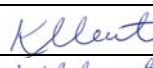
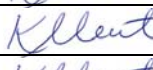
Sydney International Convention Exhibition and Entertainment Precinct (SICEEP)
Darling Square - NE Plot
Traffic, Transport and Accessibility

Lend Lease (Haymarket) Pty Ltd.

Reference: 14SYT0063
October 14

ABN 65 010 868 621

Unit G04, 27 Mars Road, Lane Cove West NSW 2066
PO Box 98, North Ryde NSW 1670
T: 02 9418 3033 **F**: 02 9418 3112 **E**: ttmnsw@ttmgroup.com.au

Rev No.	Author	Reviewed/Approved		Description	Date
		Name	Signature		
1	T Wheatley			Draft	07.10.2014
2	T Wheatley			Updated Draft	08.10.2014
3	T Wheatley			Updated Draft	09.10.2014
4	T Wheatley	K Martinez		For Issue	10.10.2014
5	T Wheatley	K Martinez		For Issue	16.10.2014
6	T Wheatley	K Martinez		For Issue	20.10.2014
7	T Wheatley	K Martinez		For Issue	23.10.2014

Contents

Table Index

Figure Index

Appendices

1. Introduction

This report supports a State Significant Development (SSD) Development Application (DA) submitted to the Minister for Planning pursuant to Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

The Application (referred to as SSDA 7) follows the approval of a staged SSD DA (SSDA 2) in December 2013. SSDA 2 sets out a Concept Proposal for a new mixed use residential neighbourhood at Haymarket referred to as "Darling Square", previously known as "The Haymarket". Darling Square forms part of the Sydney International Convention, Exhibition and Entertainment precinct (SICEEP) Project, which will deliver Australia's global city with new world class convention, exhibition and entertainment facilities and support the NSW Government's goal to "make NSW number one again".

More specifically this subsequent DA seeks approval for mixed use development within the North East development plot of Darling Square and associated public domain works. The DA has been prepared and structured to be consistent with the Concept Proposal DA.

2. Overview of Proposed Development

The proposal relates to a detailed ('Stage 2') DA for a mixed use residential development in the North East Plot of Darling Square (formerly known as 'The Haymarket') together with associated public domain works. The Darling Square Site is to be developed for a mix of residential and non-residential uses, including but not limited to residential buildings, commercial, retail, community and open space. The North East Plot is one of six development plots identified within the approved Concept Proposal.

Under the Concept Proposal, the North East Plot is planned to accommodate a mixed use podium and three residential buildings (NE1, NE2, and NE3) above and within the podium structure. More specifically, this SSD DA seeks approval for the following components of the development:

- Demolition of existing site improvements, including the existing Sydney Entertainment Centre (SEC);
- Associated tree removal and planting;
- Construction and use of a predominantly 6 storey mixed use podium, including:
  - retail floor space and residential lobbies on Ground Level;
  - above ground parking;
  - residential apartments; and
  - communal facilities.
- Construction and use of three residential buildings above podium;
- Public domain improvements surrounding the site, including interim works;
- Provision of vehicle access to the development from Harbour Street;
- Landscaping works to the podium roof level; and
- Extension and augmentation of physical infrastructure / utilities as required.

3. Background

The NSW Government considers that a precinct-wide renewal and expansion of the existing convention, exhibition and entertainment centre facilities at Darling Harbour is required, and is committed to Sydney reclaiming its position on centre stage for hosting world-class events with the creation of SICEEP.

Following an extensive and rigorous Expressions of Interest and Request for Proposals process, a consortium comprising AEG Ogden, Lend Lease, Capella Capital and Spotless was announced by the NSW Government in December 2012 as the preferred proponent to transform Darling Harbour and create SICEEP.

Key features of the Preferred Master Plan include:

- Delivering world-class convention, exhibition and entertainment facilities, including:
  - Up to 40,000m^2 exhibition space;
  - Over 8,000m^2 of meeting rooms space, across 40 rooms;
  - Overall convention space capacity for more than 12,000 people;
  - A ballroom capable of accommodating 2,000 people; and
  - A premium, red-carpet entertainment facility with a capacity of 8,000 persons.
- Providing a hotel complex at the northern end of the precinct.
- A vibrant and authentic new neighbourhood at the southern end of the precinct, now called 'Darling Square', including apartments, student accommodation, shops, cafes and restaurants.
- Renewed and upgraded public domain that has been increased by a hectare, including an outdoor event space for up to 27,000 people at an expanded Tumbalong Park; and
- Improved pedestrian connections linking to the proposed Ultimo Pedestrian Network drawing people between Central, Chinatown and Cockle Bay Wharf as well as east-west between Ultimo/Pyrmont and the City.

On 21 March 2013 a critical step in realising the NSW Government's vision for the SICEEP Project was made, with the lodgement of the first two SSD DAs with the (now) Department of Planning and Environment. The key components of these proposals are outlined below.

Public Private Partnership SSD DA (SSD 12_5752)

The Public-Private Partnership (PPP) SSD DA (SSDA 1) includes the core facilities of the SICEEP Project, comprising the new, integrated and world-class convention, exhibition and entertainment facilities along with ancillary commercial premises and public domain upgrades. SSDA1 was approved on 22 August 2013.

Concept Proposal (SSD 13_5878)

The Concept Proposal SSD DA (SSDA 2) establishes the vision and planning and development framework which will be the basis for the consent authority to assess detailed development proposals within the Darling Square Site. SSDA2 was approved on 5 December 2013. The Stage 1 Concept Proposal approved the following key components and development parameters:

- Indicative staging of demolition and development of future development plots;
- Land uses across the site including residential and non-residential uses;
- Street and laneway layouts and pedestrian routes;
- Open spaces and through-site links;
- Six separate development plots, development plot sizes and separation, building envelopes, building separation, building depths, building alignments, and benchmarks for natural ventilation and solar access provisions;
- A maximum total gross floor area of 197,236m^2 (excluding ancillary above ground parking), comprised of:
  - A maximum of 49,545m^2 non-residential GFA; and
  - A maximum of 147,691m^2 residential GFA.
- Above ground car parking including public car parking;
- Residential car parking rates;
- Design Guidelines to guide future development and the public domain; and
- A remediation strategy.

In addition to the approval of SSDA1 and SSDA2, the following approvals have been granted for various stages of Darling Square site:

- Darling Drive (part) development plot (SSDA3) for the construction and use of a residential building (student accommodation) and the provision of associated public domain works approved on 7 May 2014;
- North-West development plot (SSDA4) for the construction and use of a mixed use commercial development and public car park building and associated public domain works approved on 7 May 2014; and
- South-West development plot (SSDA5) for the construction and use of a mixed use residential development and associated public domain works approved on 21 May 2014.

Approval was also granted on 15 June 2014 for SSDA6 which includes the construction and use of the International Convention Centre (ICC) Hotel and provision of public domain works.

This report has been prepared to support a detailed Stage 2 SSD DA for mixed use development and associated public domain works within Darling Square (SSDA 7), consistent with the approved Concept Proposal (SSDA 2).

4. Site Description

The SICEEP Site is located within Darling Harbour. Darling Harbour is a 60 hectare waterfront precinct on the south-western edge of the Sydney Central Business District that provides a mix of functions including recreational, tourist, entertainment and business.

With an area of approximately 20 hectares, the SICEEP Site is generally bound by the light rail Line to the west, Harbourside shopping centre and Cockle Bay to the north, Darling Quarter, the Chinese Garden and Harbour Street to the east, and Hay Street to the south (refer to Figure 4.1). The Darling Square Site is:

- Located in the south of the SICEEP Site, within the northern portion of the suburb of Haymarket;
- Bounded by the Powerhouse Museum to the west, the Pier Street overpass and Little Pier Street to the north, Harbour Street to the east, and Hay Street to the south; and
- Irregular in shape and occupies an area of approximately 43,807m^2.

Figure 4.1: Aerial Photograph of the SICEEP Site

The Concept Proposal DA provides for six (6) separate development plots across the Darling Square Site (refer to Figure 4.2):

1. North Plot;
2. North East Plot;
3. South East Plot;
4. South West Plot;
5. North West Plot; and
6. Western Plot (Darling Drive).

The Application Site area relates to the North East Plot and surrounds as detailed within the architectural and landscape plans submitted in support of the DA.

Figure 4.2: Concept Proposal Development Plots

5. Planning Approvals Strategy

The SICEEP Project has resulted in the lodgement of numerous SSD DAs for the various components of the redevelopment project. Future applications will continue to be lodged in accordance with the Concept Proposal SSD DA for the remaining development plots of Darling Square Site.

6. Existing Transport Conditions

The existing transport conditions for Darling Square are assessed as part of the Transport and Traffic Impact Assessment report submitted with SSDA2 as attached in Appendix A.

7. Parking

7.1. Parking Supply Requirement

Parking provision for Darling Square will consist of four blocks (NW, SW, NE and SE) with a total provision of approximately 1,200 car park spaces. In addition, a public car park with 400 spaces will also be provided in the northwest block and will be available for visitors to the SICEEP Precinct.

A breakdown of the car park spaces is shown in Table 7.1.

Table 7.1: Proposed Parking Provision for Darling Square

Parking Location	Proposed Car Parking Bays
Residential / retail / student accommodation / commercial car park (Darling Square) [1]	
• North West Office/Commercial	50
• North East residential	445
• South East residential	285
• South West residential	399 (approved)
– Total provision within Darling Square	1,179
North West Public Car park	400 [2] (approved)

[1] Current indicative design for Darling Square

[2] This public car park will consist of 400 car park spaces to be delivered with Darling Square and will be available for visitors for the SICEEP precinct.

For the North East residential block, a total of 445 car park spaces will be provided. This remains consistent with the parking ratios approved as part of SSDA2, however, reflects a small increase in overall car space numbers for the NE plot. This increase is due to the change in mix and yield from the indicative scheme prepared to support the concept proposal (SSDA2), and has been assessed in terms of parking provisions for the development and impact on traffic at the adjacent intersections. The relative increase in parking spaces is minimal and not expected to alter the results of the modelling undertaken as part of SSDA1 and SSDA2.

On-site car parking provision for the North East plot has been considered in light of guidelines listed in the RMS *Guide to Traffic Generating Development (Section 5 – Parking Requirements for Specific Land Uses),* and the parking ratios approved as part of SSDA2.

7.1.1. Parking Guidelines

Roads Maritime Services (RMS) Guidelines

The RMS Guidelines stipulates parking rates based on surveyed developments and research conducted by the RMS. For the RMS, the main criterion in the assessment of parking provided for developments is the adequacy of off-street parking to meet the peak parking accumulations observed and thereby discouraging on-street parking thus maintaining the

existing levels of service and safety of the road network. Hence, the RMS guidelines stipulate the required minimum parking provision for a specific development.

Table 7.2: RMS Parking Supply Guidelines

Land Use	Extent	RMS Suggested Parking Rates	Minimum No. of Spaces
Studio	0	(0.4 spaces/1 bedroom) [1]	0
One bedroom	137	0.4 spaces/1 bedroom	54.8
One bedroom + Study	114	0.4 spaces/1 bedroom	45.6
Two Bedrooms	307	0.7 spaces/2 bedroom	214.9
Three Bedrooms	16	1.2 spaces/3 bedroom	19.2
Four Bedrooms	6	1.2 spaces/4 bedroom (rate not given)	7.2
Visitor Parking	-	1 space/7 units	83
Retail	1,823m2 GFA	1/50 sqm GFA	36.5
Total	**580**		**462**

[1] No rates stipulated for Studio type, assumes same rate as one-bedroom.

[2] Visitor parking will be at the public car park.

Based on the above parking rates of the RMS, the estimated minimum car parking requirements for the North East plot is 462 spaces. A total of 445 spaces will be provided in the North East plot. Hence, the development provides 17 fewer spaces or 3.9% less than the minimum provision as required from the RMS guidelines.

SSDA2

The parking rates approved as part of SSDA2 are:

- Studio apartments – 0 space
- One bedroom – maximum 0.5 space per apartment (includes One bedroom plus study)
- Two bedroom – maximum 1 space per apartment
- Three bedroom and more – maximum 1.5 spaces
- Retail – no provision

The parking rates allow for a maximum provision of 466 spaces, as shown in Table 7.3. However, only 445 spaces are proposed.

Table 7.3: Proposed Maximum Car Parking Supply

Land Use	Extent	Approved Parking Rate	Maximum No. Of Spaces
Studio	0	0	0
One bedroom	137	0.5 spaces/1 bedroom	68.5
One bedroom + Study	114	0.5 spaces/1 bedroom + study	57
Two Bedrooms	307	1 space/2 bedroom	307
Three Bedrooms	16	1.5 spaces/3 bedroom	24
Four Bedrooms	6	1.5 spaces/4 bedroom	9
Visitor Parking	-	0	0
Retail	-	0	0
Total	**580**		**466**

7.1.2. Suitability of Parking Supply

The development proposes a total of 445 spaces, which is less than the proposed maximum, and is considered suitable supply for the proposed development.

7.2. Car Park Layout

The proposed parking arrangements are shown on the ground floor, mezzanine, and level 01 to level 05 plans for the proposed development.

Table 7.4 identifies the characteristics of the proposed parking area with respect to the Australian Standard requirements (AS2890). The last column identifies the compliance of each design aspect. Where compliance with Australian Standards is not achieved, further information is provided below

Table 7.4: Parking Design Requirements

Design Aspect	Requirement (AS2890.1)	Proposed Provision	Compliance
Parking space length: – Standard bay – PWD bay	 5.4m (min) 5.4m (min)	 5.4m 5.4m	Compliant
Parking space width: – Standard bay – PWD bay	 2.4m (min) 2.4m (min)	 2.4m 2.4m + 2.4m (Shared Zone)	Compliant
Aisle Width: Parking aisle Circulation aisle/ramp	 5.8m (min) 6.7m (min)	 5.95m 6.7m (min)	Compliant
Access Driveway Width	Separate entry/exit access driveway	Combined (7.915m)	Compliant/ Alternative Solution
Two way Ramps	5.5m	6.0m	Compliant
Parking envelope clearance - Column intrusion	0.25m into bay within 0.3m & 0.2m into bay within	None	Compliant

Design Aspect	Requirement (AS2890.1)	Proposed Provision	Compliance
	1.2m of front of bay		
Parking envelope clearance - Column adjacent to bay	Located between 0.75m and 1.75m of aisle	Located between 0.8m and 1.8m of aisle	Compliant
Parking envelope clearance – space adjacent to wall	Space 0.3m clear of wall	Space 0.3m clear of wall	Compliant
Maximum Gradient: PWD parking Parking bay Parking aisle	 1:40 (2.5%) 1:20 (5.0%) 1:16 (6.25%)	 0% 0% 0%	Compliant
Straight Ramps: Private / Residential car parks	Up to 20m long – 1 in 4 (25%)	14.4% - 23.8%	Compliant
Curved Ramps: Private / Residential car parks	Up to 20m long – 1 in 4 (25%)	25%	Compliant
Maximum Ramp Transitions	12.5% summit 15.0% sag	12.5% 14.9%	Compliant
Height Clearance General Min. Over PWD bay	 2.2m 2.5m	 2.2m (min) 2.5m (min)	Compliant
Parking Aisle Extension	1m beyond last bay	1m beyond last bay or swept path analysis to confirm adequate for manoeuvring	Compliant/ Alternative Solution
Service Bay Length	8.8m (SRV) 9.25m (RCV)	9.8m 9.8m	Compliant
Service Bay width	3.5m	3.5m	Compliant
Service Vehicle Access driveway width	6m	7.915m	Compliant

The proposed car park layout generally complies with Australian Standards; however, the following issues are resolved with alternative solutions.

- AS2890 requires a 1m extension at the end of the blind aisle to assist with vehicles exiting the parking space. Swept path diagrams have been prepared to show that there are no implications with vehicles exiting the parking spaces, and the design of the blind aisles are, therefore, considered suitable for the proposed development.
- AS2890 specifies that a separate entry and exit is required for the proposed development. However, due to the low number of vehicles movements from the proposed development, the design for a combined access driveway is considered suitable for the development.

7.2.1. Accessible Parking

The proposal includes 9 accessible parking spaces. These spaces will be designed in accordance with AS2890.6.

7.2.2. Bicycle Parking

The Planning Guidelines for Walking and Cycling suggests that bicycle parking for residential apartment buildings be provided at the following rates:

- 20-30% of units for residents, plus 5-10% of units for visitors

The development will provide a storage cage for each apartment of sufficient size that it can be used for bicycle storage for the residents, which equates to 100% for residents. In addition 60 bicycle parking spaces will be provided for retail use, and 10 bicycle parking spaces will be provided for visitors on the ground floor, hence exceeding the guideline noted above.

8. Site Access Arrangements

8.1. Access Requirements

The proposed Harbour Street access driveway requirements are specified in Table 8.1.

Table 8.1: Typical Driveway Requirements for the Harbour Street Access

Design Aspect	Requirement	Proposed Provision	Compliance
Distance from a minor intersection	15m (min) for access used by service vehicles	25.8m north of Little Hay Street	Compliant
Distance from a major intersection	60m approach side and 30m departure side	240m Hay St/ Sussex St intersection 140m to Harbour St/Goulburn St Intersection	Compliant
Distance from a pedestrian crossing	20m (min) from approach side. 10m (min) from departure side	140m to signalised pedestrian crossing at Harbour St/Goulburn St Intersection. 33m from departure side of mid-block signalised crossing.	Compliant
Distance from another driveway	2m (min)	N/A	Compliant
Distance from a traffic signals	25m (min) and clear of queue areas and turning lanes	140m to Harbour St/Goulburn St Intersection	Compliant
Sight Distance	Ideally 55m for 40kph design speed, or 35m as an absolute minimum	no permanent obstruction within this distance	Compliant
Entry and Exit Widths	6.0m entry and 4.0 to 6.0m exit for Category 3	7.915m combined	Alternative Solution
Minimum Queuing Provisions	Based on assessment of traffic generation of 117 vph and lane capacity of 400 vph, 95th percentile queue is less than 2 cars	31m	Compliant

The queuing analysis for the access is based upon Austroads formulae (source: *Austroads Guide to Traffic Engineering Practice, Part 2: Roadway Capacity, 6.3 Queue Lengths and Delays*).

