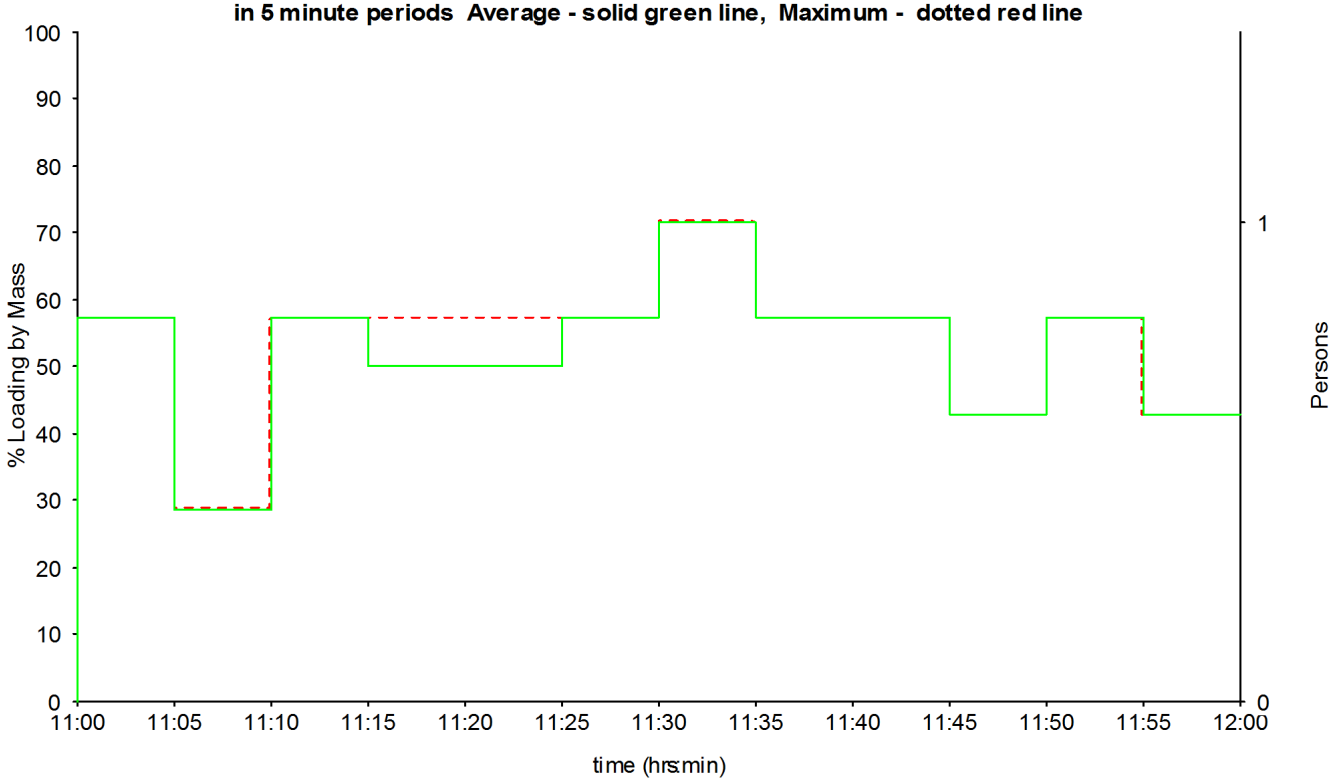


Worst Average Capacity Factor by Area during any 5 min period (%) 0.0

2 No. 2800 kg elevators @ 0.50 m/s
Average of all runs

Car Loading on Arrival at Home Floor

in 5 minute periods Average - solid green line, Maximum - dotted red line

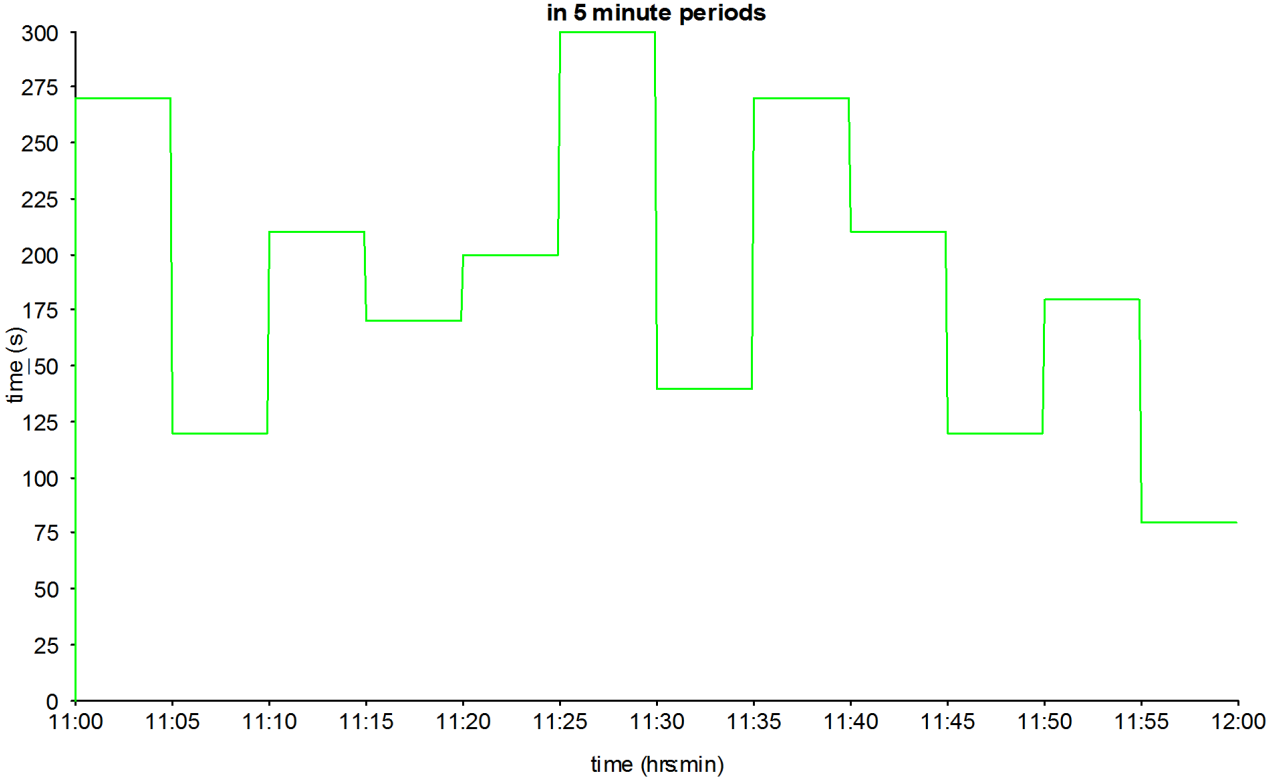


Worst Average Capacity Factor by Area during any 5 min period (%) 0.0

2 No. 2800 kg elevators @ 0.50 m/s
Average of all runs

Dispatch Interval from Home Floor

in 5 minute periods

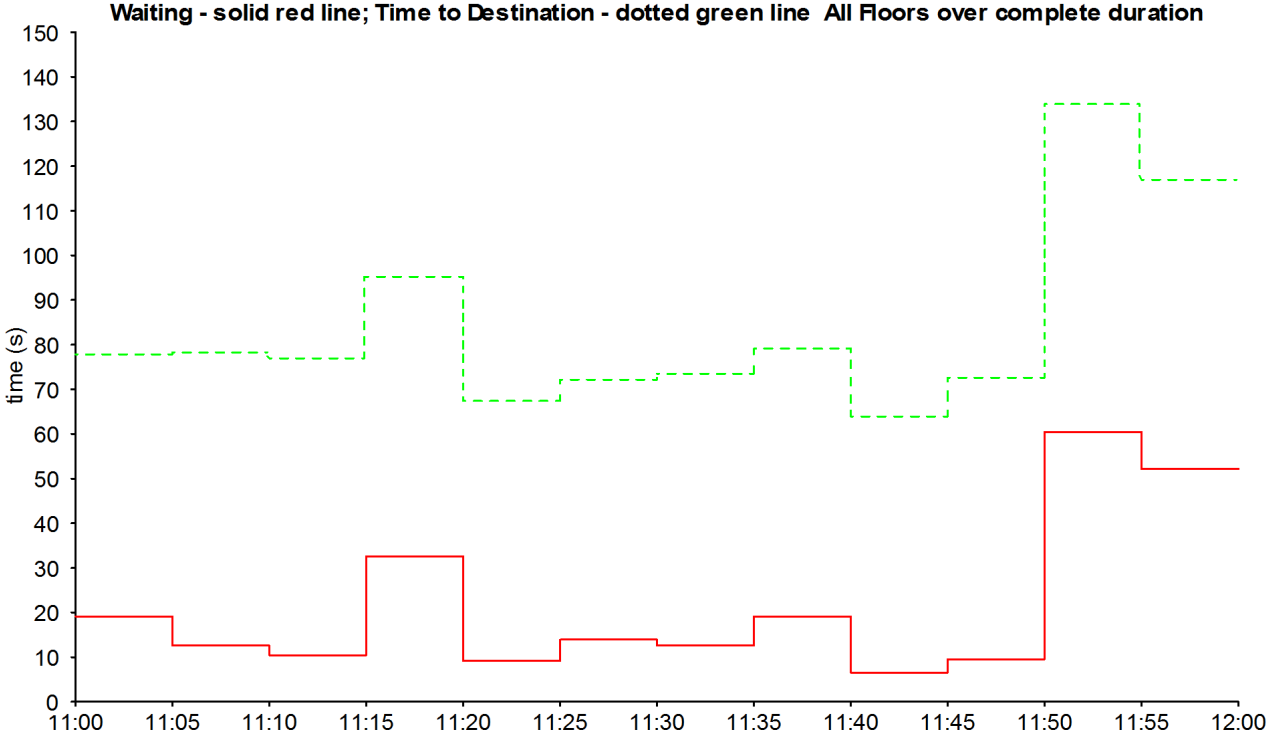


Average Interval 234.8 s (+22.4/-23.0)