The proposed access arrangement generally complies with RMS Requirements; however, the following issue is resolved with an alternative solution.

- AS2890 specifies that a separate entry and exit is required for the proposed development. However, due to the low number of vehicles movements from the proposed development, the design for a combined access driveway is considered suitable for the development.

8.2. Proposed Access Arrangements and Their Adequacy

The access is a driveway crossover, 7.915m wide at the property boundary. Its location is 25.8m north of Little Hay Street. The proposed access arrangements comply with RMS Requirements and are, therefore, suitable for the proposed development.

8.3. Layby on Harbour Street

The layby on Harbour Street is 70.9m long, with a 7.2m taper at the south end and a 10.3m taper at the north end. The width of the layby varies between 3.2m and 3.4m wide, which is wide enough for loading by heavy vehicles. The length is equivalent to parking capacity for 12 cars. It is currently signposted as no parking and is used by coaches and the general public for dropping off and picking up passengers, and for loading.

The changes proposed to the layby are:

- The creation of the new access 10.8m from its south end.
- Building out the footpath to fill in the layby for approximately 25m from the new access to the north side of the pedestrian access to the NE3 foyer. This is to avoid conflicts between service activities and pedestrian access.

It is proposed that the layby will continue to operate as it currently does, with appropriate signage for passenger drop off and pick up, and for loading to the retail uses within the development as described in Section 9.

9. Service Vehicle Arrangements

The proposed development includes both residential and retail uses.

The service vehicle provision for residential use is to be shared with the retail uses, and will be managed by the body corporate as described below.

To assess the required number of service bays for the retail/food development, TTM has referred to the City of Sydney DCP 2012 for guidance only. For the retail/food development, totalling approximately 1,823m^2, the DCP recommends service bays to accommodate 5 service vehicles, based on 1 space per 350sqm floor area.

Other service vehicle provisions are generally in accordance with AS2890.2.

9.1. Proposed Service Vehicle Arrangements and Their Adequacy

The development proposal includes a 2 bay service vehicle area, suitable to cater for refuse collection and MRV requirements, but limited to 3.8m height clearance in the manoeuvring area and 4m height clearance in the loading bays. Taller vehicles and smaller delivery vans can generally be accommodated in the layby on Harbour Street, which will have parking capacity for 6 cars once the capacity is reduced by 6 cars due to the new site access and footpath widening.

The body corporate will manage residents' use of the service bays by setting them a time slot for removalists or deliveries so they do not clash with retail use or other residents' use of the bays. Residents will be notified of the maximum size of vehicle that the service bays can accommodate; any larger vehicles will use the layby on Harbour Street.

The critical turn vehicle movements for the service vehicle bays are shown in Appendix B. TTM has identified that the space provided for manoeuvring into the loading dock is adequate to accommodate the truck movements.

All movements in the swept path analysis allow a minimum 300mm clearance (and general 500mm clearance) to all parts of the structure.

With respect to refuse collection, the height clearance in the operational area of the ground floor loading bays is limited to 4m. As such, any refuse collection arrangements established with a commercial collector will need to ensure that the collection system allows for limited height clearance vehicles. This will not allow for standard overhead collection of industrial refuse bins and will more likely be limited to rear load refuse collection. These constraints are consistent with the typical rear-loading refuse collection vehicle shown in Appendix C of the Council of the City of Sydney Policy for Waste Minimisation in New Developments.

The site conditions are considered adequate for the proposed mixed use development. All internal onsite design complies with 2890.2-2002 Parking Facilities Part 2 Off-street commercial vehicle facilities.

10. Traffic Impact Assessment

This section is an overview of the previous area-wide Transport and Traffic Impact Assessment report submitted with SSDA2, as attached in Appendix A. The proposal for the North East plot includes an additional 95 car parking spaces compared to the indicative scheme to support the concept plan SSDA2. The resulting increase in traffic generation is relatively minimal and not expected to alter the results of the modelling undertaken as part of SSDA2.

10.1. Existing Traffic Volume Trends

Traffic data from March 2012 showed Friday evening (5.30pm to 6.30pm) manifests the highest peak for traffic volume at the study area compared to other weekday traffic volume (based on midblock 24hours data collection).

Insights from the data include:

- Monday to Thursday follow similar trends and volume profiles throughout the day;
- Morning peak hour is generally between 8am to 9am and evening peak hour is generally between 5pm to 6pm on a weekday;
- Friday shows a different trend with the traffic increasing till 9am and remaining relatively constant until 6pm; after then, traffic volume decreases but then starts again to increase at 9 pm and reaches a daily high at midnight; and
- Saturday evening peak is 38% higher than the average weekly peak. Different traffic patterns indicate the use of the network by regular commuter traffic for most of the week and the shift to “entertainment-related” traffic for both Friday and Saturday evenings.

Mid-block counts conducted in November 2012 showed similar trends on Pyrmont Road and Darling Drive with the Saturday count manifesting the highest PM peak period. Traffic volumes observed on Pier Street, Harbour Street, Goulburn Street and Bathurst Street showed weekday (Thursday and Friday) traffic to be generally higher than weekend (Saturday) traffic.

10.1.1. Observed Peak Periods at Intersections

Table 4-1 summarises the highest peak hour observed at key intersections in the vicinity of Darling Square. The hour between 17:00 PM and 18:00 PM shows predominant weekday peak. The weekend PM peak spreads between 18:00 PM and 19:00 PM.

Table 10.1: Observed AM and PM Peak Periods at selected key Intersections

Intersection	Control Type	Weekday PM Peak	Weekend PM Peak
Darling Drive/Pier Street	Roundabout	17:30-18:30	17:45-18:45
Darling Drive/Hay Street	Signal	17:00-18:00	
Harbour Street/Liverpool Street	Signal	17:00-18:00	18:00-19:00
Harbour Street/Goulburn Street	Signal	17:30-18:30	18:00-19:00

10.2. Traffic Generation and Trip Distribution for the North East Plot

An indication of the peak hour traffic generation potential of the future development within Darling Square has been based on the Roads and Maritime Service *Guide to Traffic Generating Developments" (2002)*. The RMS's Guide provides a series of traffic generation rates for a variety of land uses based on generic surveys undertaken by the RMS. These rates are generally applied to the Gross Floor Area (GFA) or Gross Leasable Floor Area (GLFA).

The typical peak hour traffic generation rates applicable for the proposed land uses of Darling Square are as follows:

- Residential evening peak vehicle trips: 0.24 vehicle trips per hour for each unit; and
- Retail evening peak hour vehicle trips: 0.56 vehicle trips per hour per 100sqm GLFA.

It should be noted that initial modelling undertaken as part of the SSDA2 assumed an indicative mix for Darling Square. For the purpose of this Stage 2 DA, traffic assessment takes into account the new design layout proposed for the North East plot and includes the additional 95 car parking spaces being proposed. The relative increase in traffic generation is minimal and not expected to alter the results of the modelling undertaken as part of SSDA2.

Application of the above traffic generation rates to the proposed development yields a weekday peak period total traffic generation potential of 150 vehicle trips per hour comprising 117 In / 33 Out during evening peak periods. These traffic generation projections have been based on an arrival/departure split of 80/20 for residential and 50/50 for retail during the evening peak period.

For the purpose of this assessment, the following traffic distribution is assumed:

- 30% trips anticipated to arrive from western suburbs via M4 Western Distributor;
- 10% trips anticipated to arrive from western suburbs via Great Western Highway;
- 30% trips anticipated to arrive from northern suburbs via M4 Western Distributor and then through Darling Drive and Ultimo Road;
- 20% trips anticipated to arrive from southern suburbs by using Eastern Distributor and then through north Darling Drive and Ultimo Road; and
- 10% trips anticipated to arrive from southern suburbs by using Great Western Highway and then through Harris Street and Ultimo Road.

10.3. Network Capacity and Level of Service (LOS)

A micro-simulation model was developed for the core study area bounded by Darling Drive to the west, Harbour Street to the east, Hay Street to the south and Pyrmont Bridge to the north. The traffic modelling encompasses the Whole of Precinct (WOP) and investigates cumulative impacts from the development of the PPP, Darling Square and the ICC Hotel. The future modelling scenario represents 'worst case scenario' analysis and accounts for design proposals

developed at this stage. Details of the modelling are reported in the previous area-wide Transport and Traffic Impact Assessment report submitted with SSDA2 (see Appendix A).

The network modelling was then supplemented by more detailed assessments of selected key intersections using the SIDRA intersection modelling software to test intersection performance at the isolated level during the selected peak hours and to identify potential measures to achieve improved outcomes.

10.3.1. Existing Intersection Operation

It should be noted that the modelling undertaken for the assessment takes into account the cumulative traffic for the development of the SICEEP Precinct as a whole. The results of the analysis incorporate impacts from the various components of the development.

The criteria for evaluating the operational performance of intersections are provided by *the RMS Guide to Traffic Generating Developments, October 2002*. The criterion is based on a qualitative measure (i.e. Level of Service), which is applied to each average delay band.

The 'Level of Service' is the standard used to measure the performance of the intersection operation. This is defined as the qualitative assessment of the quantitative effect of factors such as speed, traffic volume, geometric features, delays and freedom of movement.

The intersections were assessed for existing operational performance using SIDRA Intersection Analysis. SIDRA Intersection calculates the amount of delay experienced by vehicles using an intersection, and gives a Level of Service rating. The 'Level of Service' (LOS) indicates the relative performance of that intersection with regard to the average delay (in seconds per vehicle) experienced by vehicles at the intersection.

At a signalised intersection, the Level of Service (LoS) criteria are related to average intersection delay measured in seconds per vehicle. The RMS Guide has recommended that with roundabout, "Stop" and "Give Way" sign control intersections, the LoS value is determined by the critical movement with the highest average delay.

Table 10.2 summarises intersection LoS criteria used to assess the intersection performance.

Table 10.2: LoS Criteria

Level of Service	Average Delay per Vehicle (sec/veh)	Traffic Signals, Roundabout	Give Way & Stop Signs
A	<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	Unsatisfactory with excessive queuing	Unsatisfactory with excessive queuing

In general, SIDRA predicts intersection performance for the following key parameters:

- Degree of saturation (DoS);
- Average delays to intersection;
- Level of service (LoS) determined from LoS criteria; and
- Queue length.

Intersection analysis of the key intersections adjacent to the site was undertaken. The results of the modelling for existing traffic are shown in Table 10.3 and Table 10.4. The results of the modelling reveal that on the overall the key intersections perform at an acceptable LoS on a typical Friday or Saturday PM peak.

Table 10.3 and Table 10.4 present the summary of existing level of service (LoS) for the key intersections of the precinct near the North East Plot.

Table 10.3: Intersection Performance of Existing Friday PM Peak Condition (2012)

Intersection	Intersection Control	Approach	Average Delay Approach (sec/veh)	Approach LoS	Overall Average Delay (sec/veh)	Overall LoS
Pier St / Harbour St / Goulburn St	Signalised	Harbour St North	61.4	E	44.2	D
		Goulburn St East	28.6	C		
		Harbour St South	51.3	D		
		Pier St West	34.2	C		
Harbour St / Liverpool St	Signalised	Harbour St North	24.3	B	34.0	C
		Liverpool St East	42.3	C		
		Harbour St South	31.8	C		
		Car Park Exit (West)	65.8	E		

Table 10.4: Intersection Performance of Existing Saturday PM Peak Condition (2012)

Intersection	Intersection Control	Approach	Average Delay Approach (sec/veh)	Approach LoS	Overall Average Delay (sec/veh)	Overall LoS
Pier St / Harbour St / Goulburn St	Signalised	Harbour St North	53.9	D	42.4	C
		Goulburn St East	31.3	C		
		Harbour St South	51.6	D		
		Pier St West	31.2	C		
Harbour St / Liverpool St	Signalised	Harbour St North	19.1	B	27.5	B
		Liverpool St East	44.8	D		
		Harbour St South	20.5	B		
		Car Park Exit (West)	58.2	E		

10.3.2. Future Operational Performance

The results of the modelling for the future network with the proposed development are presented in Table 10.5 and Table 10.6 below.

Table 10.5: Future Intersection Performance (Friday Event)

Intersection	Intersection Control	Approach	Average Delay Approach (sec/veh)	Approach LoS	Overall Average Delay (sec/veh)	Overall LoS
Pier St / Harbour St / Goulburn St	Signalised	Harbour St North	40.7	C	33.8	C
		Goulburn St East	35.1	C		
		Harbour St South	38.7	C		
		Pier St West	23.0	B		
Harbour St / Liverpool St	Signalised	Harbour St North	23.8	B	35.5	C
		Liverpool St East	45.0	D		
		Harbour St South	33.9	C		
		Car Park Exit (West)	70.8	F		

Table 10.6: Future Intersection Performance (Saturday Event)

Intersection	Intersection Control	Approach	Average Delay Approach (sec/veh)	Approach LoS	Overall Average Delay (sec/veh)	Overall LoS
Pier St / Harbour St / Goulburn St	Signalised	Harbour St North	49.6	D	38.4	C
		Goulburn St East	33.0	C		
		Harbour St South	44.7	D		
		Pier St West	24.1	B		
Harbour St / Liverpool St	Signalised	Harbour St North	15.1	B	20.4	B
		Liverpool St East	29.9	C		
		Harbour St South	17.9	B		
		Car Park Exit (West)	33.5	C		

The results indicate that with development traffic, the key intersections in the vicinity of the North East Plot will perform at an acceptable LoS on a typical Friday or Saturday PM peak.

11. Public and Active Transport

11.1. Public Transport

The site is ideally located in close proximity to all forms of public transport infrastructure currently available in Darling Square. The site is positioned as follows:

- Approximately 350m walking distance to bus stops on George Street, with frequent services to Sydney CBD and the surrounding suburbs.

  Details of the Sydney bus services which are in the vicinity of the site include the following:

  - Route 422 Kogarah – Tempe – St Peters – City;
  - Route 423 Kingsgrove – Earlwood – City;
  - Route 426 Dulwich – Marrickville – City;
  - Route 428 Canterbury – Petersham – City;
  - Route 436 Chiswick – Rodd Point – Leichhardt – City;
  - Route 438 Abbotsford – Leichhardt – City;
  - Route 439 Mortdale – Leichhardt – City;
  - Route 440 Rozelle – Leichhardt – City;
  - Route 443 Maritime Museum – The Star – Pymont – City;
  - Route 470 Lilyfield – Annandale – City;
  - Route 504 Chiswick – Drummoyne – City;
  - Route 303 Sans Souci – Mascot – Surry Hills – City; and
  - Route X03 Sans Souci – City.
- Approximately 150m walking distance from the Paddy's Market light rail stop, servicing the light rail route between Central Station/CBD and the inner west suburbs through Darling Harbour South. The light rail provides services every 10 – 15 minutes between Central Station and Lilyfield, and operates 24 hours daily between Central Station and The Star Casino with night services operating every 30 minutes.
- Approximately 650m walking distance from Central Train Station, servicing trains on almost all of the lines of the Sydney Train network, and is the major terminus for NSW TrainLink services, which provides services to the regional areas of NSW.
- Approximately 800m walking distance from Town Hall Train Station, which serves Sydney Central Business district and provides services to the City Circle, North Shore, Bankstown and Eastern Suburbs line.
- Approximately 1km walking distance from Darling Harbour Wharf, servicing ferries between Circular Quay and Parramatta.

In addition, water taxis operate around Darling Harbour providing pick up and drop off at any accessible wharf or waterfront locations.

TTM consider the high-availability of public transportation provisions in the vicinity of the site will satisfy the site's requirements for such facilities.

11.2. Pedestrian Access

Pedestrian access to the site is considered satisfactory with several pedestrian access points available along the site frontage, as well as being surrounded with multiple pedestrian crossings around the site.

11.3. Cyclist Provision

The site has direct access to cycling facilities, with on-street cycle lanes located on Darling Drive.

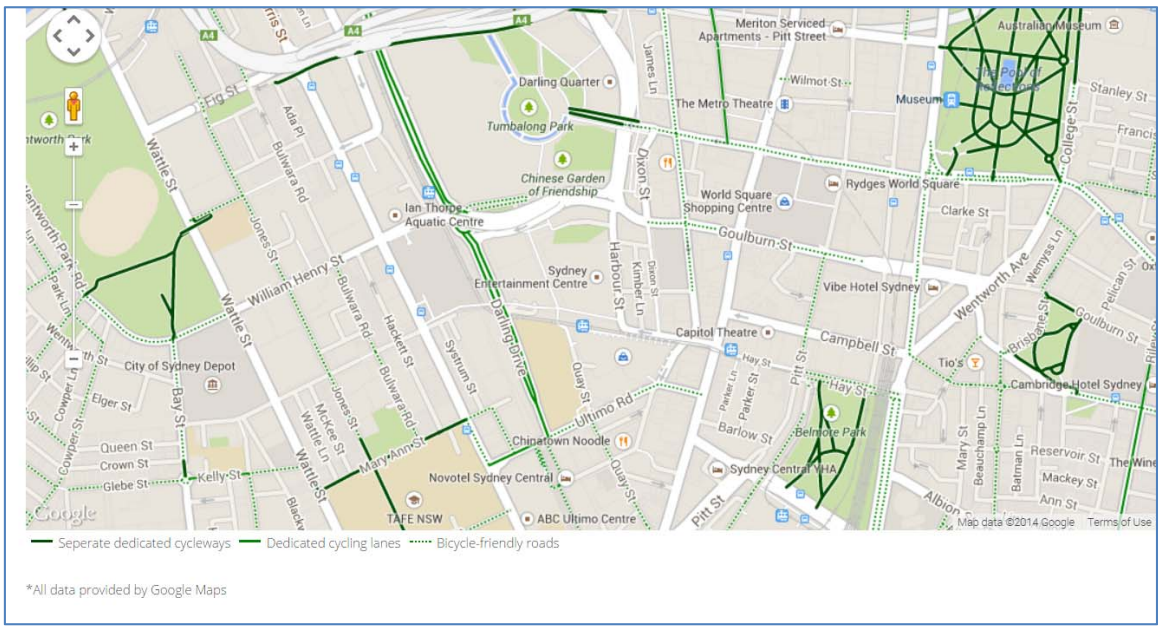


Figure 11-1: Cycle Network (http://www.sydneycycleways.net/map/)

As discussed in Section 7.2.2 the development provides the following on-site cyclist parking facilities:

- a storage cage for each apartment of sufficient size that it can be used for bicycle storage for the residents; and
- 70 cyclist spaces for retail use and visitors on the ground floor.

Cyclist access to bicycle parking is from Harbour Street via the car park access and internal ramps.

12. Construction Traffic Impact and Management

12.1. Background

A Preliminary Construction Management Plan has been prepared by Lend Lease Building. The document outlines the indicative management plans relating to the construction works associated with SSDA7.

This section presents excerpts from the above document relevant to Traffic and Pedestrian Management during construction of the North East Plot, including description and layouts of the planned mitigation arrangements demonstrating how, during the development, the pedestrian and vehicular movements will be addressed to minimise impact.

12.2. Site Boundary

Figure 12-1 below depicts the hoarding locations proposed for the North East plot, which identifies the area for the development construction zone. A Class hoarding is outlined in blue and B Class hoarding s shaded in red.

Figure 12-1: Site Boundaries during Demolition/Construction Works

12.3. Construction Staging

12.3.1. Staged Demolition of Sydney Entertainment Centre and Sydney Entertainment Centre Car Park

While the demolition of the SEC car park is proposed to facilitate the initial development stages of Darling Square on the western side of the site, the Sydney Entertainment Centre will remain in operation until December 2015. Prior to December 2015, the car parking needs of the SEC will be serviced by the public car parking facilities beneath Darling Walk and other adjacent public car parking stations.

12.3.2. Staged Delivery of NE Plot

On completion of the demolition of the Sydney Entertainment Centre the demolition site will be divided into the 3 plots being the North, North East and South East.

It is planned for the North and North East Plots to be built concurrently. The NE Plot establishment will consist of 3 cranes, 1 to residential Building NE1 (20 Levels) and 2 to residential Building NE3 (40 levels). Each of these towers will have a twin high speed Man & Materials hoist to the exterior façade. A hoarding plan showing the extent of works remaining under construction is shown in Figure 12-1.

12.4. Construction Vehicle Access

The primary construction heavy vehicle access to the North East Plot will be via Harris Street, George Street and Harbour Street, and egress will be via Darling Drive with connection to Pyrmont Bridge.

Traffic movements and vehicles will conform to current Roads and Maritime Services (RMS) requirements. All vehicles accessing the site will conform to the “Traffic controls at work sites” manual, and Australian Standard 1742 – Traffic control, and only certified traffic controllers shall be used to direct vehicles outside of the construction boundaries. The main access for construction deliveries shall be the entry and exit gates to the North East site is shown in Figure 12-2. These points may need to be relocated during the course of the works to facilitate construction activities and will be controlled to ensure safe movement of vehicles and pedestrians.

On site construction access routes will be established within the construction boundaries with hoists transporting personnel and materials within each building.

The truck movements anticipated will be spread evenly throughout the construction programme. Usually the bulk truck movements would be during the excavation phase, however, the adopted design involves minimal bulk excavation thereby reducing this heavy vehicle activity.

During the course of the development it is anticipated that vehicle movements for such trades as Demolition, Civil, Piling, Detail Excavation, Structure, Façade, Internal Finishes and Public Domain works shall occur.

Based on the programme and volume of materials required, it is estimated that approximately 3 - 4 trucks per hour will access the site for the duration of the development. In such instances such as concrete pours, this volume will increase, but shall be controlled (as the preferred supply plant is within 1km of the development) to alleviate any congestion to the surrounding traffic network.

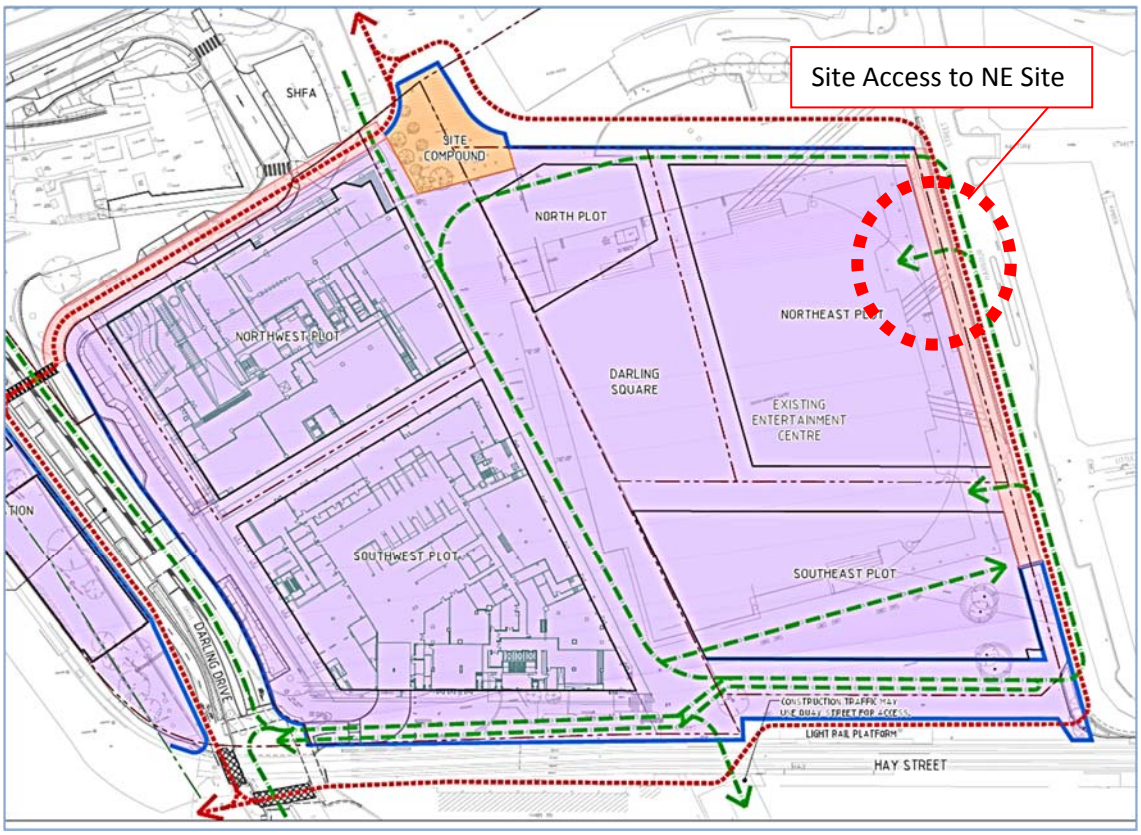


Figure 12-2: Access to the North East Site

12.5. Parking During Construction

Onsite parking will not be allowed during construction. Measures will be implemented to encourage the use of good public transport systems already in place for construction staff and workers. This will be conveyed through all subcontract documentation and site inductions. Timetables shall be provided for all bus routes and the three closest railway stations serviced by bus routes.

12.6. Pedestrian Access During Construction

Pedestrian access during construction will generally be adopting the following principles:

- Hoardings will be erected to prevent public entry into constructions areas;
- Public access along existing desire lines around construction areas will be maintained where possible; and

- Pedestrian access along Harbour Street will be controlled (and may need to be limited periodically) during demolition and services relocation works to ensure public safety.

12.7. Traffic Management Measures

Appropriate directional signage and traffic control will be provided to ensure vehicles enter and leave the site with minimal disturbance to other road users and so they are advised of any changes in road conditions. Temporary road closures, single lane access and relocations during the construction period will be subject to coordination with the appropriate authorities. All traffic related issues and changes shall also be presented to Stakeholders as part of the consultation process. These will, wherever and whenever possible, are carried out in non-peak periods.

The traffic and pedestrian management plan outlined in the Construction Management Plan is generally aimed at mitigating any potential impacts that may be attributed to the construction works. Risks to the public and the construction crew would be minimised through the implementation of the construction management plans specifically prepared for the SICEEP construction works of the PPP and Darling Square. The Plan will be regularly updated to address any new outcomes identified through constant monitoring as the works progress.

12.8. Cumulative Traffic Impacts

The North and North East Plots are planned to be built concurrently from mid-2016, halfway through construction of the West, South West and North West Plots. It is anticipated that truck movements to these three sites shall drop significantly after February 2015.

The number of heavy vehicles for the NE Plot will be temporary only for the duration of the construction period. However, the majority of the heavy vehicle movements would occur during the excavation phase and will be managed through the preparation of a Construction Traffic Management and Access Plan. This plan will be prepared prior to commencement of construction works and in consultation with the relevant stakeholders and affected parties.

Table 12.1 provides an indicative estimate of truck movements through each component of the PPP, PDA South, and PDA North projects through their early works and structure phases where it is expected that peak traffic loads shall occur. It can be seen that estimated peak construction traffic will be evident in the months between July 2014 (97 truck movements per day) to February 2015 (107 truck movements per day), and shall drop off significantly following this period.

Traffic surveys undertaken in October 2012 suggests there are approximately 550 truck movements recorded on a Friday and 200 truck movements recorded on a Saturday along Darling Drive. It is estimated that approximately 10 truck movements per hour or 100 truck movements per day (over a 10-bour period) are associated with the existing Exhibition and Convention Centre on Darling Drive, north of the Pier Street roundabout.

From Table 12.1, it is estimated that the truck movements associated with the construction of the SICEEP development (PPP, PDA South and PDA North) will be approximately 107 truck

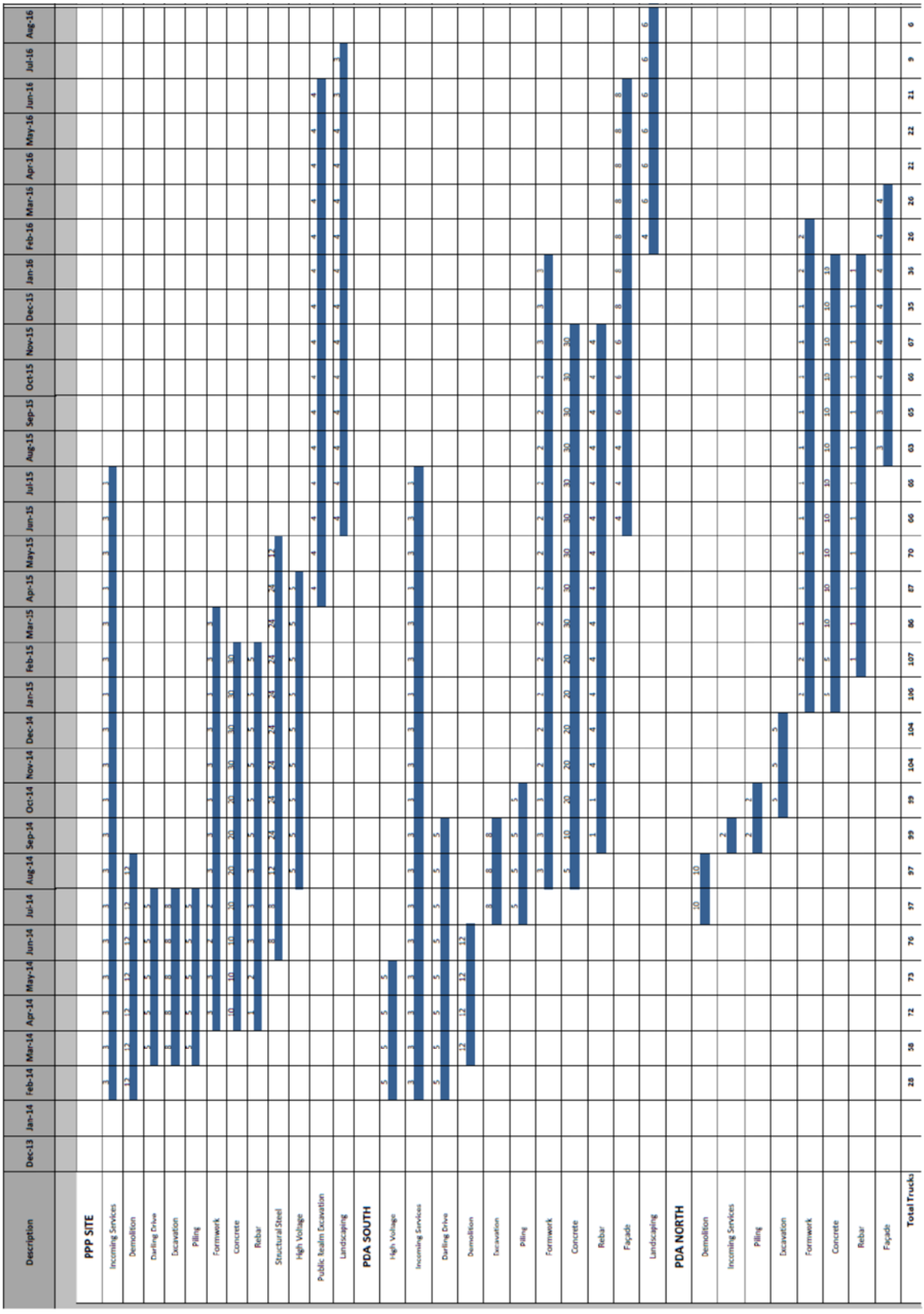
movements per day in the busiest month of February 2015. This equates to at least 1 additional truck movement per hour in a 7 hour day when compared to existing truck movements. It should be noted that this increase is marginal and that during construction, the Exhibition Centre and Convention Centre will not be operating and construction traffic is not likely to exceed current levels of existing truck traffic on Darling Drive.

The diversity of construction access points will largely mitigate any significant construction traffic impacts on Harbour Street /Darling Drive.

Analysis of the frequency and type of expected construction vehicles suggests:

- The distribution will alleviate potential for congestion at any single access point;
- Potential conflict points can be monitored and managed through the preparation of detailed construction traffic management plans;
- The specific plans will be regularly updated in accordance with any changes required to proposed route and movements as identified through constant monitoring as the works progress; and
- Any possible impact would be marginal and temporary.

Table 12.1: Indicative Construction Duration and Associated Truck Movements by Construction Component



13. Summary and Conclusions

13.1. Development Access

The access is recommended as a 7.915m wide driveway crossover.

The proposed access arrangement generally complies with Australian Standards; however, due to the low number of vehicles movements from the proposed development, a combined access driveway is considered suitable for the development rather than a separate entry and exit as required by AS2890.

Finally, the development access will provide 5 cars queue provision. This is expected to be sufficient on the basis that the access will need to cater for 117 vehicles per hour in (and 33 out), most of which will occur without significant conflict and, therefore, limited queuing.

13.2. Car Parking Arrangements

The proposed parking supply for the residential component of the site is generally consistent with parking rates approved as part of SSDA2. It is proposed that no parking will be provided on site for the retail component of the site because a 400 space public car park is being provided on the North West Plot. The internal car park layouts, as a minimum, comply with AS2890 requirements. Overall, TTM considers the proposed car parking arrangements for this development are adequate.

13.3. Impact on Surrounding Road Network

Assessment of the proposed development indicates that the development will not have a significant impact on the future road network. As such, no further mitigating road works are required.

13.4. Service Vehicle Arrangements

Servicing for this development will be facilitated in the designated loading area on the ground floor, accessed off Harbour Street. Service vehicle demands for the various uses of the site will be managed in a way to share the use of the loading area, and also restrict the size of vehicles accessing the site. The largest design vehicle, a 9.25m City of Sydney garbage truck can manoeuvre on site in order to enter and exit in a forward gear. Overall, the proposed service vehicle arrangements are considered adequate to meet the needs of the proposed development.

13.5. Public Transport and Bicycle / Pedestrian Facilities

The current public transport infrastructure and proposed site provisions for pedestrian/bicycle facilities is considered adequate for the development.

13.6. Construction Traffic Impact and Management

Analysis of the frequency and type of expected construction vehicles suggests that any possible impact would be marginal and temporary.

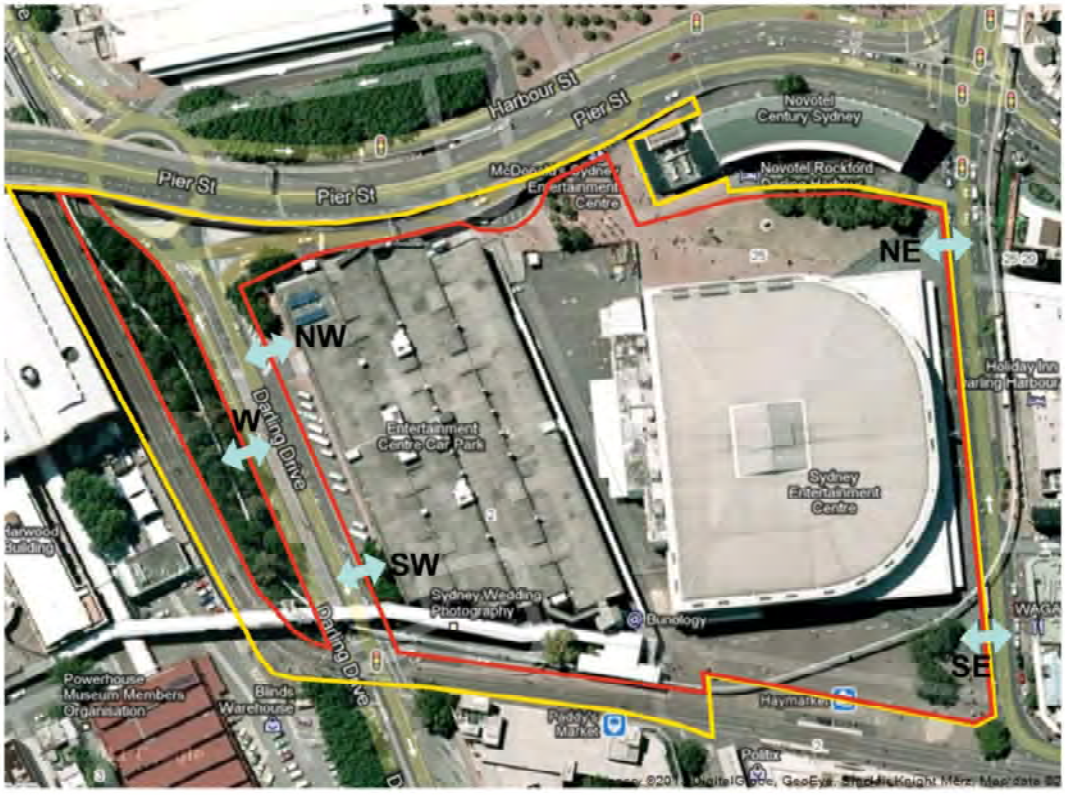
13.7. Conclusion

Based on the assessment contained within this report, TTM see no traffic engineering reason why the relevant approvals should not be granted.