2 No. 2800 kg elevators @ 0.50 m/s
Average of all runs

Average Waiting and Time to Destination

Waiting - solid red line; Time to Destination - dotted green line All Floors over complete duration



Worst Average Waiting Time during any 5 min period (s) 60.1
Worst Average Transit Time during any 5 min period (s) 73.8

ANALYSIS DATA

Analysis Type	Simulation
Measurement system	Metric
Dispatcher Algorithm	Group Collective Traffic mode: Normal
Time slice between simulation calculations (s)	0.10
No of time slices between screen updates	10
No of simulations to run for each configuration	5
Random number seed for passenger generator	1
Energy Model	Off

BUILDING DATA

Floor Name	Floor Height (m)	No of people	Area (m²)	Area/person	Entrance Floor
G	3.80	0	-	-	Yes
B1	3.00	0	-	-	No
B2	3.00	4	-	-	No
B3	3.00	4	-	-	No
B4	3.00	4	-	-	No
B5		4	-	-	No

Absenteeism (%)	0.00

ELEVATOR DATA

No of Elevators	2
Type	Single Deck
Capacity (kg)	2800
Car area (m²)	5.41
Door Pre-opening Time (s)	0.00
Door Open Time (s)	8.00
Door Close Time (s)	8.00
Door Dwell 1 (s)	10.00
Door Dwell 2 (s)	10.00
Speed (m/s)	0.50
Acceleration (m/s²)	0.50
Jerk (m/s³)	0.50
Start Delay (s)	1.50
Levelling Delay (s)	1.00
Home Floor	G

PASSENGER DATA

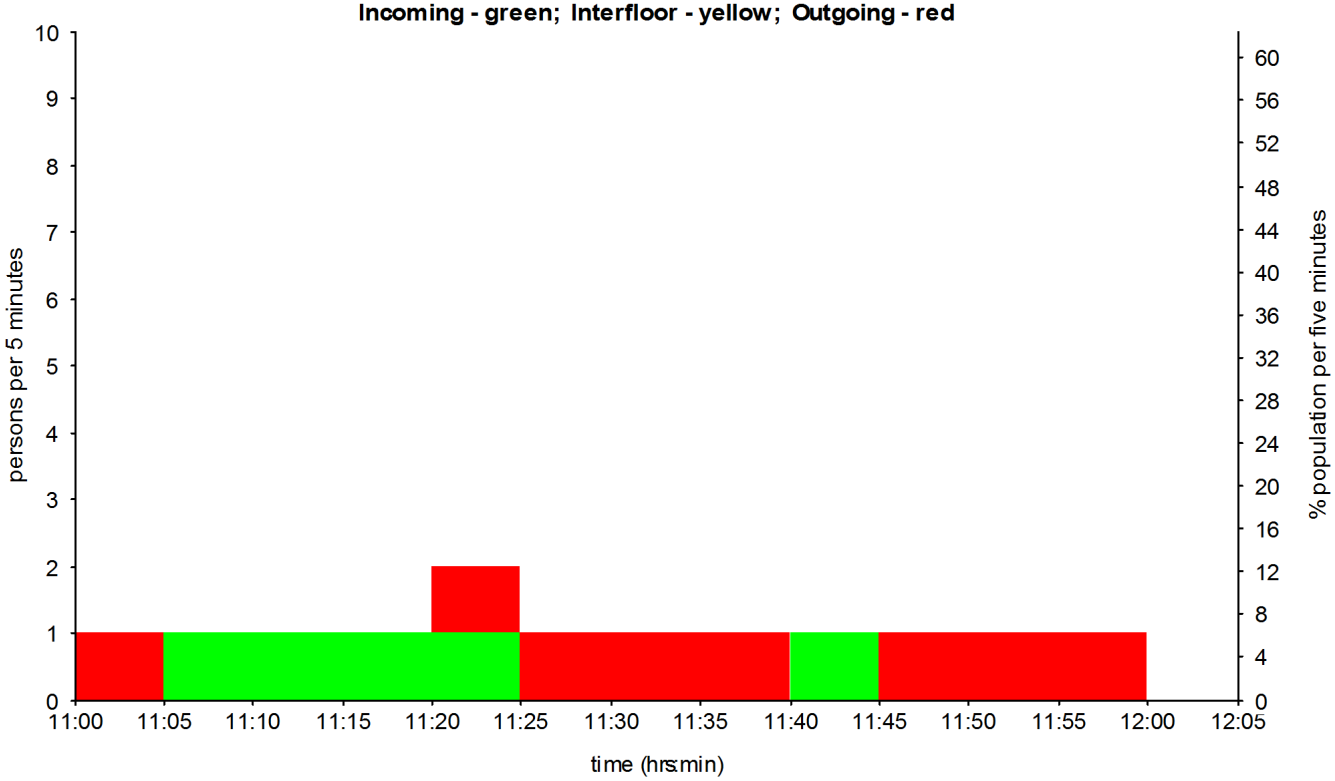
Arrangement	Conventional for Single Deck elevators
Template	Constant traffic (% building pop per 5 mins)
Demand (% pop per 5 mins)	10.00
Incoming (%)	50.00
Outgoing (%)	50.00
Interfloor (%)	0.00
Start Time (hrs:mins)	11:00
End Time (hrs:mins)	12:00
Passenger Mass (kg)	2000
Passenger Area (m²)	0.00
Loading Time (s)	12.00
Unloading Time (s)	6.00
Stair Factor (%)	0.00
Capacity Factor by Mass (%)	80.00
Capacity Factor by Area (%)	100.00

Floor Name	Entrance Bias
G	100.00

2 No. 2800 kg elevators @ 0.50 m/s
Average of all runs

Total Passenger Activity

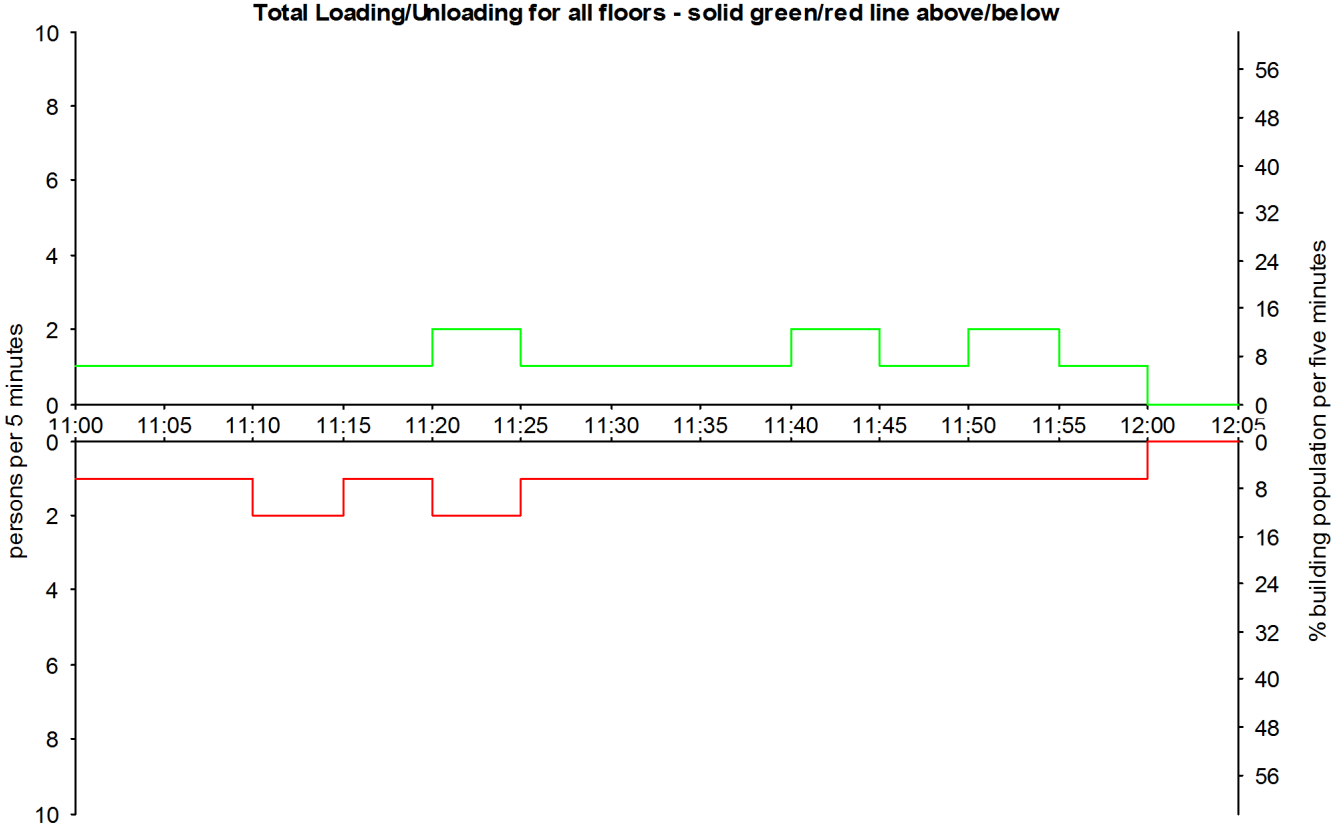
Incoming - green; Interfloor - yellow; Outgoing - red



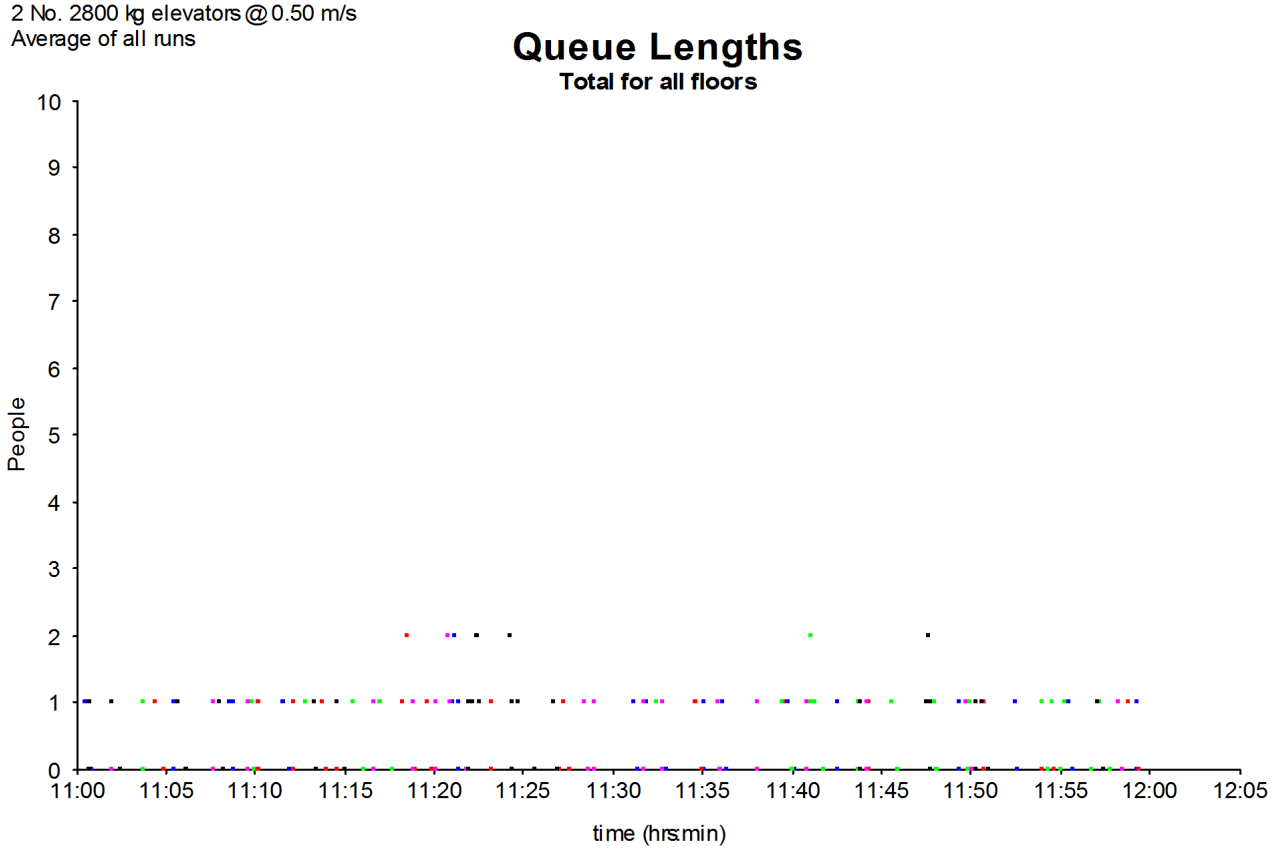
2 No. 2800 kg elevators @ 0.50 m/s
Average of all runs