Appendix A SSDA2 Transport and Traffic Impact Assessment Report

SYDNEY INTERNATIONAL CONVENTION, EXHIBITION AND ENTERTAINMENT PRECINCT (SICEEP) – THE HAYMARKET PRECINCT

TRANSPORT AND TRAFFIC IMPACT ASSESSMENT (INCLUDING TMAP AND ROAD SAFETY ASSESSMENT)



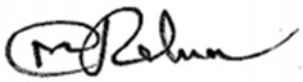
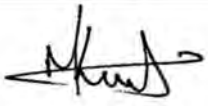
Hyder Consulting Pty Ltd
ABN 76 104 485 289
Level 5, 141 Walker Street
Locked Bag 6503
North Sydney NSW 2060
Australia
Tel: +61 2 8907 9000
Fax: +61 2 8907 9001
www.hyderconsulting.com

LEND LEASE PTY LTD

DARLING HARBOUR LIVE

Sydney International Convention, Exhibition and Entertainment Precinct (SICEEP)

Transport and Traffic Impact Assessment (including TMAP and Road Safety Assessment) - The Haymarket

Author	Sally Manahan	
Checker	Mukit Rahman	
Approver	Michael Kurtz	

Report No

Date

This report has been prepared for Lend Lease Pty Ltd in accordance with the terms and conditions of appointment for Darling Harbour Live dated March 2013. Hyder Consulting Pty Ltd (ABN 76 104 485 289) cannot accept any responsibility for any use of or reliance on the contents of this report by any third party.

CONTENTS

1 INTRODUCTION

This report supports a State Significant Development Application (SSD 5752-2012) submitted to the Minister for Planning and Infrastructure pursuant to Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

The Application seeks approval for the establishment of building envelopes and design parameters for a new neighbourhood and a community hub (referred to as The Haymarket) as part of the Sydney International Convention, Exhibition and Entertainment Precinct SICEEP Project at Darling Harbour.

The project will develop The Haymarket into one of Sydney's most innovative residential and working districts. Through the delivery of the overall Project, Darling Harbour will also become home to Australia's largest convention and exhibition facilities, Sydney's largest red carpet entertainment venue, and a hotel complex of up to 900 rooms.

The SICEEP Project importantly forms a critical element of the NSW Government's aspiration to "make NSW number one again".

2 OVERVIEW OF PROPOSED DEVELOPMENT

The proposal relates to a staged development application and seeks to establish concept plan details for The Haymarket, located within the southern part of the SICEEP Site.

The Haymarket will include student housing, public car parking, a commercial office building, and four mixed use development blocks (retail/commercial/residential podium with residential towers above) centred around a new public square to be named Haymarket Square.

More specifically concept approval is sought for the following:

- Demolition of existing site improvements, including the existing Sydney entertainment Centre (SEC), Entertainment car park, and part of the pedestrian footbridge connected to the Entertainment car park and associated tree removal;
- North-west block – construction of a part public car park and part commercial/office building;
- North-east block – construction of a mixed use podium (comprising retail, commercial, above ground parking, and residential);
- South-east block - construction of a mixed use podium (comprising retail, commercial, above ground parking, and residential);
- South-west block - construction of a mixed use podium (comprising retail, commercial, above ground parking, and residential);
- North block – construction of a low rise mixed use building comprising retail, commercial and residential;
- Student housing – construction of two buildings providing for student accommodation;
- Public domain improvements including a new square, water features, new pedestrian streets and laneways, streetscape embellishments, and associated landscaping. (It is intended that a Stage 2 DA seeking approval for parts of the part of the public domain (The Boulevard and Haymarket Square) will be lodged with the first residential stage);
- Darling Drive realignment
- Remediation strategy; and

- Car parking rates.

2.1 BACKGROUND

The existing convention, exhibition and entertainment centre facilities at Darling Harbour were constructed in the 1980s and have provided an excellent service for Sydney and NSW.

The facilities however have limitations in their ability to service the contemporary exhibition and convention industry which has led to a loss in events being held in Sydney.

The NSW Government considers that a precinct-wide renewal and expansion is necessary and is accordingly committed to Sydney reclaiming its position on centre stage for hosting world-class events with the creation of the Sydney International Convention, Exhibition and Entertainment precinct.

Following an extensive and rigorous Expressions of Interest and Request for Proposals process, Darling Harbour Live (formerly known as 'Destination Sydney'- a consortium comprising AEG Ogden, Lend Lease, Capella Capital and Spotless) was announced by the NSW Government in December 2012 as the preferred proponent to transform Darling Harbour and create the new Sydney international convention, exhibition and entertainment precinct.

Key features of the Darling Harbour Live Preferred Master Plan include:

- Delivering world-class convention, exhibition and entertainment facilities, including:
  - Up to 40,000m^2 exhibition space;
  - Over 8,000m^2 of meeting rooms space, across 40 rooms;
  - Overall convention space capacity for more than 12,000 people;
  - A ballroom capable of accommodating 2,000 people; and
  - A premium, red-carpet entertainment facility with a capacity of 8,000 persons.
- Providing up to 900 hotel rooms in a hotel complex at the northern end of the precinct.
- A vibrant and authentic new neighbourhood at the southern end of the precinct, called 'The Haymarket', home to an IQ Hub focused on the creative industries and high-tech businesses, apartments, student accommodation, shops, cafes and restaurants.
- Renewed and upgraded public domain, including an outdoor event space for up to 25,000 people at an expanded Tumbalong Park.
- Improved pedestrian connections linking to the proposed Ultimo Pedestrian Network drawing people between Central, Chinatown and Cockle Bay Wharf as well as east-west between Ultimo/Pyrmont and the City.

2.2 SITE DESCRIPTION

The SICEEP Site is located within Darling Harbour. Darling Harbour is a 60 hectare waterfront precinct on the south-western edge of the Sydney Central Business District that provides a mix of functions including recreational, tourist, entertainment and business.

With an area of approximately 20 hectares, the SICEEP Site is generally bound by the Light Rail Line to the west, Harbourside shopping centre and Cockle Bay to the north, Darling Quarter, the Chinese Garden and Harbour Street to the east, and Hay Street to the south.

The SICEEP Site has been divided into three distinct redevelopment areas (from north to south) – Bayside, Darling Central and The Haymarket. The Application Site area relates to The Haymarket as shown in Figure 1.

Figure 1 SICEEP Site

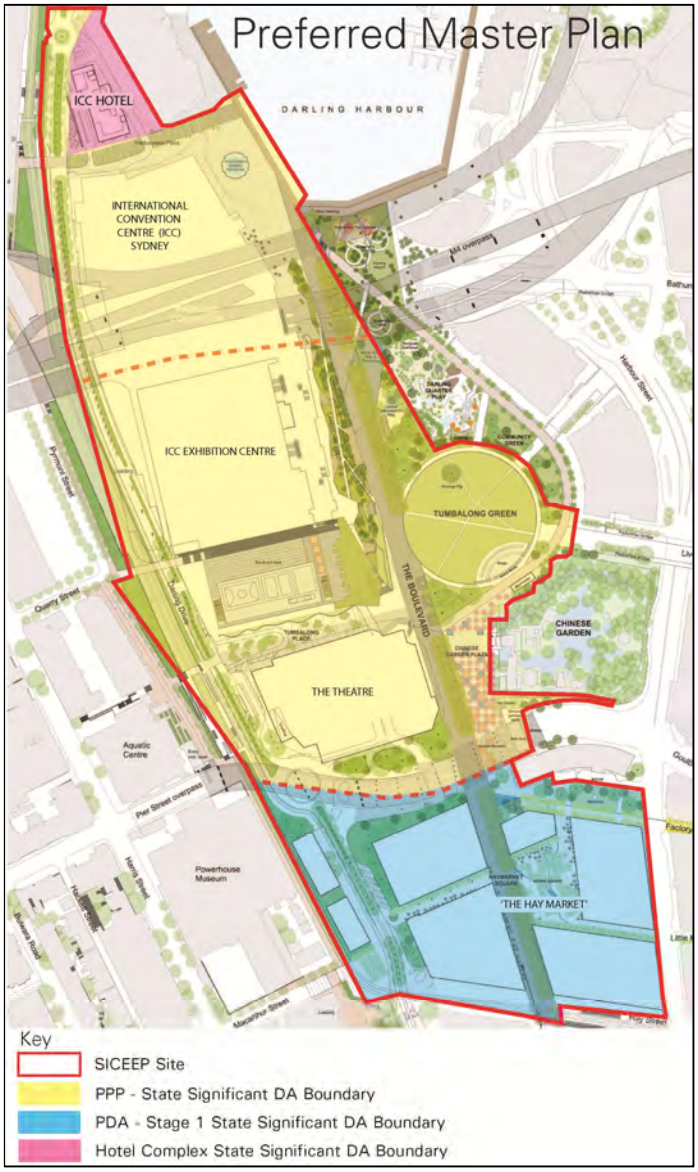
2.3 PLANNING APPROVALS STRATEGY

In response to separate contractual agreements with the NSW Government and staging requirements Lend Lease (Haymarket) Pty Ltd is proposing to submit a number of separate development applications for key elements of the overall Project.

This staged development application involves the establishment of building envelopes and design parameters for a new neighbourhood and a community hub (The Haymarket) within the southern part of the SICEEP Site. Detailed development applications will accordingly follow seeking approval for specific aspects of The Haymarket in accordance with the approved staged development application.

Separate development applications will be lodged for the PPP component of the SICEEP Project (comprising the convention centre, exhibition centre, entertainment facility and associated public domain upgrades) and Hotel complex.

Figure 2 Preferred Master Plan



2.4 SCOPE OF STUDY

An overall Transport and Traffic Impact Assessment (including TMAP and Road Safety Assessment) Study was undertaken for the Preferred Master Plan in order to assess the cumulative impacts of the proposal as a whole. A Transport and Traffic Assessment Report (Main Report) was prepared to support the development approval of the project and is attached as Appendix A. This report is being submitted to support the development approval of The Haymarket and has been prepared in conjunction with the Main Report.

This report is a compilation of the key sections from the Main Report that are relevant to The Haymarket. The Environmental Assessment Requirements issued by the Director General for development approval for the Preferred Master Plan and Specific Requirements for the individual SSDAs for the SICEEP (SSD 5752-2012) were issued on 21 January 2013. The main report addresses the general requirements for the overall project relating to Transport and Accessibility, as outlined in Section 8 of the DGRs.

Section 8 and 16.2 of the DGRs require the following:

- Address the impact of traffic and pedestrian volumes on surrounding road network including intersections using appropriate traffic modelling analysis based on the worst cumulative traffic impacts including a sensitivity analysis;
- Provide details of any upgrading or road improvement works required to accommodate the proposed development;
- Address any impacts on the Light Rail corridor and Western Distributor viaducts;
- Justify the level of car parking provided on the site;
- Provide details of measures to encourage sustainable transport measures, including end of trip cyclist facilities, pedestrian and cycle connections and travel plans;
- Address the impacts from construction traffic to the surrounding area and include the cumulative impact of construction activities from other sites in the locality;
- Provide details of the parking provision and arrangements during the demolition/construction period;
- Provide details of the pedestrian and cyclist connections to the surrounding area including west to Ultimo and east to the Central Business District;
- Address road safety at key intersections and locations subject to heavy vehicle movements and high pedestrian activity; and,
- Address traffic management during construction including cumulative impact from surrounding development sites and details of vehicle routes, numbers of trucks, hours of operation, access arrangements, traffic control measures, crane locations and swing path of cranes.

In addition to the General Requirements, a list of Specific Requirements for each of the individual SSDAs were provided. Issues to be considered for SSDA 2 – The Haymarket precinct (Concept) did not identify any issue under Transport and Accessibility.

2.5 STUDY OBJECTIVES

This study has been prepared in accordance with NSW Department of Transport's *Draft Interim Guidelines on TMAPs* and the RMS *Guide to Traffic Generating Developments*. The objectives of this study are to:

- Meet the DGRs
- Manage the transport impacts of the SICEEP development (The Haymarket)
- Help reduce reliance on private car use
- Promote and maximise the use of sustainable modes of transport, i.e. public transport, walking and cycling.

2.6 PREVIOUS STUDIES

This assessment was undertaken on the basis of data and information collected at the time of preparation of the report and supplemented by traffic data and information contained in the following reports:

- Traffic and Transport Conditions Report, Darling Harbour South Master Plan, Sydney Harbour Foreshore Authority, (Halcrow), November 2010.
- Urban Design Report – Darling Harbour South Master Plan, Johnson Pilton Walker, Sydney Harbour Foreshore Authority, December 2010.
- Ultimo Pedestrian Network (UPN) Stage 2 Central Station to Darling Harbour Pedestrian Link, SHFA (Aspects Studios with Choi Ropiha Fighera).

In addition, INSW provided two reports that covered the preliminary traffic analysis of baseline conditions of the SICEEP including the baseline traffic model developed in AIMSUN:

- Existing Traffic and Transport Conditions Report, Sydney International Convention, Exhibition and Entertainment Precinct, Infrastructure New South Wales (Mott MacDonald), May 2012.
- Traffic Management and Accessibility Plan, Sydney International Convention, Exhibition and Entertainment Precinct, Infrastructure New South Wales (Mott Macdonald), August 2012

The above reports formed the basis for the network model and is attached in Appendix A

2.7 REPORT STRUCTURE

This report is structured to provide a full assessment of the transport accessibility issues relating to the Preferred Master Plan. This report is laid out in the following order:

- Section 1 provides an introduction to the study;
- Section 2 provides an overview of the project, background information and the study objectives;
- Section 3 details the strategic context within which the assessment has taken place. This section provides a summary of strategies and priorities noted from relevant state, regional, local and other documents;
- Section 4 establishes the existing transport context in the surrounding area. The chapter also provides an overview of public transport, walk and cycle provisions;
- Section 5 presents the modelling approach and methodology to assess the road network impacts of the proposed development;
- Section 6 provides a more detailed overview of the Haymarket concept plan in terms of the development component, access arrangement etc.;
- Section 7 documents the impact assessment;

- Section 8 provides a summary of crash statistics collected by the RMS and discusses road safety issues associated with Darling Drive and Harbour Street corridors;
- Section 9 outlines the construction impacts and the draft construction traffic management plan; and,
- Section 10 provides the conclusions and recommendations of this study.

3 STRATEGIC CONTEXT

3.1 INTRODUCTION

NSW Government strategies and policies have been continuously articulated in policy documents. Key themes in these policies have been the need to reduce car dependency, increase the attractiveness and usage of sustainable transport modes, reduce the growth in vehicle kilometres travelled and provide an urban form which supports public transport provision.

The documents reviewed contain the strategic context relevant to the local planning and development of the SICEEP site. Details of each document have been provided in the Main Report and are noted below in the context of development directions relevant to the Southern Haymarket Precinct.

3.2 STATE AND REGIONAL STRATEGIC POLICIES

The following documents were reviewed:

- NSW 2021
- Metropolitan Plan for Sydney 2036
- NSW Long Term Master Plan
- The Sydney City Draft Sub-Regional Strategy
- Planning Guidelines for Walking and Cycling
- NSW Bike Plan 2010
- Integrating Land use and transport Policy Package

The strategic policies embodied in these documents provide the framework for the overall development objectives for the SICEEP noting key priorities in land use and transport to support economic growth and guide strategic directions of planning outcomes necessary to ensure sustainable environments.

3.3 LOCAL PLANNING CONTEXT

- Sustainable Sydney 2030
- Cycle Strategy and Action Plan
- Infrastructure NSW SICEEP Urban Design and Public Realm Guidelines
- City of Sydney Chinatown Public Domain Plan
- Ultimo Pedestrian Network

The local planning documents outline the planning principles to guide the development of the City of Sydney. The documents define specific goals and objectives that should be met while planning of infrastructure for transport and accessibility.

4 EXISTING TRANSPORT CONDITIONS

4.1 ROAD NETWORK PERFORMANCE

An assessment of existing network capacity has been undertaken to identify key issues with regard to network deficiencies at key roads and intersections.

4.1.1 TRAFFIC SURVEY DATA

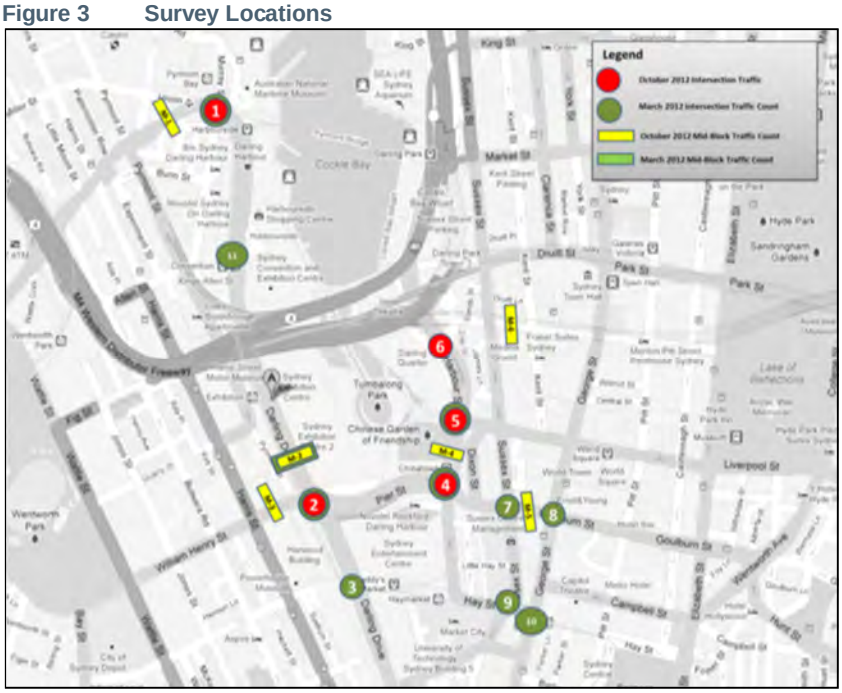
INSW provided intersection turning movement counts for eight intersections and midblock automatic tube counts for 7 locations within the study area. The intersection classified turning movement counts were undertaken for three hours in the AM peak (7-10am) and three hours in the PM peak (4-7pm) on a Thursday (25 October 2012) and on a Saturday (27 October 2012). The midblock automatic tube counts were collected for three days from Thursday to Saturday (25-27 October 2012).

Traffic surveys were also undertaken as part of the Transport Study commissioned by INSW to Mott MacDonald. The traffic survey data was also provided to Hyder for reference in this study. The surveys covered turning movement counts at 14 intersections and were undertaken for two hours (4:30-6:30 p.m.) on a Friday (23 March 2012). The midblock automatic tube counts were collected at two locations for a period of seven (7) days (16-23 March 2012).

Combining both data sets, a total of nineteen (19) intersections had survey data, eight (8) of which had both weekday and weekend data while eleven (11) sites had only weekday data. Both data sets were utilised to inform the analysis for model development, calibration and validation.

Figure 3 shows locations of the selected surveyed intersections and midblock locations included in the modelling.

Figure 3 Survey Locations



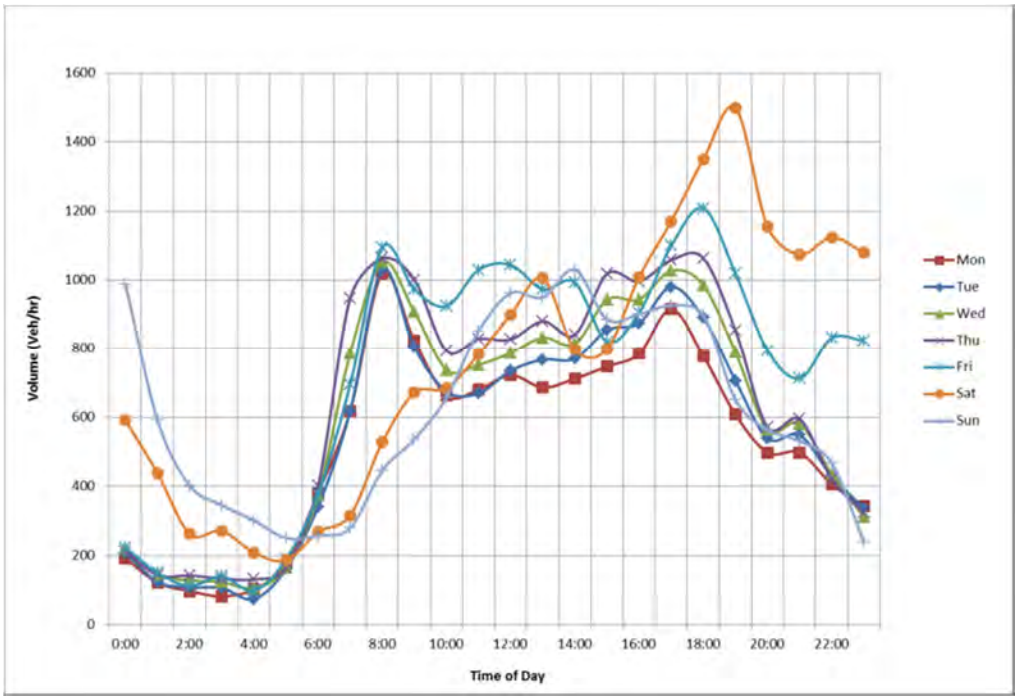
4.1.2 TRAFFIC VOLUME TRENDS

In the study document prepared by Mott MacDonald for INSW it was reported that Friday evening (5.30pm to 6.30pm) manifests the highest peak for traffic volume at the study area compared to other weekday traffic volume (based on midblock 24hours data collection). The profile shown in Figure 4 below represents traffic volume trends observed on Darling Drive.

Insights from the data include:

- Monday to Thursday follow similar trends and volume profiles throughout the day;
- Morning peak hour is generally between 8am to 9am and evening peak hour is generally between 5pm to 6pm on a weekday;
- Friday shows a different trend with the traffic increasing till 9am and remaining relatively constant until 6pm after then traffic volume decreases but then starts again to increase at 9 pm and reaches a daily high at midnight; and
- Saturday evening peak is 38% higher than the average weekly peak. Different traffic pattern indicates the use of the network by regular commuter traffic for most of the week and the shift to “entertainment-related” traffic for both Friday and Saturday evenings.

Figure 4 Seven days Traffic Volume Counts (March 2012), Darling Drive



Mid-block counts conducted in November 2012 showed similar trends on Pyrmont Road and Darling Drive with Saturday count manifesting the highest PM peak period. Traffic volumes observed on Pier Street, Harbour Street, Goulburn Street and Bathurst Street showed weekday (Thursday and Friday) traffic to be generally higher than weekend (Saturday) traffic.

4.1.3 OBSERVED PEAK PERIODS AT INTERSECTIONS

Table 4-1 summarises the highest peak hour observed at key intersections in the vicinity of The Haymarket Precinct. The hour between 17:00 PM and 18:00 PM shows predominant weekday peak. The weekend PM peak spreads between 18:00 PM and 19:00 PM.

Table 4-1 Observed AM and PM Peak Periods at selected key Intersections

Intersection	Control Type	Weekday PM Peak	Weekend PM Peak
Darling Drive/Pier Street	Roundabout	17:30-18:30	17:45-18:45
Darling Drive/Hay Street	Signal	17:00-18:00	
Harbour Street/Liverpool	Signal	17:00-18:00	18:00-19:00
Harbour Street/Goulburn	Signal	17:30-18:30	18:00-19:00

4.2 PUBLIC TRANSPORT SERVICES

The site is accessible via public transport services generally located on the eastern side of the Darling Harbour precinct and consisting of buses, light rail, ferry services and heavy rail.

4.2.1 CITYRAIL SUBURBAN RAIL SERVICES

The Haymarket Precinct site is accessible via the suburban rail stations in the CBD with walking distances from approximately 700-800 metres from the train station at Town Hall and Central Station, respectively. Town Hall Station is approximately 10-12 minutes walking distance to The Haymarket Precinct. via Bathurst Street and Harbour Street. Central Station is a also 10-12 minutes' walk via Ultimo Road/George Street. Both rail stations provide connections to the suburban rail network with Central Station also servicing interurban and inter regional rail services and coaches. Most train services do not operate between midnight and 4 AM but an alternative NightRide bus service is available between these hours on most Sydney suburban lines.

4.2.2 LIGHT RAIL

The Metro Light Rail provides a direct connection from Central Station/CBD on the eastern side with the inner West suburbs through Darling Harbour South. The Metro Light Rail transport system traverses east west from Central Station along Hay Street via Capitol Square, Paddy's Market, then travels north parallel to Darling Drive with stops at ICC Exhibition Centre, Convention Centre, up to Pyrmont Bay, then Star Casino then onwards to Lilyfield. The light rail operates from 6am to 11pm daily between Central Station and Lilyfield with a service frequency of 10-15 minutes and 24 hours daily between Central Station and Star Casino with night service at 30 minute intervals. Extended hours are also observed on the Central Station to Lilyfield route during Fridays and Saturdays.

Figure 5 Sydney Light Rail Service Coverage

Source: ***www.metrotransport.com.au***

4.2.3 EXISTING BUS SERVICES

Bus services in the Sydney CBD are provided by Sydney Buses. There are no bus routes or bus stops in the immediate vicinity adjoining the ICC Exhibition Centre or along Darling Drive. The closest bus stop is located at the Maritime Museum some 5 minutes walking distance from the Site and is being serviced by bus route 443 and bus route 448.

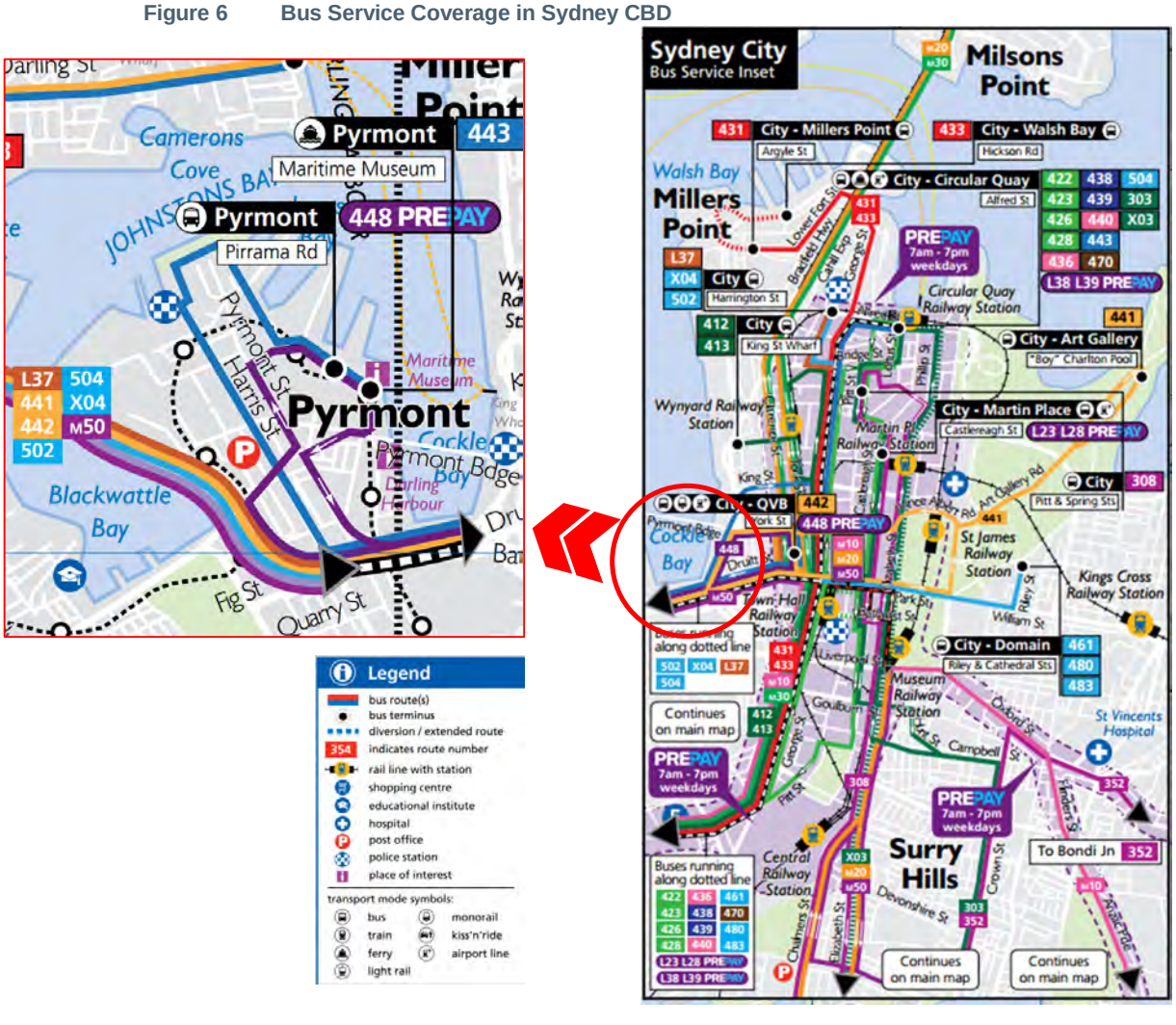
In proximity to the site, a large number of routes operating in the CBD have stops along George Street, with the majority stopping at Town Hall/QVB approximately some 10 minutes walking distance from the SICEEP.

A total of eight (8) bus routes travelling along George Street can service the transport demand for the SICEEP. These routes including bus routes 443 and 448 will be assessed in terms of its level of service based on its current operating characteristics.

The routes consist of daily full time service, Monday to Friday peak hour service, pre-pay service only and a combination of pre-pay and pay-on-board service.

The routes are shown in Figure 6. In addition to the above routes, Sydney Buses operates Route 555 which is a free shuttle bus service in the CBD. The Sydney CBD shuttle bus runs every 10 minutes in both directions on a loop from Central Station to Circular Quay via Elizabeth and George Streets. On weekdays, the shuttle bus operates from 9:30am to 3:30pm with a late finish of 9pm on Thursday evenings and on weekends from 9:30am to 6:00pm. Commuters can board these high frequency buses from any bus stop marked with the green shuttle logo. Each bus is an accessible bus that can be used by people in wheelchairs or with other accessibility requirements, and parents or carers with prams.

Figure 6 Bus Service Coverage in Sydney CBD



Source: www.151300.com.au

4.2.4 FERRY SERVICES

Sydney Ferries operates ferry services between Circular Quay and Darling Harbour via Milson Point, McMahons Point, Balmain East and stops at Sydney Aquarium and Pyrmont Bay. Both stops are some 5-10 minutes walking distance to the Convention Centre.

In addition, water taxis operate in Sydney Harbour and provides pickup or drop off at any accessible wharf or waterfront location.

4.3 PEDESTRIAN AND CYCLE FACILITIES

4.3.1 PEDESTRIAN NETWORK

Pedestrian access to and from the SICEEP and adjacent areas of the CBD is provided by a network of footpaths alongside major roads. Pedestrian connectivity across Darling Harbour and adjacent areas in the CBD consists of multiple road crossings or overhead walkways including steps, ramps or lifts.

Current initiatives being implemented by the Sydney Harbour Foreshore Authority and the City of Sydney are aimed at improving pedestrian and cyclist access from the CBD into Darling Harbour. Works are underway to improve the overall landscape, amenity and character of the adjoining area to complement the development of the SICEEP.

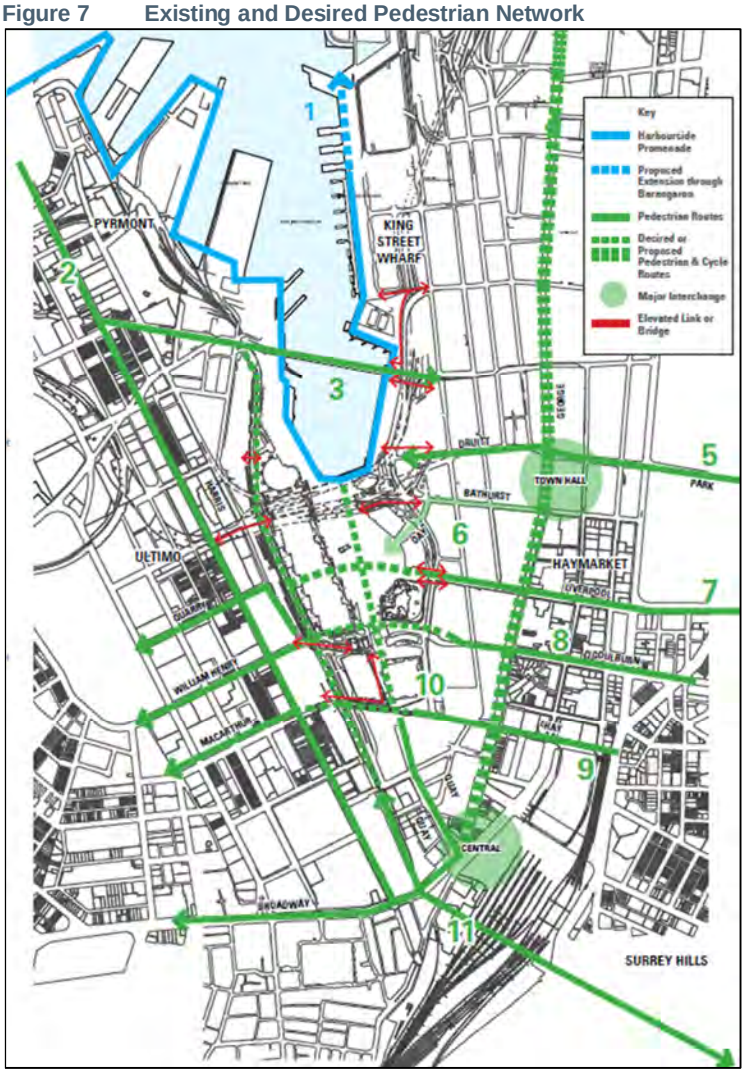
The major pedestrian links to the Precinct include connection to Town Hall and Central Station. The principal routes to and from Town Hall are Druitt Street and Bathurst Street. From Central Station, a direct route exists along Quay Street but is under-utilised as linkages close to Central Station are poor. At the intersection of Quay Street and Hay Street, the route is further obstructed by the loading area between the Sydney Entertainment Centre and the Entertainment Carpark.

In the Urban Design Report prepared for the Darling Harbour South Master Plan, a detailed Precinct survey was undertaken to assess pedestrian connectivity across Darling Harbour South and adjacent areas in the CBD.

The Urban Design Report has listed proposals to improve pedestrian routes to enhance pedestrian connectivity (as shown in Figure 7).

- New pedestrian link between Liverpool Street to Quarry Street (east-west connection);
- Improve link along Goulburn Street to William Henry Street;
- Improve link along Hay Street to MacArthur Street currently provided by stairs at the Entertainment Carpark rising to an elevated footbridge; and
- Improve link on Quay Street to Central Station.