Passenger Transfer by Floor

Total Loading/Unloading for all floors - solid green/red line above/below

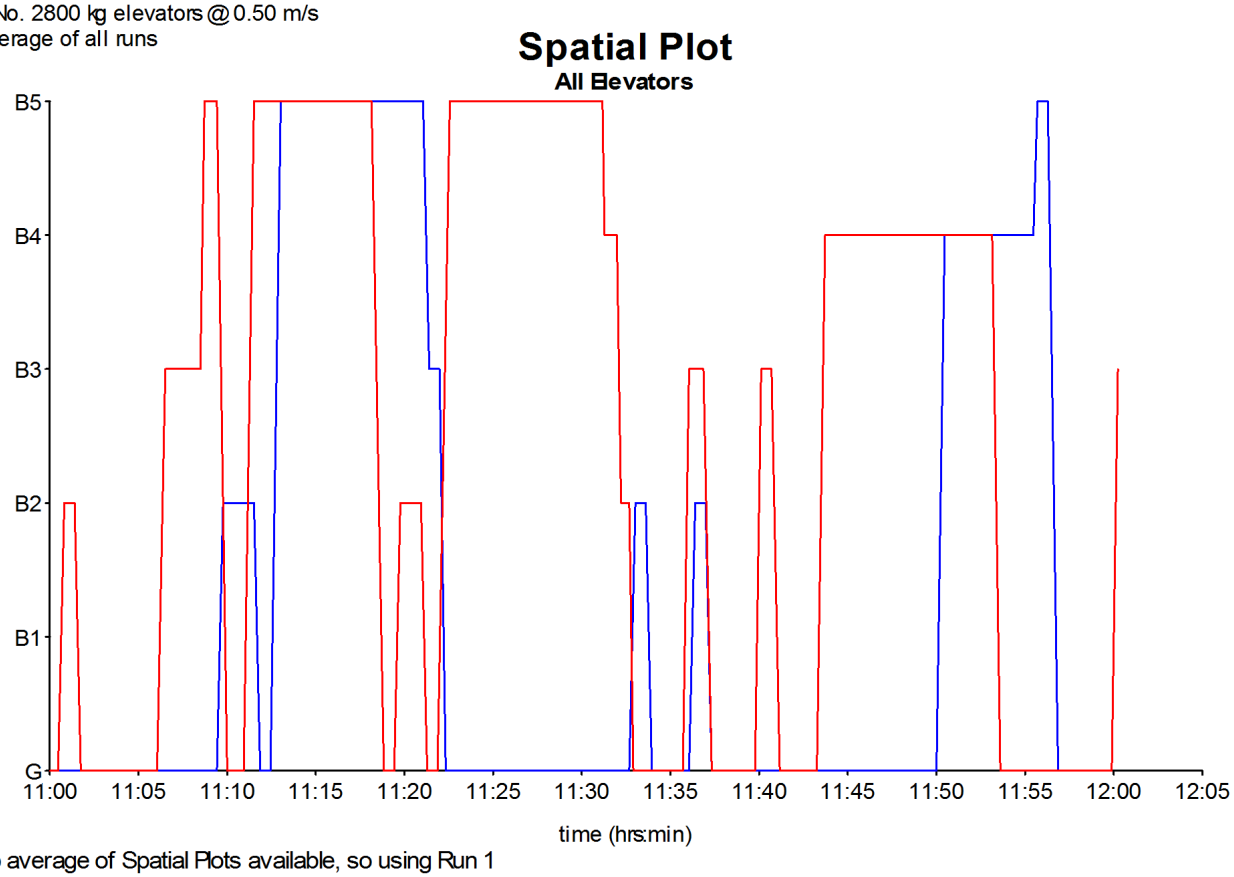


2 No. 2800 kg elevators @ 0.50 m/s
Average of all runs



No average of Queue Length so results for all runs plotted together

2 No. 2800 kg elevators @ 0.50 m/s
Average of all runs

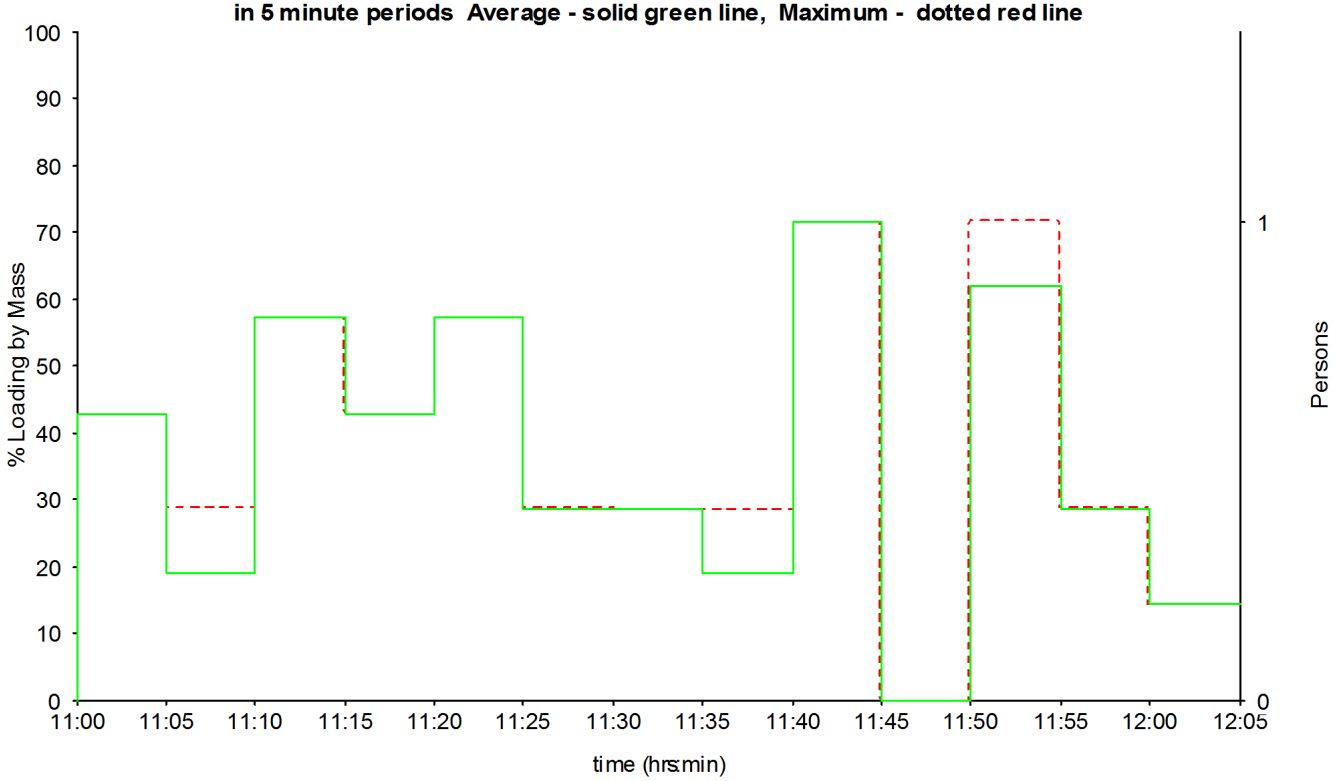


No average of Spatial Plots available, so using Run 1

2 No. 2800 kg elevators @ 0.50 m/s
Average of all runs

Car Loading on Departure from Home Floor

in 5 minute periods Average - solid green line, Maximum - dotted red line

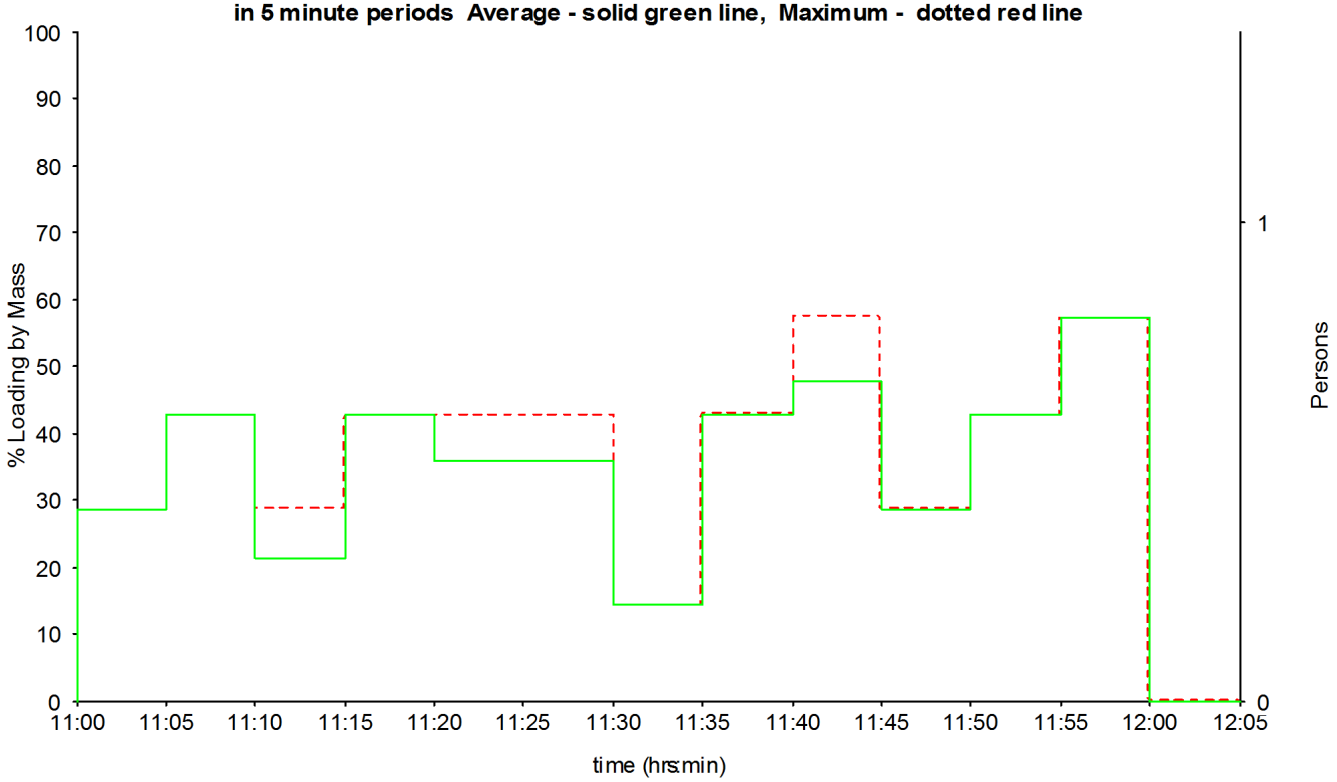


Worst Average Capacity Factor by Area during any 5 min period (%) 0.0

2 No. 2800 kg elevators @ 0.50 m/s
Average of all runs

Car Loading on Arrival at Home Floor

in 5 minute periods Average - solid green line, Maximum - dotted red line

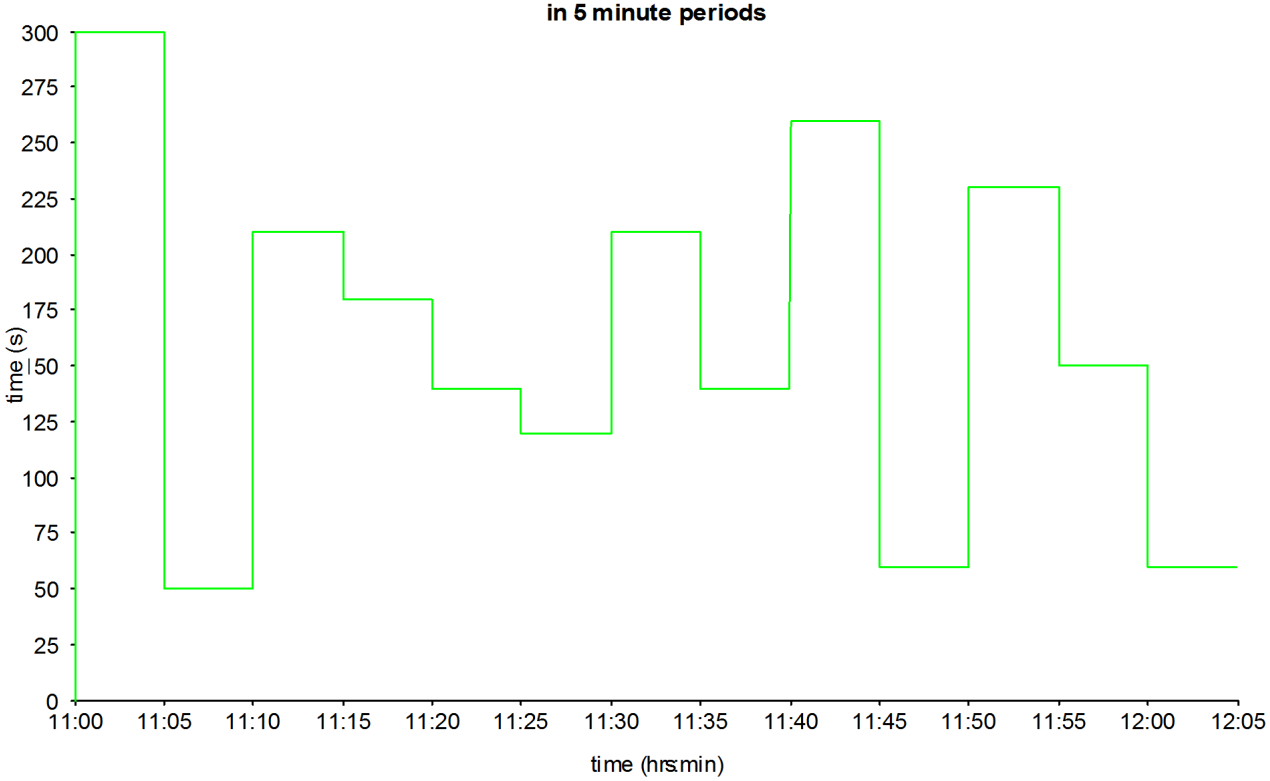


Worst Average Capacity Factor by Area during any 5 min period (%) 0.0

2 No. 2800 kg elevators @ 0.50 m/s
Average of all runs

Dispatch Interval from Home Floor

in 5 minute periods

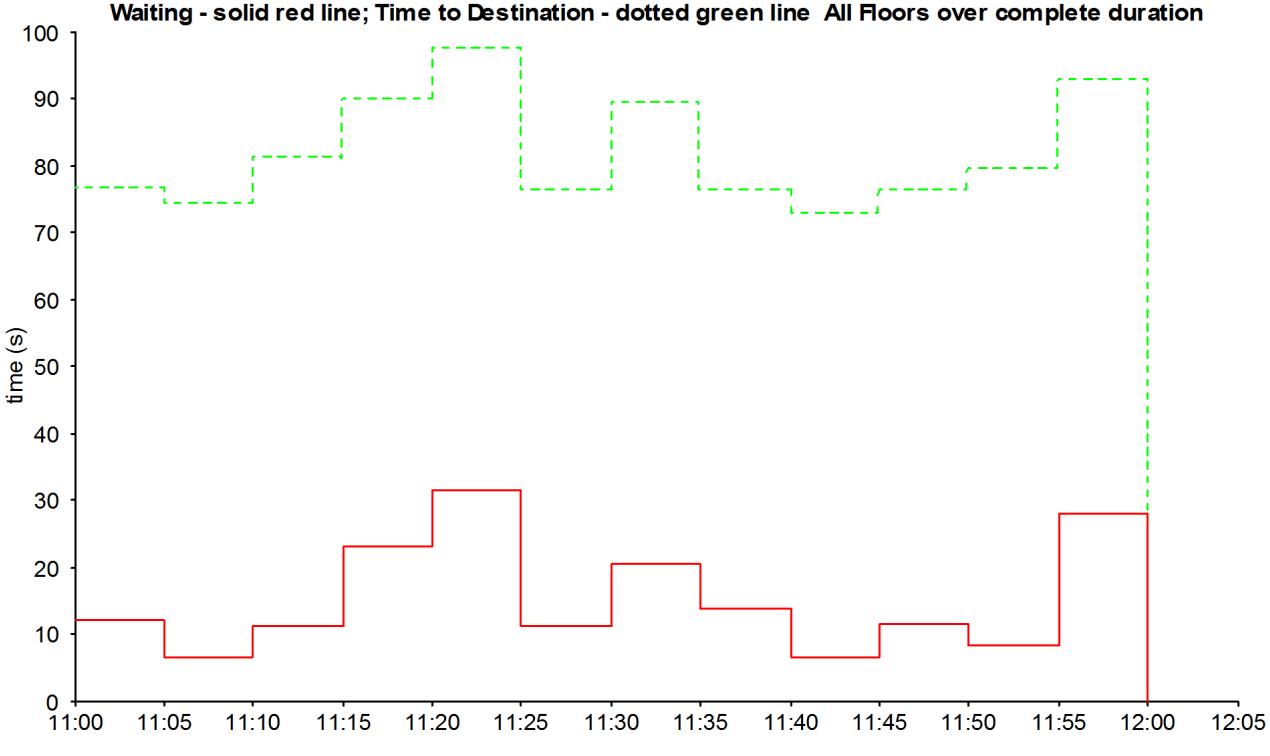


Average Interval 306.4 s (+83.6/-46.4)

2 No. 2800 kg elevators @ 0.50 m/s
Average of all runs

Average Waiting and Time to Destination

Waiting - solid red line; Time to Destination - dotted green line All Floors over complete duration



Worst Average Waiting Time during any 5 min period (s) 31.6
Worst Average Transit Time during any 5 min period (s) 71.5

Appendix C

Green Travel Plan

Kapau Holdings Pty Ltd

617-621 Pacific Highway, St Leonards

Green Travel Plan

Rev C | 12 December 2016

Job number Job number

Arup
Arup Pty Ltd ABN 18 000 966 165

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Level 10 201 Kent Street
PO Box 76 Millers Point
Sydney 2000
Australia
www.arup.com

ARUP

Document Verification

ARUP

Job title		617-621 Pacific Highway, St Leonards			**Job number** Job number
Document title		Green Travel Plan			**File reference**
Document ref					
Revision	**Date**	**Filename**	617-621 Pacific Hwy Green Travel Plan Draft 1.docx		
Draft 1	18 Feb 2016	**Description**	First draft		
			Prepared by	Checked by	Approved by
		Name	James Turner	Andrew Hulse	Andrew Hulse
		Signature			
Issue	22 Mar 2016	**Filename**	617-621 Pacific Hwy Green Travel Plan.docx		
		Description	Issue		
			Prepared by	Checked by	Approved by
		Name	James Turner	Andrew Hulse	Andrew Hulse
		Signature			
Rev B	5 Aug 2016	**Filename**	617-621 Pacific Hwy Green Travel Plan.docx		
		Description			
			Prepared by	Checked by	Approved by
		Name	James Turner	Andrew Hulse	Andrew Hulse
		Signature			
Rev C	12 Dec 2016	**Filename**	617-621 Pacific Hwy Green Travel Plan Rev C.docx		
		Description			
			Prepared by	Checked by	Approved by
		Name	James Turner	Andrew Hulse	Andrew Hulse
		Signature			
				Issue Document Verification with Document	✓

Contents

Appendices

1 Introduction

1.1 Project background