Figure 7 Existing and Desired Pedestrian Network



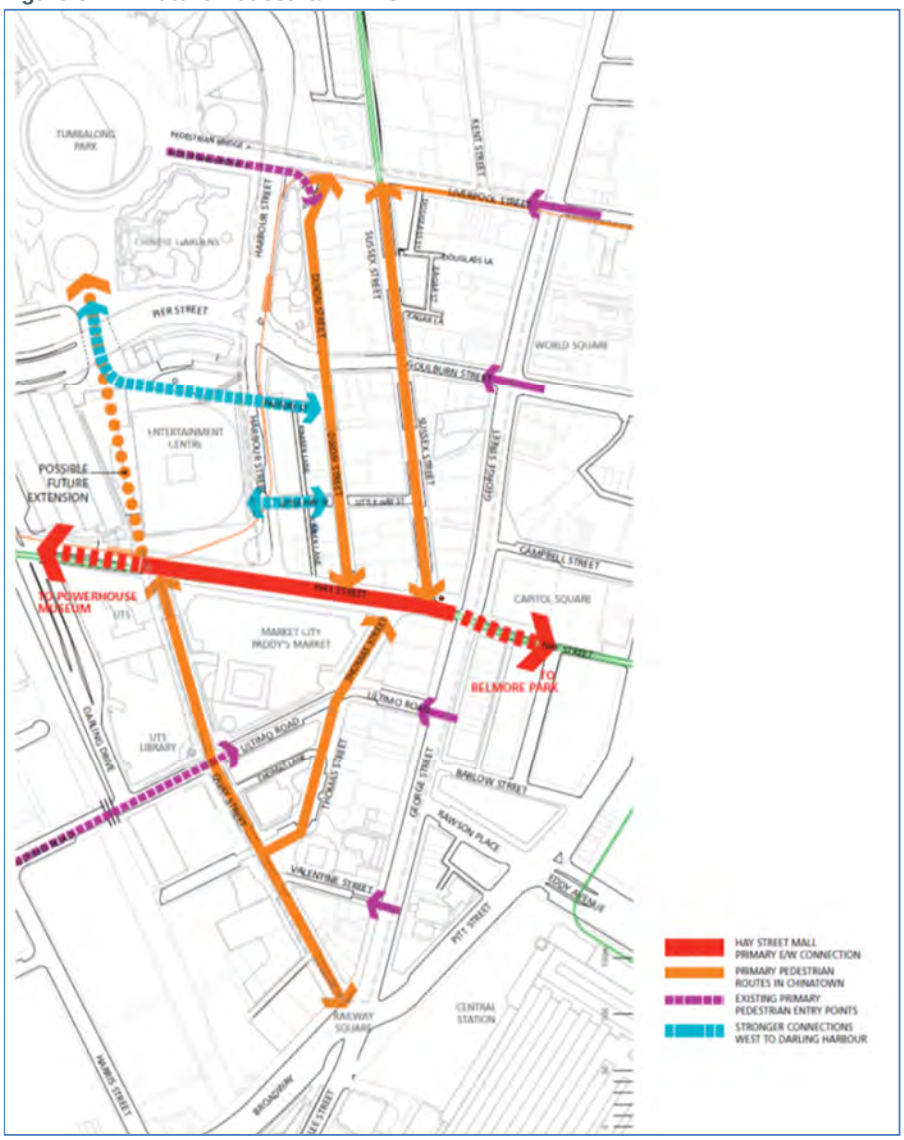
Source: Urban Design Report – Darling Harbour South Master Plan, JPW , Dec 2010

Current proposals under the Ultimo Pedestrian Network (UPN) and Chinatown Public Domain Plan are anticipated to improve access to Darling Harbour from along Goulburn Street side and along Hay Street.

Moreover, the Chinatown Public Domain Plan includes a network of future pedestrian links shown in that will likewise improve pedestrian connectivity to Darling Harbour as the UPN project.

Figure 8 shows the nominated future pedestrian links under the Chinatown Public Domain Plan.

Figure 8 Future Pedestrian Links



Source: Chinatown Public Domain Plan, CoS

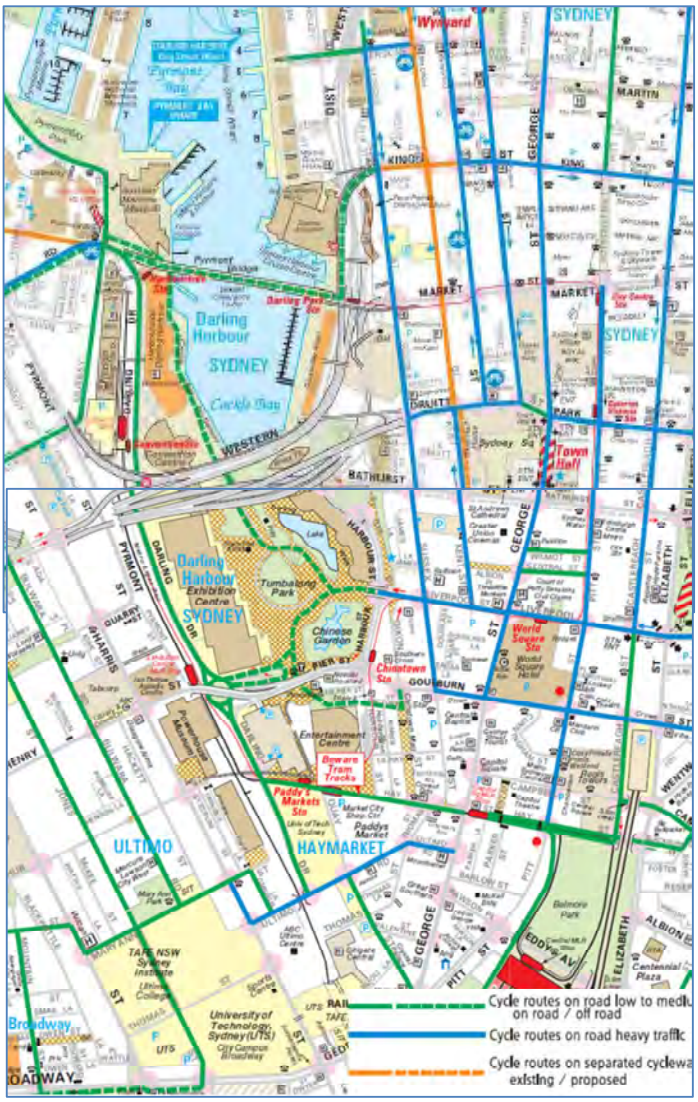
4.3.2 CYCLE FACILITIES

The current Sydney CBD bicycle network is deemed by many to be limited in terms of connectivity and available infrastructure. Majority of the routes are shared routes on roads containing medium to high levels of vehicle traffic.

The Sydney CBD Cycleway network consists of on-street marked cycle lanes, and separated at-grade cycleways. SICEEP is currently connected to the CBD network via the on-street marked cycle lanes along Darling Drive and the off-road cycle path within Darling Harbour.

Figure 9 shows the Cycle Network in the vicinity of SICEEP. Opportunities for east-west linkages are limited. It is suggested that improvements along the east west direction be included as part of the development package.

Figure 9 Existing Cycle Network



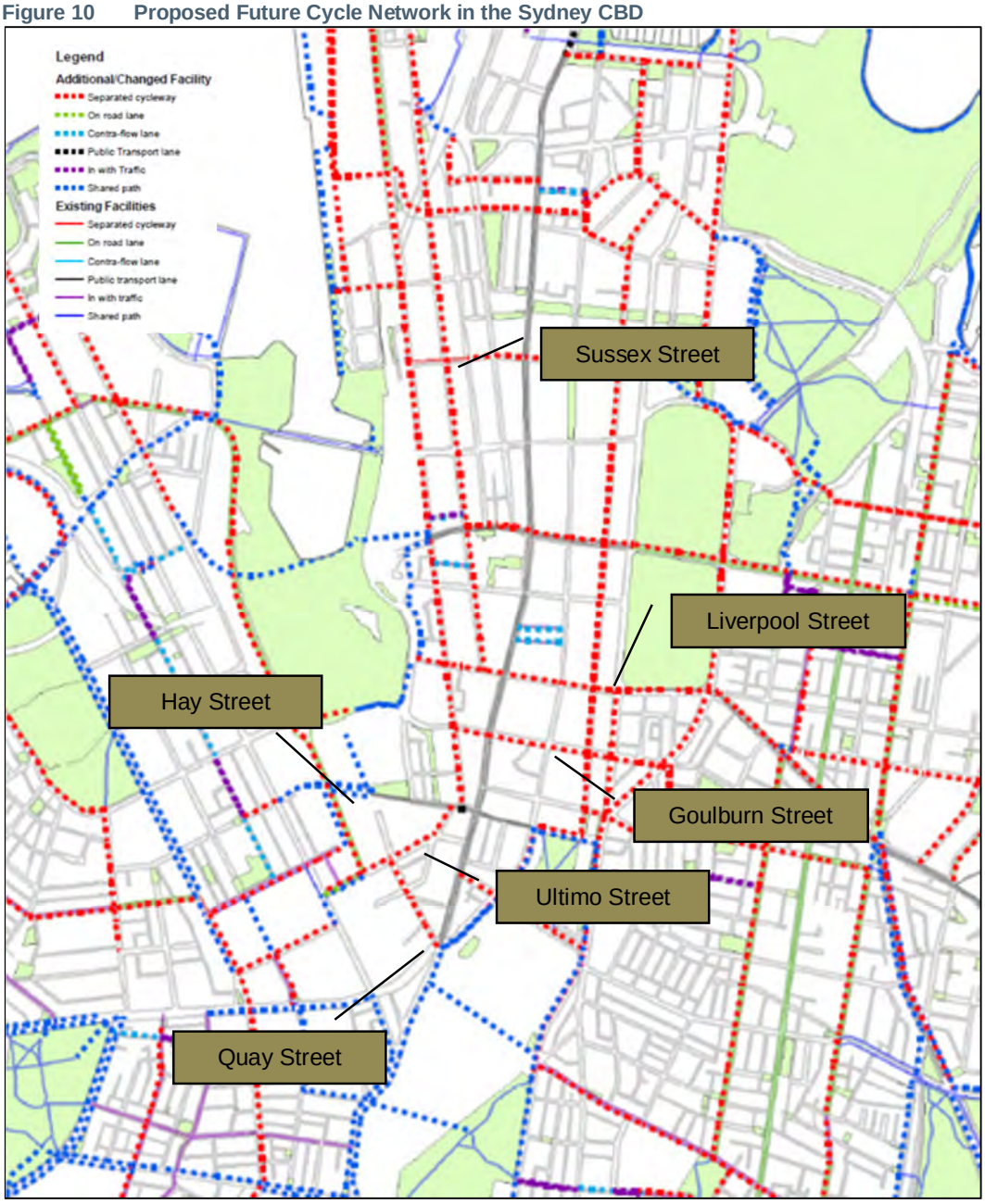
Source: www.cityofsydney.gov.au

As part of the City of Sydney's Cycle Strategy and Action Plan 2007-2017, dedicated bicycle paths will be constructed at key thoroughfares within the CBD over the next 2-3 years.

Figure 10 shows the proposed future cycle network in the Sydney CBD. The key cycle facilities proposed within the vicinity of SICEEP include:

- A separated cycle path along Ultimo Road linking Harris Street to Hay Street;
- A separated cycle path along Hay Street;
- Separated cycle paths along Sussex Street, Goulburn Street and Liverpool Street

Figure 10 Proposed Future Cycle Network in the Sydney CBD



Source: www.cityofsydney.gov.au

4.4 PARKING

4.4.1 EXISTING PARKING SUPPLY

There are a number of public carparks located adjacent to and within walking distance to the SICEEP that can accommodate a total of approximately 10,000 bays. A selected number of the carparks are in close proximity to The Haymarket Precinct.

Figure 11 presents the locations of car parks with Table 4-2 indicating their respective capacities.

Table 4-2 Car Parking Capacity

Map ID	Car Park[1]	Bays	Availability[1]	
			Day	Evening
1	Exhibition Centre	900	800	600
2	Sydney Entertainment Centre	1900	926	1423
4	1 Dixon Street	100	14	53
5	Darling Quarter	600	66	246
8	Market City	614	68	250
9	World Square	557	62	227
11	Citigate Central (Thomas St)	600	67	245

[1] Selected carparks in close proximity to The Haymarket Precinct only. No available information on carpark capacity for carparks A, B, C and G.

Figure 11 Locations of Car Parking near The Haymarket Precinct

5 TRAFFIC MODELLING APPROACH

5.1 OVERVIEW OF THE TRAFFIC MODELLING APPROACH

A micro-simulation model was developed for the core study area bounded by Darling Drive to the west, Harbour Street to the east, Hay Street to the south and Pyrmont Bridge to the north. AIMSUN (Advanced Interactive Microscopic Simulator for Urban and Non-Urban Networks) is a dynamic transport modeling software tool that has the ability to model the movements of individual vehicles and their interactions with other traffic and network constraints. This level of modeling is well suited for modeling traffic circulation in urban centres, and developments such as the SICEEP development. The network modelling was then supplemented by more detailed assessments of selected key intersections using the SIDRA intersection modelling software to test intersection performance at the isolated level during the selected peak hours and to identify potential measures to achieve improved outcomes.

The traffic modelling encompasses the Whole of Precinct (WOP) and investigates cumulative impacts from the development of the PPP, The Haymarket and the ICC Hotel. The future modelling scenario represents 'worst case scenario' analysis and accounts for design proposals developed at this stage.

5.2 AIMSUN MODELLING

The base AIMSUN model was initially developed by Mott MacDonald[1] for INSW. The base model represented existing conditions on a Friday PM Peak (5:30 pm to 6:30 pm) with a network coverage consisting of 14 intersections. The Mott MacDonald base model employed the traffic state demand method and did not include pedestrian movements at the intersection. As agreed with INSW in a meeting held 16 January 2013, the base model developed by Mott MacDonald for INSW will be adopted by Hyder but further developed to incorporate key amendments to reflect existing network and proposed changes in the future road network. In the meeting, Hyder had expressed the limitations of the base model prepared by Mott MacDonald for INSW and the absence of a calibration/validation report. Hyder stated that the base model will need to be updated and model calibration / validation will be undertaken to confirm the base model is robust and can be used for modelling the future traffic in the SICEEP.

The key amendments include the following:

- Reconfiguration and realignment of Darling Drive;
- Road Changes to Exhibition Place
- Additional zones to represent car park access (ingress and egress); and
- Incorporate pedestrian movements at relevant intersections assessed.

Furthermore,

- A Saturday PM peak model was also developed; and
- Calibration and validation checks were undertaken where required.

[1] SICEEP - Traffic and Transport Conditions – Mott MacDonald, May 2012

The future AIMSUN (Non-event and Event) models were developed to facilitate a more in-depth analysis of the operational impacts of key intersections within the SICEEP study area. The AIMSUN models were calibrated and validated in accordance with industry standards with reference to the RMS Paramics Modelling Guidelines to ensure that the models adequately represent existing condition. The models represented weekday and weekend afternoon (PM) peak periods, i.e.:

- Weekday (Friday) PM peak period between 5:30 pm and 6:30 pm, and
- Weekend (Saturday) PM peak period between 6:00 pm and 7:00 pm.

Figure 12 shows the representation of the amended network for future base network that includes the access nodes to the car parks within the SICEEP

Figure 12 Amended Base Network

The criteria for the calibration of a model include the GEH assessment criteria based on the UK Design Manual for Roads and Bridges requirements. This assessment criteria requires not less than 85% of the total modelled flows to be greater than a GEH value of 5. In addition, all GEH values are required to be less than 10. The AIMSUN models for both the Friday and Saturday PM Peaks were calibrated and validated. .

5.3 SIDRA MODELLING

Detailed SIDRA modelling is employed to further confirm the outcomes of the micro-simulation modelling and to determine future intersection performance at key locations. The assumptions used for the modelling include:

- For the future scenario, all signalised intersections are modelled with optimum signal settings. In lieu of the current settings (from the RMS SCATS data) for signal phasing time allocation, SIDRA optimises the signal phasing time allocation based on the forecast future approach demand to achieve optimum results in terms of LoS
- Future demand volumes tested at the intersections were based on the assumed traffic distribution parameters detailed in the report in Section 7.1. The distribution parameters were applied to calculate forecast demand volumes at the intersections; and
- Short lane effects were modelled for signalised intersections to account for adjacent lane spillover.

The above assumptions reflect anticipated future operations at the intersections.

6 DEVELOPMENT COMPONENTS

6.1 OVERVIEW

SICEEP includes the development of a combination of new multi-functional facilities and flexible spaces to enhance the existing convention, exhibition and entertainment facilities. SICEEP forms part of the vision embodied in the Darling Harbour South Master Plan. The SICEEP development works consists of the demolition of the existing Entertainment Centre and Entertainment Centre car park (Haymarket) to give way to redevelopment into mixed-use precinct with residential/retail precinct; an increase in capacity of the exhibition and convention space - ICC, ICC Exhibition Centre, as well as the development of the new Multi-Functional Entertainment Centre (MFEC) – The Theatre.

6.2 ROAD CHANGES TO EXHIBITION PLACE

The proposed road network has introduced proposals for road changes to the access lane from the roundabout to be undertaken as part of the PPP. A one-way system is being proposed where vehicles accessing The Theatre carpark and NW public carpark at The Haymarket will enter from the roundabout but will exit via a proposed new one way road running parallel to northern boundary of the northwest block of The Haymarket in the east-west direction then turning southbound parallel to Darling Drive merging into the outer lane on the proposed amended Darling Drive. The egress and exit point of the NW block will also be at northern side facing Pier Street and can be accessed via the loop road from the roundabout and exit via the one way road.

This is shown in Figure 13. This new configuration will force vehicles exiting the carparks to travel southbound towards Ultimo Road.

Figure 13 Proposed Road Changes to Exhibition Place

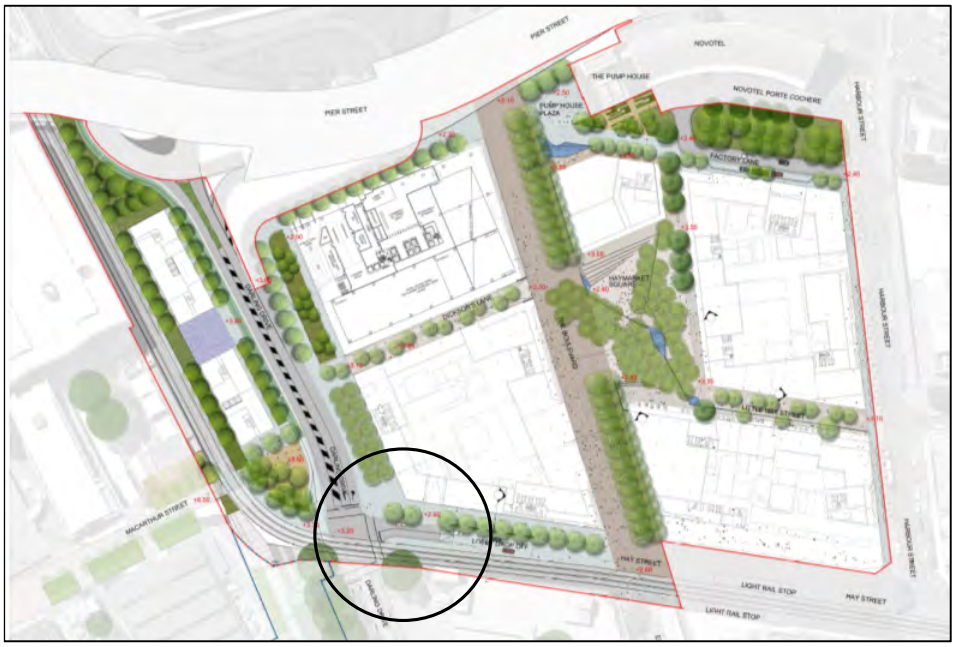
The above road changes will impact on the existing bus operators and coach routing system when accessing the bus stop under the Pier Street viaduct. The one-way system will only allow buses and coaches to travel southbound after drop-off or pick –up. However, two new bus drop-off locations will be provided within the PPP to service the precinct.

The impact of this proposed road change has been modelled and the results are presented in Section 7.2 of this report.

6.3 NEW LANEWAY AT HAY STREET

A new laneway at Hay Street is being proposed to service the podium of the Southwest building as well as service the private carparking provisions at the Southwest sector of The Haymarket Precinct. The egress and exit point of the SW block will be maintained on the southwest corner off the intersection of Darling Drive/Hay Street. The new laneway will be adjacent to the access driveway to the SW carpark and entry and exit will be controlled in the same manner as the carpark access via amendment to the existing signal system at the intersection with Darling Drive.

Figure 14 New Laneway at Hay Street



6.4 RECONFIGURATION AND REALIGNMENT OF DARLING DRIVE

It is proposed that Darling Drive be reconfigured and realigned to accommodate the student accommodation proposed for The Haymarket Precinct. It is noted that the existing configuration of Darling Drive provides two lanes per direction with a two directional cycle lane on east side between the southbound lane and the SEC carpark access lane.

The proposed design reduces Darling Drive to one lane per direction with an additional southbound lane from the loop road for the Theatre carpark and NW public carpark .

The assessment of mid-block lane capacity of Darling Drive is essential to provide an indication of the ability of Darling Drive to carry existing and future traffic.

The AUSTROADS *Guide to Traffic Engineering Practice - Part 2: Roadway Capacity* states that the typical one-way mid-block lane capacities on urban roads under interrupted flow conditions are 900-1000 vehicles/hr/lane. Table 6-3 provides the traffic flow limits for different levels of service, in terms of peak hour flows for one and two lanes of unidirectional travel. Level of Service is used as a performance standard to assess effect of a development proposal on the traffic efficiency of the road network.

Table 6-3 LOS Criteria – Urban Road Peak Hour Flows

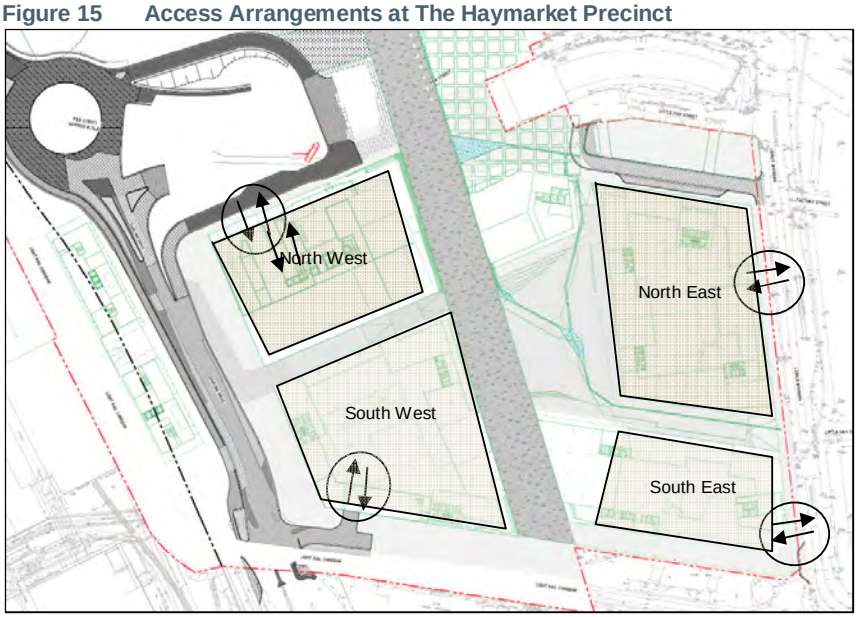
Level of Service	One Lane (veh per hr)	Two Lanes (veh per hr)
A	200	900
B	380	1400
C	600	1800
D	900	2200
E	1400	2800

It is estimated that the PM peak hour volume on Darling Drive is approximately in the order of 900 vehicles per hour in the southbound direction and 400 vehicle per hour in the northbound per direction. From Table 6-3, it can be stated that Darling Drive will still have the capacity to accommodate existing traffic plus additional traffic to be generated by the north and south car parks. Hence, the proposed reconfiguration of Darling Drive is anticipated to be able to accommodate the forecast peak hour volume. .

6.5 NEW VEHICULAR ACCESS POINTS TO HARBOUR STREET

The proposed layout of The Haymarket introduces new vehicular access points to Harbour Street. The residential apartments on the western side of Harbour Street will be facilitated with two separate driveways which provide access to two separated (un-connected) car parking facilities. (See Figure 15)

Figure 15 Access Arrangements at The Haymarket Precinct



These driveways will be located on the western kerb line of Harbour Street approximately 15m and 140m north of Hay Street respectively. A high level assessment was carried out of the potential traffic implications of providing driveways at these locations. There are several key assumptions that were made in this assessment, as follows:

(1) Harbour Street is a one-way northbound road with three traffic lanes and one parking lane. At present, lane 1 (the western-most lane) is a designated bus drop off/ pick up area. However, as the demand for bus services is heavily governed by the existing entertainment centre, which will cease to exist post-development, it has been assumed that the bus zone will be removed and this traffic lane will henceforth operate as a full-time travel lane with no kerb side parking permitted.

(2) The Goulburn Street/ Pier Street/Harbour Street signalised intersection is assumed to have an average cycle time between 60-75 seconds. Furthermore, it has been conservatively assumed that the average green time provided for traffic in the southern (Harbour Street) approach is 20 seconds per cycle, followed by 40-55 seconds of “red”.

(3) The average vehicle footprint is 7m allowing for the vehicle length and the spatial buffer in front of and behind the vehicle.

(4) The capacity of the northern car park is 350 cars with an estimated 20% outbound volume in the PM peak period. This equates to up to 70 outbound vehicles in the PM peak hour.

(5) The capacity of the southern car park is 285 cars with an estimated 20% outbound volume in the PM peak period. This equates to up to 57 outbound vehicles in the PM peak hour.

(6) The left-turn egressing movements from the driveways would require gaps of 5 seconds in the receiving traffic flows. Sight lines would be sufficient for following vehicles to achieve a follow-up time of 3 seconds.

Queuing implications in the southern approach to the Goulburn Street/ Pier Street/ Harbour Street intersection

The potential queue spillback from the Goulburn Street/ Pier Street/ Harbour Street intersection was assessed to determine whether these queues would block the egress path for outbound vehicles from the driveways.

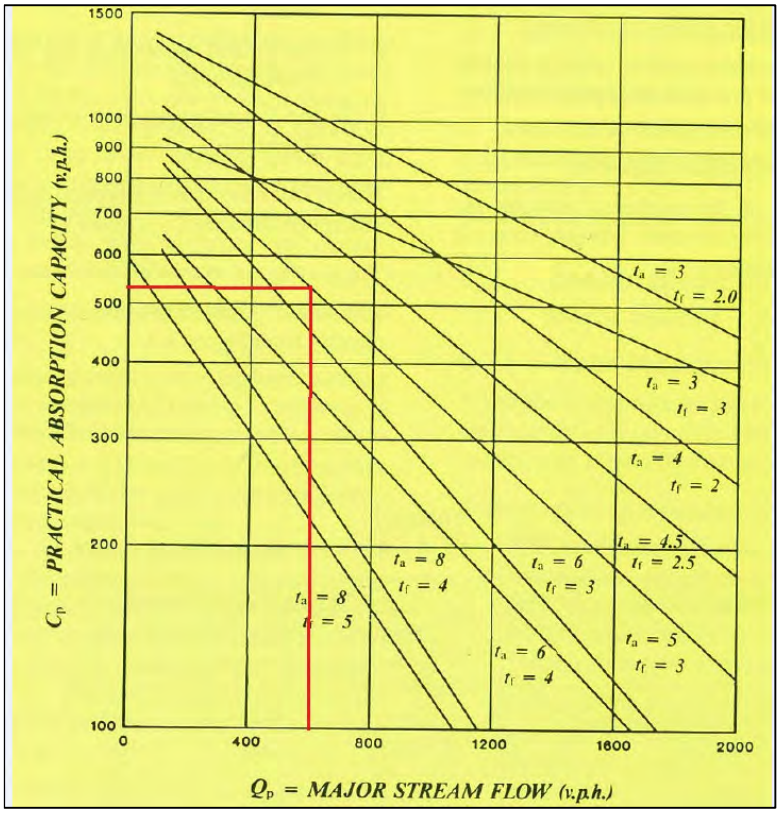
A PM peak traffic volume of 600 vehicles/hour has been adopted for Harbour Street NB. The approximate 300m lane distance from the upstream intersection of Hay Street/ Sussex Street/ Thomas Street signalised intersection would allow for some degree of platoon dispersion. However, as an inner city road, it is still likely that the arrival rate in this southern approach to the Goulburn Street/ Pier Street/ Harbour Street intersection would be platooned. As such, a more intensified arrival rate equivalent to 900 vehicles/hour has been adopted for conservatism.

An intensified arrival rate of 900 vehicle/hour for Harbour Street equates to 300 vehicles/hour/lane based on an assumption that all traffic is evenly split across the three northbound travel lanes. This equates to an arrival rate of 0.083 vehicles/ second/ lane. Therefore, a red period of 55 seconds would generate queues in the order of 35m in each lane in the southern approach to the Goulburn Street/ Pier Street/ Harbour Street intersection. As the northern driveway is more than 50m south of the intersection, it is unlikely that the queues from this intersection would block the egress path from the driveway. Furthermore, the estimated 70 outbound vehicles in the PM peak period (ie. 1 outbound vehicle every 50 seconds) is unlikely to experience difficulty egressing and the queuing potential within this driveway would also be limited.

Absorption capacity of Harbour Street

The absorption capacity of Harbour Street refers to the maximum volume of additional traffic that Harbour Street can absorb before it reaches saturation conditions. The Austroads Guide to Traffic Engineering Practice Part 2 – Roadway Capacity (1988) provides a method for determining the absorption capacity of receiving traffic streams based on gap acceptance and follow up headway requirements of the entering traffic. The figure below, Figure 16, shows the practical absorption capacities based on these requirements.

Figure 16 Practical Absorption Capacity



As seen, a road with an traffic volume of 600 vehicles/hour (for a single lane) would have an absorption capacity in excess of 500 vehicles/hour. That is, an additional 500 vehicles per hour could enter that road before the road reaches saturation levels. Based on this, the forecasted 127 vehicles per hour from the two driveways would be easily absorbed into the Harbour Street traffic stream. Furthermore, this analysis is conservative as it has assumed that all 600 vehicles on Harbour Street would be in lane 1, whereas in reality a more even distribution across the three travel lanes would be expected.

Potential road safety implications

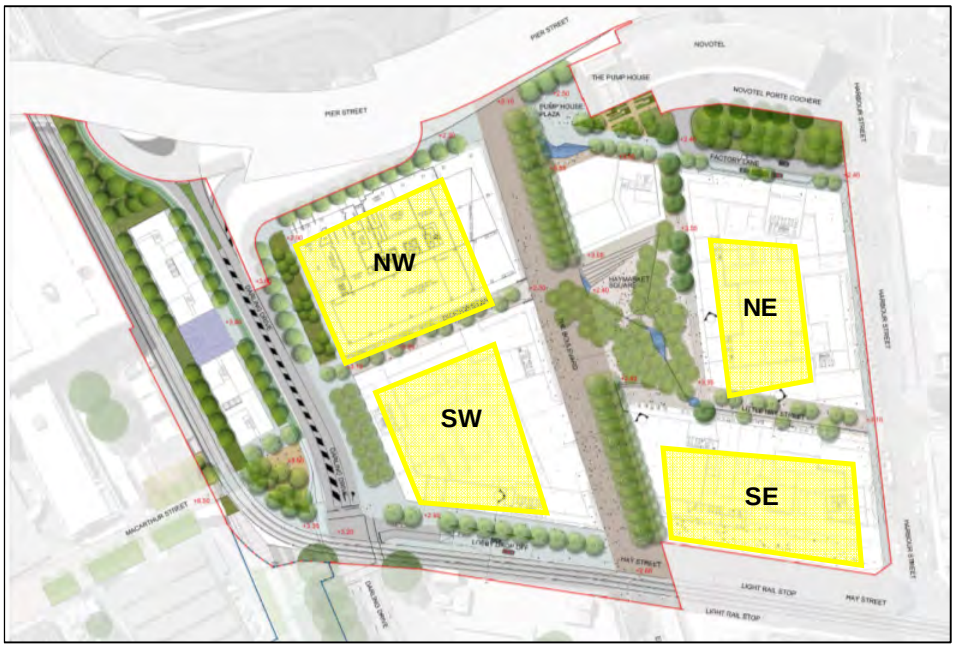
The one-way travel restriction on Harbour Street is advantageous in significantly reducing the crash conflicts at the two driveways. This will make the two driveways function as left-in-left-out intersections which are one of the safest forms of unsignalised T intersection configuration and traffic control. That is, a traditional 'T' intersection with all travel movements permitted have nine possible vehicle-to-vehicle crash conflicts. By contrast, a left-in-left-out intersection has two possible vehicle-to-vehicle conflicts.

Further work will be conducted at the detailed design stage to ensure that minimum gap acceptance sight lines are provided and maintained for outbound traffic from the car parks, as well as safe intersection sight distances for northbound traffic on Harbour Street to the driveways.

6.6 PARKING PROVISION

Parking provision for The Haymarket will consist of four blocks (NW, SW, NE and SE) with a total provision of approximately 1,040 car park spaces. In addition, a public carpark with 400 spaces will also be provided in the northwest block and will be available for visitors to the SICEEP Precinct.

Figure 17 Parking Locations for The Haymarket Precinct



A breakdown of the car park spaces is shown in Table 6-4.

Table 6-4 Proposed Parking Provision

Parking Location	Proposed Car Parking Bays	
Residential / retail / student accommodation / commercial car park (The Haymarket Precinct) [1]		
North West Office/Commercial	50	
North East residential	350	
North residential	30	
South East residential	285	
South West residential	325	
Total provision within The Haymarket Precinct		1040
North West Public Carpark	400[2]	

[1] Current indicative design for the The Haymarket Precinct

[2]This public carpark will consist of 400 car park spaces to be delivered under the Haymarket Precinct and will be available for visitors for the SICEEP precinct.

On-site car parking provision for The Haymarket Precinct is assessed against guidelines listed in the RMS *Guide to Traffic Generating Development (Section 5 – Parking Requirements for Specific Land Uses)* and parking rates approved for similar developments within the City of Sydney LGA (CoS).

Parking rates generally vary by type of land use development and location of development. Factors to be considered include the availability of public transport, mode split, car occupancy, availability of on-street parking, and others.

RMS Guidelines

The RMS Guidelines stipulates parking rates based on surveyed developments and researched conducted by the RMS. For the RMS, the main criterion in the assessment of parking provided for developments is the adequacy of off-street parking to meet the peak parking accumulations observed and thereby discouraging on-street parking thus maintaining the existing levels of service and safety of the road network. Hence, the RMS guidelines stipulate the required minimum parking provision for a specific development. The Guide also notes that potential variations between local government areas must also be considered. Thus, these parking provision rates will be validated against the City of Sydney Council's rates.

Table 6-5 RMS Parking Rates and Proposed provisions

Land Use Type	Units / Rooms / GLA[3]	RMS Suggested Parking Rates	RMS Guidelines for Parking Requirements	Proposed Parking Provision
Residential			735 spaces	990 spaces
Studio[1]	122	(0.4 spaces/1 bedroom) [1]		
One bedroom	653	0.4 spaces/1 bedroom		
Two Bedroom	558	0.7 spaces/2 bedroom		
Three Bedroom	27	1.2 spaces/3 bedroom		
Visitor parking:		Plus 1 space/7 units	194 spaces	0[2]
Office/ Commercial	25,000 sqm GFA	Unrestrained – 1 per 40sqm Restrained - 1 per 125sqm GFA (assuming Category E, CoS DCP2012) [3]	200 spaces (25,000 sqm GFA)	50 spaces
Retail	7,689 sqm GFA	1/50 sqm GFA	154 spaces	0
TOTAL			1089 spaces	1,040 spaces

[1] No rates stipulated for Studio type, assumes same rate as one-bedroom.

[2] Visitor parking will be at the public carpark.

[3] Indicative only. The site does not fall within an assigned category and the adjacent areas are Category D and F.

Based on the above parking rates of the RMS, the estimated minimum car parking requirements for The Haymarket Precinct is 1089 spaces. A total of 1040 spaces will be provided in the

precinct plus the 400 space public carpark to be located in the northwest sector. Hence, The Haymarket Precinct development complies with the minimum provision as required from the RMS guidelines.

City of Sydney Council Parking Rates

On the other hand, the City of Sydney Council's Development Control Plan (DCP) states that car parking spaces must be provided to meet the car parking needs of the development having regard to the accessibility of the development and Council's policy of reduced car dependency. Council has clarified that the DCP is written to indicate the maximum number of car parking spaces allowable and not to impose an absolute minimum of car parking spaces required. Various DCPs have been developed by Council to apply to specific areas of the City.

Sydney DCP 2012 is the most recent DCP that covers the Pyrmont and Darling Harbour and it supports the Sydney Local Environmental Plan (LEP) 2012 with more detailed planning and design guidelines for developments within the CoS. However, the SICEEP development site is excluded from the area covered under the Sydney LEP 2012 and hence, the parking rates contained in the LEP do not apply to the development proposed. Instead, the development seeks approval for parking rates per Table 6.4 above that are considered appropriate for the development on the basis of comparisons with rates applied to the immediate surrounding areas and known CoS approved rates of comparable land use developments.