Arup was engaged by KannFinch Architects on behalf of Kapau Holdings Pty Ltd to provide traffic engineering services for the proposed mixed use residential development site located at 617-621 Pacific Highway, St Leonards. The proposal is for the development of a high rise building which will include one level of retail on the ground floor, two levels of community spaces and three levels of commercial office spaces and 41 levels of residential apartments.

1.2 Purpose of this Report

This report has been prepared to accompany the Traffic Impact Assessment for the Development Application for the St Leonards Mixed Use Building and associated works. This document provides the framework to develop a Green Travel Plan addressing travel demand and sustainable travel initiatives for the St Leonards Mixed Use Building.

1.3 What is a Green Travel Plan?

A Green Travel Plan is a tool to minimise the negative impact of private vehicle travel on the environment. This Plan is a package of measures put in place to encourage more sustainable travel and describes ways in which the use of sustainable transport may be encouraged. Using public transport, cycling, walking, working from home, carpooling, making business vehicles more fuel efficient and the use alternative fuels are all more sustainable means of transport than single occupant driving.

More generally, the principles of a Green Travel Plan are applied to all people travelling to and from a site. Government authorities around the nation are placing increasing emphasis on the need to reduce the number and lengths of motorised journeys and in doing so encourage greater use of alternative means of travel which have less environmental impact than cars.

1.4 Site location

The proposed development site has a site area is 1,067m^2 and is located at 617-621 Pacific Highway, St Leonards which is shown in Figure 1. The site is located within the North Sydney Council LGA and is currently occupied by a 12 storey commercial building at 621 Pacific Highway and a 7 storey commercial building at 619 Pacific Highway.

St Leonards is identified as a strategic centre by the NSW Government in ‘A Plan for Growing Sydney’ (the new Metropolitan Strategy for Sydney) due to the area’s accessibility to public transport. The area surrounding the site has a mixture of high density residential, commercial and retail uses.

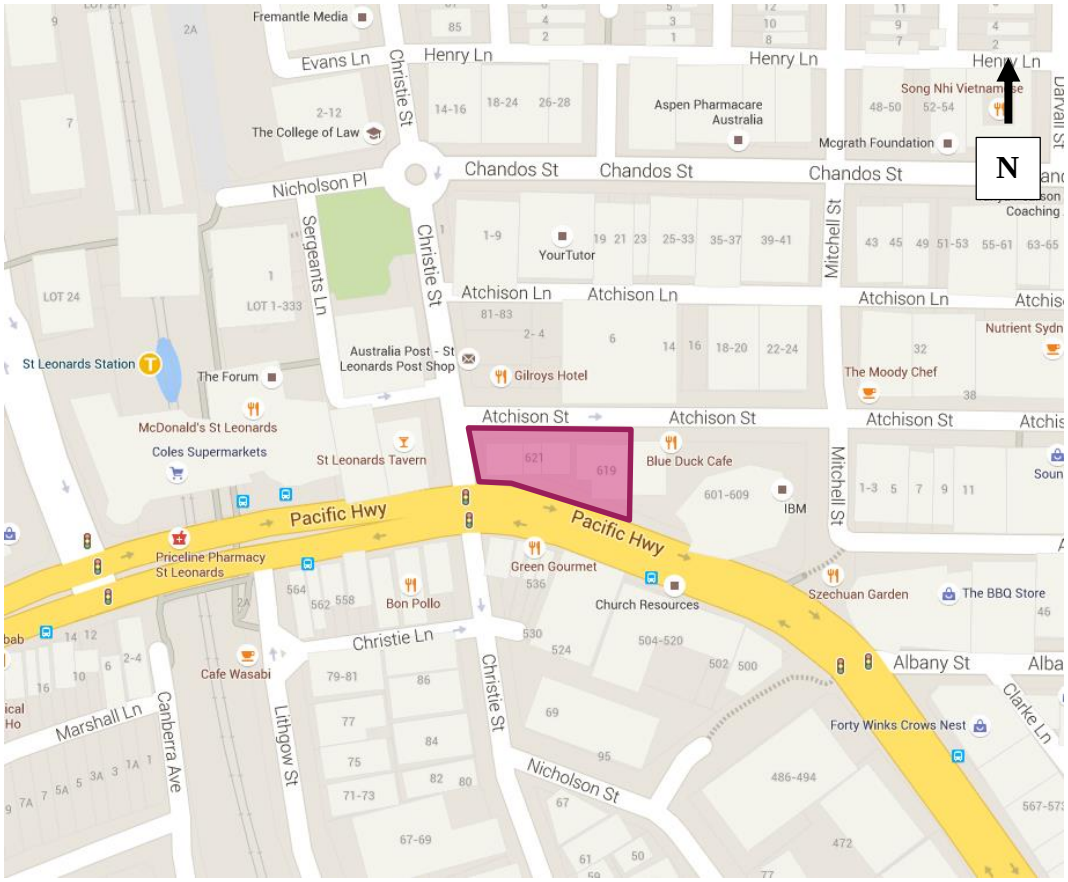

Figure 1: Site location

1.5 Benefits of a Green Travel Plan

The Green Travel Plan can bring a number of benefits to residents, commercial tenants and visitors:

- Residents/employees can enjoy improved health, less stress, a better quality of life, cost and time savings, and greater travel choice;
- Reduced traffic congestion;
- Benefit from improved air quality, less noise and pollutants; and
- Deliver health benefits, tackle obesity and improve quality of life

1.6 Green Travel Plan Framework

A Green Travel Plan for the mixed use building will need to address the following issues:

- What are the **objectives** for the buildings in terms of travel journeys including trips to work, retail and other land uses.
- How are the set objectives going to be met? What **measures** are going to be implemented and encouraged?
- Who is going to be responsible for the management, implementation and administration of the measures?

In contrast to a workplace environment or other destination based land uses, where opportunities to influence travel demand are easier, the implementation of a Green Travel Plan for mixed use buildings (especially residential) is more difficult to achieve. The key element to reducing the reliance on private vehicle for the site will be maximising the use of public transport and the promotion of car share vehicles.

1.7 Green Travel Plan Objectives

The main objectives of the Green Travel Plan are to reduce the need to travel and promotion of sustainable means of transport.

The more specific objectives include:

- To reduce the level of single occupancy car borne trips associated with commuting.
- To facilitate the sustainable and safe travel of visitors to the site.
- To reduce site traffic congestion and associated pollution in order to enhance, improve and make safe journeys of minority/sustainable transport mode users.
- To work in partnership with neighbouring organisations/developments, local authorities, retailers and other relevant bodies in achieving the maximum mode shift away from the private car.
- To continually develop, implement, monitor, evaluate and review the progress of the travel plan strategy.
- To facilitate all residents' and employees' access to key facilities such as retail, leisure, health and education.

2 Transport and Access Service Strategy

2.1 Mode split

Mode share patterns at the site were analysed using 2011 Journey to Work (JTW) Census data from the Bureau of Transport Statistics. The JTW data for travel zone 1844 was used to assess the likely mode of peak hour trips to and from the site. The location and the coverage of travel zone 1844 is shown in Figure 2. The results of the analysis are shown in Table 1.

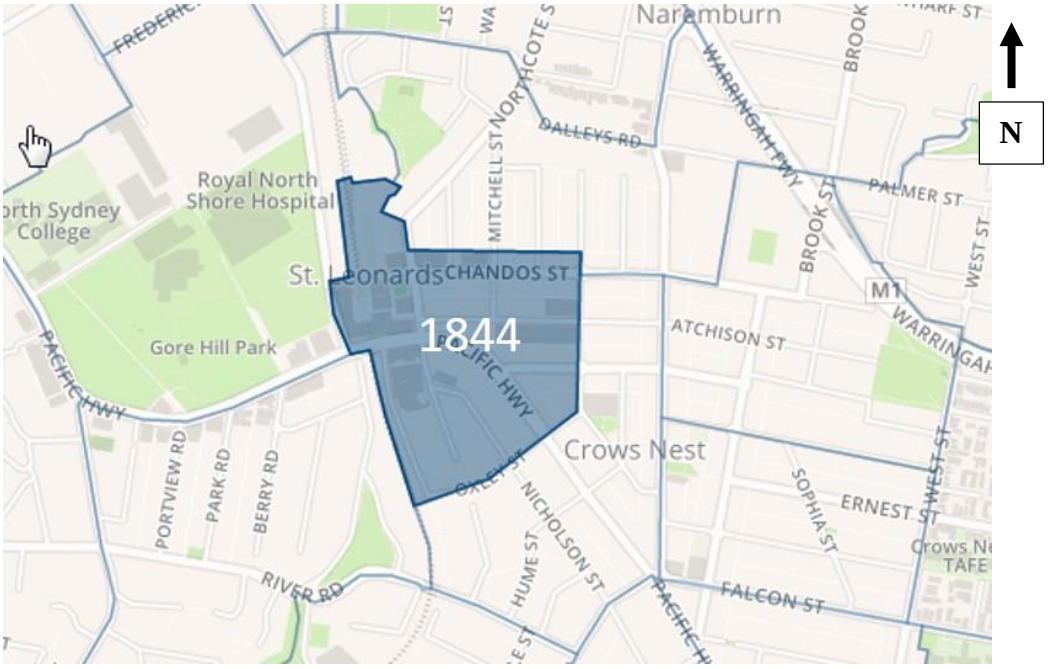

Figure 2: Journey to Work travel zone coverage

Table 1: Journey to Work travel patterns

Mode	Inbound trips to work (Employees)	Outbound trips to work (Residents)
Train	37%	49%
Bus	8%	7%
Car	47%	27%
Walk	5%	15%
Other	2%	2%
Mode not stated	1%	0%
Total trips	10,938	1,959

Source: BTS, 2011

The JTW data shows that residents of travel zone 1844 rely primarily on public transport to commute to work. The data reveals that commuting to work by train is the most heavily used mode of transport at 49%. This can be attributed to the close proximity of St Leonards Station and the frequency of services to the Sydney CBD and Chatswood CBD.

The JTW data reveals that commuters travelling to travel zone 1844 rely more heavily on car trip modes which makes up 48% of inbound trips. Commuters travelling to work by train make up 35% of inbound trips and trips made by bus make up 8%.

2.2 Pedestrian Linkages

The site is located within the commercial core of St Leonards and is well served by a good network of local footpaths. Paved footpaths and kerb ramps are provided on all streets. All roads on the walking route from the proposed development site to St Leonards transport interchange possess paved footpaths and kerb ramps on both sides of the road. Sections of Pacific Highway and Herbert Street are covered to protect pedestrians during rainy weather. There are signalised pedestrian crossings across Christie Street at the Pacific Highway intersection as well as the Sergeants Lane intersection.

2.3 Cycling Access

The site is well connected to a number of cycling routes which consist of both off-road cycling paths as well as on-road marked paths. The on-road bike path on Pacific Highway provides a safe and efficient connection to the Sydney Harbour Bridge as well as a connection to the northern suburbs. The local cycling routes also connect to the Warringah Freeway cycleway which provides connections to Lane Cove, North Ryde and Chatswood.

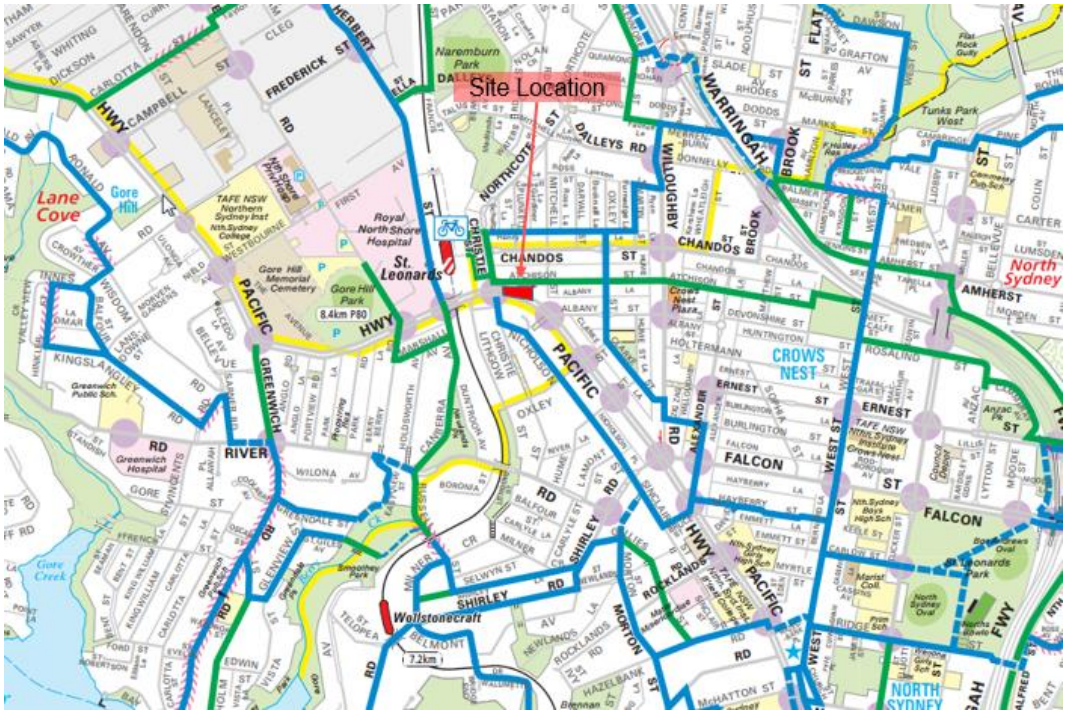

Figure 3: Bike paths

2.4 Public Transport Accessibility

The site has good access to public transport and is located within 100m walking distance from St Leonards Station and within 100m walking distance from bus stops located on Pacific Highway which are illustrated in Figure 4.

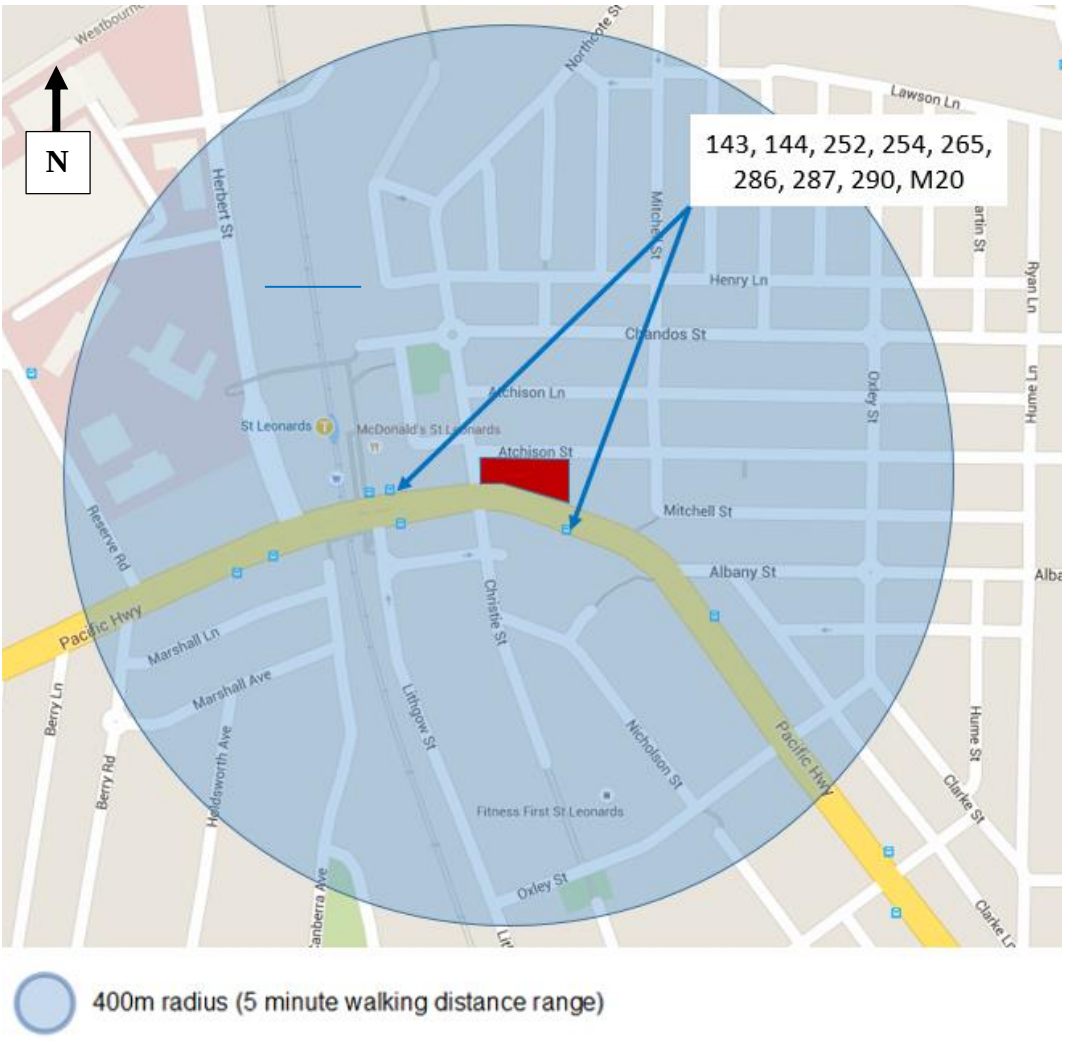

Figure 4: 400m radius circle from site

St Leonards Station services the T1 North Shore and Northern lines, and the Central Coast and Newcastle lines. The station is well connected to other major stations such as Central Station, Chatswood Station and Epping Station. The station is well served by trains with services every 3 minutes during the peak periods in both directions of travel.

The bus routes connecting to the bus stops shown in Figure 4 are summarised in Table 2. Buses connect the local area to the Sydney CBD, Chatswood CBD, Crows Nest, Epping, Lane Cove and surrounding suburbs. The bus stops are well served, with frequent services throughout the day and express buses operating during the peak periods.

Table 2: Bus routes

Bus Route	Service description
Route 143, Manly and Macquarie University	Services every 30 minutes throughout the day in each direction.
Route 144, Chatswood and manly via Royal North Shore Hospital	Services every 30 minutes throughout the day in each direction.
Route 252, Lane Cove West and City via Pacific Highway	Services every 30 minutes throughout the day in each direction.
Route 254, Riverview and City via Pacific Highway	Services every 30 minutes throughout the day in each direction.
Route 257, Chatswood to Balmoral Beach	Services every 30 minutes throughout the day in each direction.
Route 265, McMahons Point and Lane Cove via Greenwich Wharf	Services every 30 minutes throughout the day in each direction.
Route 286, Denistone East and City via Pacific Highway	Services every 30 minutes during the peak periods between Monday to Friday
Route 287, Ryde and Milsons Point via Pacific Highway and North Sydney	Services every 30 minutes during the peak periods between Monday and Friday in each direction
Route 290, Epping and City via Macquarie Centre and Pacific Highway	Services every 15 minutes during the peak periods between Monday and Friday in each direction Services every hour at all other times.
M20, Botany and Gore Hill	Services every 10 minutes during the peak periods in each direction. Services every 15 minutes at all other times.

It should be noted that the accompanying Traffic Impact Assessment considers the impacts to public transport loadings in more detail and states there is spare capacity for this building.

3 Green Travel Plan Measures

In order to meet the objectives and targets of the Green Travel Plan, the following physical and management measures should be implemented.

3.1 Travel Packs

A new development provides an opportunity to offer residents and employees advice on travel modes to and from the site. At this time, new travel habits are being established and people may particularly welcome information about the travel services and facilities available to them.

A travel pack could be supplied to all occupants of the building. The pack will include information on the development travel plan, bicycle and walking routes, bus and rail timetables, information on car sharing and membership information for the development car club. The pack could also include discount vouchers for a local bicycle retailer and a questionnaire about travel behaviour. An example resident travel survey is presented in Appendix A and could also be replicated for building employees. Short term membership to a car share organisation may also be provided in the travel pack.

3.2 General Marketing and Promotion

The objectives of the Green Place Travel Plan will only be achieved with the support of building occupants. Marketing the benefits and promoting the sustainable alternatives available are therefore crucial in encouraging residents and employees to adopt the Green Place Travel Plan measures. It is important that at an early stage, both the residents and employees are made aware of the need for the Green Travel Plan, and that it is emphasised that the measures are being introduced to support and encourage people to use cars more wisely. In addition to raising general awareness, any successes achieved will be fully publicised to residents and employees in order to motivate them to use sustainable modes of transport.

- Travel information and poster could be set up at public area, for example, lobby, notice board, or inside the elevators;
- A Green Travel Plan ‘e-flyer’ should be distributed to residents and employees during the launch of the Plan. The ‘e-flyer’ will provide a summary of the benefits of the Travel Plan, its objectives and measures. This could be distributed to both residents and employees via the managing strata corporation;
- Events such as National Bike Week, Bike2Work Days, walk to work day should be promoted through notice board posters and email;

3.3 Car Sharing

Car sharing is a proven means of reducing the number of car journeys generated by a development. A recent study on the effectiveness of car sharing schemes across Sydney (e.g. GoGet) shows that every car share space replaces the need for 12 private vehicle spaces[1].

Car share arrangements should form an integral part of new project applications and this can be conditioned at the appropriate time and would form part of a Travel Plan. Information on local car sharing schemes would be provided in the travel pack.

Consultation with car share operators such as Go Get would be undertaken to provide car share vehicles within the proposed future road network or basement car park, for use by local residents and employees. This will be dependent upon the requirements of car share operators although the development is considered to be a suitable candidate site for the provision of on-street facilities for car share vehicles. This would also form part of a Travel Plan.

The Council DCP notes that the installation of car share parking to replace general off-street parking is optional and at the discretion of the developer. Therefore, it is proposed to provide six car share spaces for use by the building occupants.

3.4 Travel During the Day

To provide residents and employees with a choice of convenient sustainable transport options for travelling during the day, the following initiatives should be promoted:

- Provide bus, train and ferry timetable and routes information specific to the building location at lobby;
- Provide walking and cycling maps to the surrounding public transport nodes, recreational area and local attractions; and
- Promote use of bikes for short journeys within the North Shore;

3.5 Cycling

The building will have good access to the Sydney cycling network and onsite facilities for cyclists. One secure bicycle parking space will be provided for each residential unit in the building, complying with Green Building Council Green Star requirements. Secure bicycle parking should also be provided to employees of the building, with adequate end of trip facilities such as showers and change rooms. Additional visitor parking spaces will be provided near the entrances to the building.

In order to activate and promote cycling the following measures should be taken:

[1] SGS Economics & Planning (2012), Benefit-Cost Analysis of Car Share within the City of Sydney

- Supply a communal bike toolkit-this can consist of puncture repair equipment, a bike pump, a spare lock and lights;
- Come to an arrangement with a local cycle retailer for cheap servicing of resident and employee bikes. Negotiate group buying discount on bicycle, equipment and accessories purchase.
- Provide Sydney cycle maps to all building occupants;
- Participate in annual events such as 'Ride to Work Day';
- Notice boards in public areas should have news of events / generic posters promoting cycling;
- Provide pool bikes for common use by both residents and employees of the buildings;
- The building management should have a transport website specific for their location containing details of bike storage areas, and links containing useful journey planning websites in Sydney;
- Inform residents and employees on public transport cycling carriage policies and cycle storage facilities at rail stations;
- Formation of a Bicycle User Group in order to provide a body of regular cyclists who can discuss on issues relating to the provision of on-site cycling facilities and the maintenance of off-site cycle routes; and

3.6 Public Transport

To promote the use of public transport.

- Provide information of useful website links to journey planning websites in Sydney;
- Provide useful public transport maps and promotional items to potential and current public transport users;
- Notice boards in public areas should have news of events / generic posters promoting public transport; and
- Provision of bus passes for the initial occupation of the building so that residents and employees would be encouraged to make public transport their modal choice from the day they moved in.

3.7 Walking

Specific Travel Plan measures designed to encourage more walking trips for short distance trips.

- Create and maintain an e-flyer ‘useful walking routes’ containing useful routes to key parts of the Sydney, including public transport nodes at St Leonards;
- Formation of local walking group using Heart Foundation Walking Walkers kit (www.heartfoundation.org.au/walking). Hold regular recreational walks for residents and employees; and

- Participate in Walk to Work day and look into holding a ‘healthy breakfast’ as a reward to all those who participate.

3.8 Working from Home

The developer will work with suppliers to facilitate full broadband services to all residences on the site. Broadband availability will encourage working from home through the provision of high-quality data transfer between the workplace and home.

3.9 Travel Plan Group

It is proposed that a travel plan group made up of the members of the building executive committee is created. A committee member, in liaison and working with the building management group, will take the lead in driving the strategies and initiatives contained in the travel plan. The implementation of the travel plan would form an item of discussion at every executive committee meeting, particularly in the initial stages of building occupancy. At the annual general meeting of the building, the travel plan group co-ordinator will report back to attendees on the status of the travel plan and further measures to be adopted for the coming year.

4 Monitoring

Monitoring is crucial to the successful implementation of any travel plan. Monitoring will primarily be conducted by the development's travel plan co-ordinator and the travel plan group.

The primary means of monitoring the travel behaviour of residents and employees will be through completion of questionnaires delivered to all residences and tenancies in the development. These questionnaires will be distributed to all the units that are occupied at the end of the first phase. Further questionnaires will be conducted once the other phases are completed, and one year and three years after full occupation of the whole site.

The travel plan questionnaire delivered to all units will investigate residents' and employees' current mode of travel to work; mode of travel for shopping, leisure and other personal business; use of travel plan measures; and attitudes towards alternative transport and aspirations to enable travel plan development. As part of the questionnaire, everyone will also be asked to complete a one-day travel diary, on a Tuesday, Wednesday or Thursday. This will enable the number of car trips on a typical weekday to be measured.

The headline findings from the monitoring exercise will be reported back to residents and employees in an easily digestible newsletter. A more detailed report will be produced with copies supplied to the travel plan group and local authority. This will ensure that decision makers are informed about residents' and employees' travel behaviour.

5 Targets, Indicators and Timescales

The following proposed initiatives/measures are suggestions only and will be refined closer to the initial occupancy of the building.

No.	Measure/Initiative	Implementation Date	Responsibility	Indicator
Travel Packs				
1	A travel pack could be supplied to all residents and employees as they move into the building.	Launch date	Travel Plan Group (TPG)	Feedback from
2	Travel questionnaire to all building occupants contained in the travel pack	As occupants move into the building	Travel Plan Group (TPG)	No. of responses
General Marketing and Promotion				
3	Travel information and poster could be set up at public area, for example, lobby, notice board, or inside the elevators	Launch date	Building Management	Feedback from
4	A Green Transport Plan 'e-flyer' will be distributed to residents and employees during the launch of the Green Travel Plan.	Launch date	Travel Plan Group (TPG)	Feedback from
5	Events such as National Bike Week, Bike2Work Days, walk to work day promoted to residents and employees through notice board posters and email	Annually	Travel Plan Group (TPG)	No. of attendees
Car Sharing				
6	Consultation with car share operators to increase provision of car share spaces nearby to the building	Prior to building occupancy	Developer	No. of new car share members
Travel During the Working Day				
7	Provide bus, train and ferry timetable and routes information specific to the building location at lobby	Ongoing	Travel Plan Group (TPG)	Feedback from
8	Provide walking and cycling maps to the surrounding public transport nodes, recreational area and local attractions in travel packs	Launch date	Travel Plan Group (TPG)	Feedback from
Cycling				
9	Provide pool bikes for common use by residents and employees of the buildings	Initial building occupancy	Developer	Usage

No.	Measure/Initiative	Implementation Date	Responsibility	Indicator
10	Come to an arrangement with a local cycle retailer for cheap servicing of resident and employee bikes. Negotiate group buying discount on bicycle, equipment and accessories purchase	Launch date	Travel Plan Group (TPG)	Take-up by both residents and employees
11	Formation of a Bicycle User Group in order to provide a body of regular cyclists who can discuss on issues relating to the provision of on-site cycling facilities and the maintenance of off-site cycle routes	Launch date	Travel Plan Group (TPG)	Number of participating occupants
Public Transport				
12	Provide useful public transport maps and promotional items to potential and current public transport users	Launch date	Travel Plan Group (TPG)	Feedback from
13	Notice boards in public areas should have news of events / generic posters promoting public transport	Launch date	Building Management	Feedback from
Walking				
14	Create and maintain an e-flyer ‘useful walking routes’ containing useful routes to key parts of the Sydney, including public transport nodes at St Leonards	Launch date	Travel Plan Group (TPG)	Feedback from
15	Formation of local walking group using Heart Foundation Walking Walkers kit (www.heartfoundation.org.au/walking). Hold regular recreational walks for residents and employees	Launch date	Travel Plan Group (TPG)	Number of participating occupants
16	Participate in Walk to Work day and look into holding a ‘healthy breakfast’ as a reward to all those who participate	Annually	Travel Plan Group (TPG)	No. of attendees
Working From Home				
17	Broadband availability will encourage working from home through the provision of high-quality data transfer between the workplace and home	Prior to building occupancy	Developer	Take-up by residents and employees
Travel Plan Group				
18	Formation of travel plan group to co-ordinate and implement Green Travel Plan strategies and actions	Launch date	Building Management / Developer	Feedback from

6 Conclusions

Implementation of a Green Travel Plan and travel demand measures are essential for providing access to and from the proposed mixed use building in a sustainable way and meeting the low car mode share target for journey to work. The Green Travel plan will contribute to a healthier and better quality of life for residents and employees, with a reduction in air and noise pollution.

Appendix A

Example Resident Survey

1. Gender

○ Male

○ Female

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2. Age

○ Under 25

○ 25-34

○ 35-44

○ 45-54

○ Over 55

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3. Where do you work or go to school?

Postcode

---

4. What times do you normally work/ study?

○ Full-time

○ Full-time (flexi hours/shifts)

○ Part-time

---

5. How do you normally travel to work/school?

○ Walk

○ Cycle

○ Motorbike/moped

○ Train

○ Bus (number(s) if available)

○ Park and ride

○ Taxi

○ Car

○ Other (please specify)

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6. If you travel to work by car what is your main reason for doing so?

○ Car essential to perform job

○ Dropping off/collecting children

○ Personal chores during lunchtime

○ Health reasons

○ Lack of alternative (please explain)

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7. How far do you travel to work/ School?

○ Less than 1km

○ 1-2 km

○ 3-5 km

○ 6-10 km

○ 11-20 km

○ 20+ km

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8. How long does it take you to get to work/school?

○ 0-15 minutes

○ 16-30 minutes

○ 31-60 minutes

○ 61-90 minutes

○ 90+ minutes

9. Which of the following measures would encourage you to walk or cycle to work/school? (If you already

12. Which of the following would encourage you to car share?

TICK NO MORE THAN TWO

walk or cycle, what measures would you like to see more)

TICK NO MORE THAN TWO

○ Safer/better lit streets/ pathways

○ Better changing and showering facilities

○ Better securing facilities for bikes

○ Information on safer routes

○ Loans/discounts for buying equipment

○ Free travel home in an emergency

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10. Which of the following measures would encourage you to use public transport on your journey to work/school? (If you presently use public transport, what measures would you like to see more of?)

TICK NO MORE THAN TWO

○ Cheaper public transport

○ More reliable public transport

○ Improved waiting areas

○ Better/clearer transport information

○ Better connections with other transport

○ Other (please state)

---

11. Would you be prepared to car share?

○ Yes

○ No

○ Better/ clearer transport information

○ Better connections with other modes of transport

○ Other (please state)

○ Help finding a car-sharing partner

○ Free travel home in an emergency

○ Reduced parking costs

○ Share with someone

○ Permit holder

○ Free parking

○ Pay to park

---

13. If you presently drive to work/ school, would you consider trying an alternative form of transport – even occasionally?

○ Yes

○ No

---

14. Do you currently use public transport to access

○ Shops

○ Leisure facilities

○ Health facilities

○ Visit friends and family

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15. Which of the following measures would encourage you to use Public Transport for the journeys in question 14? (If you currently use public transport, what measures would you like to see more of?)

TICK NO MORE THAN TWO

○ Cheaper public transport

○ More reliable public transport

○ Improved waiting areas