Residential

The proposal seeks development approval for a total of 1,360 residential units totalling 124,393 sqm GFA. The parking rates being proposed are:

- Studio apartments – 0 space`
- One bedroom – maximum 0.5 space
- Two bedroom – maximum 1 space plus 1 space per 5 units (includes 1 bedroom plus study)
- Three bedroom and more – maximum 2 spaces

The proposed rates being sought for The Haymarket Precinct residential component are consistent with those approved for comparable developments within the City of Sydney. Comparable developments in the area that have been approved with the above parking rates include:

- Carlton and United Brewery (CUB) site in Chippendale 1400 dwellings with 132,950 sqm GFA. Based on the mix of units, a total of 1,072 parking spaces for residential use
- The Quay site in Haymarket – 271 residential apartments and 270 parking spaces.
- Harold Park – 1,250 dwellings with 120,361 sqm GFA. The parking rates applied to Harold Park differ slightly from the above since the maximum car parking spaces is set out in a site specific LEP.

With the future mix of land uses between The Haymarket Precinct and the PPP, demand for parking will balance across different peak periods and consequently, reduce potential impacts associated with parking provision.

Office / Commercial

It is proposed to incorporate a maximum of 25,000sqm GFA allocated for office/commercial development and proposes to provide a total of 50 spaces to support the office/commercial space. This equates to approximately 1 space per 300 sqm commercial GFA.

The above rate is comparable to Darling Walk which has a GFA of 64,000 sqm and basement parking with 200 spaces.

Retail + Student Accommodation

No car parking is proposed to support the retail and the student accommodation land uses on the basic premise that the development site has the locational advantage of being in close proximity to existing public transport and active transport modes and it is anticipated to also mainly service the local areas surrounding the site whereby patrons will likely access the site via walking trips. It should be noted that significant enhancements for the active transport network for the immediate area is being proposed as part of the development proposal.

Table 6-6 summarises the parking rates for The Haymarket Precinct.

Table 6-6 Summary of Proposed Parking Provision for The Haymarket Precinct

Land Use Type	Proposed Parking Rates	Proposed Parking Provision
Residential		990 spaces[1]
Studio	0 space	
One bedroom	0.5 spaces/1 bedroom	
Two Bedroom	1.2 spaces/2 bedroom	
Three Bedroom	2 spaces/3 bedroom	
Office/ Commercial	1 space /300 sqm GFA	50 spaces
Retail	No provision	-
Student accommodation	No provision	-

[1] This is based on an indicative design. Final parking provision based on these rates will be finalized with each Stage 2 DA.

6.7 PEDESTRIAN NETWORK

The proposed pedestrian network builds on the initiatives introduced with the Ultimo Pedestrian Network and the Chinatown Public Domain Plan and provides interfacing with the improved pedestrian network around South Darling Harbour. Aside from maintaining existing routes, the design will extend the UPN to Darling Drive to improve access and strengthen linkages between Central Station, the education precinct (UPS/TAFE), Haymarket, Chinatown from the south towards the Powerhouse Museum and Darling Harbour to the north. The reconfiguration of Darling Drive and the new pedestrian connections will enhance accessibility to Quarry Street to the west and create new east-west connections through Tumbalong Place.

The design proposes to enhance at-grade pathways through the PDA towards Tumbalong Park creating a direct north-south promenade extending from Quay Street to the Harbourside and linking major public gathering spaces (Haymarket Square, Tumbalong Park and Harbouside) within the Precinct.

The Traffic Transport and Access Plan for the whole precinct illustrates the proposed pedestrian connections and linkages.

6.8 CYCLE NETWORK

Darling Harbour Live proposes to build upon the initiatives of City of Sydney to improve connectivity in the Precinct with the cycle network and new public transport linkages. The proposal will create new cycling routes through the Public Domain by:

- Extending the cycling route in the east west direction and providing a new shared pedestrian and cycle pathway linking the Precinct to the west along the Pier Street corridor link and;
- Enhancing the north-south connections at Quay Street to Harbourside via a through route between the ICC Exhibition Centre and Tumbalong Park.

As part of the realignment and reconfiguration of Darling Drive, cycle connections are proposed to be enhanced via the dual lane two-way segregated cycle path on the west side of Darling Drive. Further connections to the existing routes will be provided through new linkages on the existing road network.

The proposed cycle way could be segregated to improve the safety of cyclists along Darling Drive and will run along the western side of Darling Drive.

The proposed dual lane cycle way can tie into a shared space zone, in the southern sector, south of the Darling Drive / Pier Street roundabout. Within this shared space zone, the dual cycle way cansplit and link into the existing single lane, one-way cycle way network, on either side of Darling Drive.

North of the Darling Drive / Pier Street roundabout the dual lane two-way segregated cycle-way will be provided along the western side of Darling Drive, until it meets the proposed scramble crossing in the northern sector by the ICC and ICC Hotel. At this junction the proposed cycle-way will utilise the proposed scramble crossing to allow a safe connection to the existing single lane, one-way cycle way network, on the eastern side of Darling Drive. Consequently, the proposed cycle way will revert back to a single lane, one-way cycle way, and link into the existing cycle network on both sides of Darling Drive.

6.9 TAXIS, COACHES AND BUSES

The provision for taxis, coaches and buses are generally located in the PPP areas and are accessible to The Haymarket.

7 TRAFFIC IMPACT ASSESSMENT

7.1 TRAFFIC GENERATION AND TRIP DISTRIBUTION

7.1.1 THE HAYMARKET PRECINCT

An indication of the peak hour traffic generation potential of the future development within The Haymarket Precinct has been based on the Roads and Traffic Authority *Guide to Traffic Generating Developments" (2002)*. The RTA's Guide provides a series of traffic generation rates for a variety of land uses based on generic surveys undertaken by the RTA. These rates are generally applied to the Gross Floor Area (GFA) or Gross Leasable Floor Area (GLFA).

The typical peak hour traffic generation rates applicable for the proposed land uses of The Haymarket Precinct are as follows:

- Residential evening peak vehicle trips: 0.24 vehicle trips per hour for each unit
- Retail evening peak hour vehicle trips: 0.56 vehicle trips per hour per 100sqm GLFA
- Commercial evening peak vehicle trips 2 vehicle trips per hour per 100sqm GFA

Application of the above traffic generation rates to the proposed development yields a weekday peak period total traffic generation potential of 372 vehicle trips per hour comprising 270 In / 102 Out during evening peak periods. These traffic generation projections have been based on an arrival/departure split of 80/20 for residential, 50/50 for retail and 20/80 for commercial during the evening peak period. The estimated peak hour traffic generation for the proposed future developments is shown in Table 7-7.

Table 7-7 Traffic Generation for the PDA

PDA Divisions	IN (vtph)	OUT (vtph)	TOTAL (vtph)
North East and North	100	25	125
South East	75	19	94
South West	86	21	107
North West	9	37	46
Total	270	102	372

The above table assumes the following:

- Retail trips will mainly consist of non-car trips; and
- Office/Commercial trips would be capped with the available parking space allocation.

For the purpose of this assessment, the following traffic distribution is assumed:

- 30% trips anticipated to arrive from western suburbs via M4 Western Distributor;
- 10% trips anticipated to arrive from western suburbs via Great Western Highway;
- 30% trips anticipated to arrive from northern suburbs via M4 Western Distributor and then through Darling Drive and Ultimo Road;
- 20% trips anticipated to arrive from southern suburbs by using Eastern Distributor and then through north Darling Drive and Ultimo Road; and,
- 10% trips anticipated to arrive from southern suburbs by using Great Western Highway and then through Harris Street and Ultimo Road.

7.1.2 STUDENT ACCOMMODATION

There are also no guidelines for trip generation rates for student accommodation in the RMS Guide. However, it is anticipated that majority of the trips for the student accommodation will comprise of walking trips and public transport trips during the peak hour. Vehicle trips for this land use are expected to be minimal and are anticipated to mostly occur outside the normal commuter peak. No parking will be provided for this land use but loading facilities will be incorporated in the design layout to allow for students moving in and moving out. In the absence of any guidelines, it is assumed that vehicle trip generation for student accommodation is not likely to exceed the vehicle trip generation for high density residential (0.24 vehicle trips

per unit) and a high estimate could potentially be in the order of 0.12 vehicle trips per unit. Hence, for a total of 422 units, vehicle trip generation could be in the order of 50 vehicle trips.

7.2 INTERSECTION OPERATION

7.2.1 NETWORK CAPACITY AND LEVEL OF SERVICE (LOS)

The criteria for evaluating the operational performance of intersections are provided by the *RMS Guide to Traffic Generating Developments, Version 2.2, October 2002*. The criterion is based on a qualitative measure (i.e. Level of Service), which is applied to each average delay band.

The 'Level of Service' is the standard used to measure the performance of the intersection operation. This is defined as the qualitative assessment of the quantitative effect of factors such as speed, traffic volume, geometric features, delays and freedom of movement.

The intersections were assessed for existing operational performance using SIDRA Intersection Analysis. SIDRA Intersection calculates the amount of delay experienced by vehicles using an intersection, and gives a Level of Service rating. The 'Level of Service' (LOS) indicates the relative performance of that intersection with regard to the average delay (in seconds per vehicle) experienced by vehicles at the intersection.

At a signalised intersection, the Level of Service (LoS) criteria are related to average intersection delay measured in seconds per vehicle. The RMS Guide has recommended that with roundabout, "Stop" and "Give Way" sign control intersections, the LoS value is determined by the critical movement with the highest average delay.

Table 7-8 summarises intersection LoS criteria used to assess the intersection performance.

Table 7-8 LOS Criteria

Level of Service	Average Delay per Vehicle (sec/veh)	Traffic Signals, Roundabout	Give Way & Stop Signs
A	<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	Unsatisfactory with excessive queuing	Unsatisfactory with excessive queuing

In general, SIDRA predicts intersection performance for the following key parameters:

- Degree of saturation (DoS);

- Average delays to intersection;
- Level of service (LoS) determined from LoS criteria; and
- Queue length.

It should be noted that inappropriate interpretation of these parameters can create misleading conclusions, particularly for sign controlled intersections. For example, for a sign controlled intersection LoS is determined by the highest delay for minor traffic movements and there are instances where the LoS could be lower such as LoS "F" but associated only to a small volume of traffic being delayed. In this situation, the intersection should actually not have a significant capacity issue except for that one minor movement.

7.2.2 EXISTING INTERSECTION PERFORMANCE

SIDRA modelling was undertaken to assess existing operational performance of key intersections. The model runs were based on:

- Traffic survey data from the peak hour intersection turning movement counts;
- SCATS (Sydney Coordinated Adaptive Traffic System) data on phasing plan and cycle time; and,
- Existing intersection configurations.

Table 7-9 and Table 7-10 below present the summary of existing level of service (LoS) for the key intersections of the precinct.

Table 7-9 Intersection Performance of Existing Friday PM Peak Condition (2012)

Intersection	Intersection Control	Approach	Average Delay Approach (sec/veh)	Approach LoS	Overall Average Delay (sec/veh)	Overall LoS
(I-1) Darling Dr / Murray St / Pyrmont Bridge Rd	Signalised	Murray St North	49.7	D	44.9	D
		Darling Dr East	33.4	C		
		Murray St South	58.7	E		
		Pyrmont Bridge Rd West	49.9	D		
(I-2) Darling Dr / Pier street	Roundabout	Darling Dr North	3.6	A	10.2	A
		Pier St (off-ramp) East	8.9	A		
		Existing SEC Car Park Exit	5.8	A		
		Darling Drive South	7.9	A		
(I-3) Darling Dr / Car Park Access	Signalised	Darling Dr North	19.4	B	23.0	B
		Future PDA Car Park Access	46.5	D		
		Darling Dr South	16.4	B		
(I-4) Pier St / Harbour St / Goulburn St	Signalised	Harbour St North	61.4	E	44.2	D
		Goulburn St East	28.6	C		
		Harbour St South	51.3	D		

Intersection	Intersection Control	Approach	Average Delay Approach (sec/veh)	Approach LoS	Overall Average Delay (sec/veh)	Overall LoS
		Pier St West	34.2	C		
(I-5) Harbour St / Liverpool St	Signalised	Harbour St North	24.3	B	34.0	C
		Liverpool St East	42.3	C		
		Harbour St South	31.8	C		
		Car Park Exit (West)	65.8	E		

** it is assumed that 90 vehicles are coming out and 15 vehicles are going into the SEC car park exit / entry leg at Darling Drive and Pier Street roundabout. (for both Friday and Saturday)*

***model short lane as full lane to examine the actual capacity of the adjacent lane*

Table 7-10 Intersection Performance of Existing Saturday PM Peak (2012)

Intersection	Intersection Control	Approach	Average Delay Approach (sec/veh)	Approach LoS	Overall Average Delay (sec/veh)	Overall LoS
(I-1) Darling Dr / Murray St / Pyrmont Bridge Rd	Signalised	Murray St North	57.6	E	47.3	D
		Darling Dr East	30.5	C		
		Murray St South	64.2	E		
		Pyrmont Bridge Rd West	52.9	D		
(I-2) Darling Dr / Pier street	Roundabout	Darling Dr North	3.6	A	10.4	A
		Pier St (off-ramp) East	9	A		
		Existing SEC Car Park Exit	6.1	A		
		Darling Drive South	9.6	A		
(I-3) Darling Dr / Car Park Access	Signalised	Darling Dr North	19.4	B	23.0	B
		Future PDA Car Park Access	46.5	D		
		Darling Dr South	16.5	B		
(I-4) Pier St / Harbour St / Goulburn St	Signalised	Harbour St North	53.9	D	42.4	C
		Goulburn St East	31.3	C		
		Harbour St South	51.6	D		
		Pier St West	31.2	C		
(I-5) Harbour St / Liverpool St	Signalised	Harbour St North	19.1	B	27.5	B
		Liverpool St East	44.8	D		
		Harbour St South	20.5	B		
		Car Park Exit (West)	58.2	E		

** it is assumed that 90 vehicles are coming out and 15 vehicles are going into the SEC car park exit / entry leg at Darling Drive and Pier Street roundabout. (for both Friday and Saturday)*

***model short lane as full lane to examine the actual capacity of the adjacent lane*

The results of the modelling reveal the following key findings:

- The modelling investigation has found that on the overall the five key intersections perform at an acceptable LoS on a typical Friday or Saturday PM peak.
- Some turning movements have longer delays and have capacity issues with the available phase time splitting information;
- At intersection I-1, left and right turning from Pyrmont Bridge Road west are the critical movements in terms of average delay. Queue length will occasionally exceed right turning bay (40m) and overflow to the adjacent lane;
- Similar results for right turning from Darling Drive east which showed queue lengths exceeding lane storage length (50m) and blocking the through traffic movement; and,
- Right turning from Goulburn Street East in the intersection I-4 shows a potential capacity issue and the queue extends back of the short turning bay and blocks the through movement. At present there is provision for two short lanes – 30m and 28m for right turning vehicles.

7.2.3 FUTURE OPERATIONAL PERFORMANCE

The results of the modelling for the future network with the proposed development are presented in the following section.

Table 7-11 Future Intersection Performance (Friday Event)

Intersection	Intersection Control	Approach	Average Delay Approach (sec/veh)	Approach LoS	Overall Average Delay (sec/veh)	Overall LoS
(I-1) Darling Dr / Murray St / Pyrmont Bridge Rd	Signalised	Murray St North	44.7	D	40.9	C
		Darling Dr East	38.1	C		
		Murray St South	50.0	D		
		Pyrmont Bridge Rd West	40.3	C		
(I-2) Darling Dr / Pier street	Roundabout	Darling Dr North	4.0	A	9.4	A
		Pier St (off-ramp) East	9.4	A		
		Darling Drive South	8.9	A		
(I-3) Darling Dr / Car Park Access	Signalised	Darling Dr North	8.7	A	10.7	A
		Future PDA Car Park Access	71.7	F		
		Darling Dr South	7.9	A		
(I-4) Pier St / Harbour St / Goulburn St	Signalised	Harbour St North	40.7	C	33.8	C
		Goulburn St East	35.1	C		
		Harbour St South	38.7	C		
		Pier St West	23.0	B		
(I-5) Harbour St / Liverpool St	Signalised	Harbour St North	23.8	B	35.5	C
		Liverpool St East	45.0	D		
		Harbour St South	33.9	C		
		Car Park Exit (West)	70.8	F		

Table 7-12 Future Intersection Performance (Saturday Event)

Intersection	Intersection Control	Approach	Average Delay Approach (sec/veh)	Approach LoS	Overall Average Delay (sec/veh)	Overall LoS
(I-1) Darling Dr / Murray St / Pyrmont Bridge Rd	Signalised	Murray St North	54.4	D	61.2	E
		Darling Dr East	32.0	C		
		Murray St South	59.8	E		
		Pyrmont Bridge Rd West	85.9	F		
(I-2) Darling Dr / Pier street	Roundabout	Darling Dr North	4.3	A	9.8	A
		Pier St (off-ramp) East	9.7	A		
		Darling Drive South	20.5	B		
(I-3) Darling Dr / Car Park Access	Signalised	Darling Dr North	9.4	A	10.4	A
		Future PDA Car Park Access	62.6	E		
		Darling Dr South	6.9	A		
(I-4) Pier St / Harbour St / Goulburn St	Signalised	Harbour St North	49.6	D	38.4	C
		Goulburn St East	33.0	C		
		Harbour St South	44.7	D		
		Pier St West	24.1	B		
(I-5) Harbour St / Liverpool St	Signalised	Harbour St North	15.1	B	20.4	B
		Liverpool St East	29.9	C		
		Harbour St South	17.9	B		
		Car Park Exit (West)	33.5	C		

8 ROAD SAFETY ISSUES

8.1 CRASH STATISTICS

This assessment is based on the crash data supplied by the RMS for the five-year period from July 2007 to June 2012 inclusive. The data covers crashes reported to the Police, and includes fatal, injury or vehicle damage only accidents for:

- Harbour St from Hay Street to Bathurst Street including 10m at intersections; and
- Darling Drive from Ultimo Road to Murray Road, including 10m at intersections.

A total of 58 crashes were recorded for Harbour Street and a total of 78 crashes were recorded for Darling Drive in the five year period. Figure 18 and Table 8-13 shows crash statistics for the five year period between 2006 and 2010.

Figure 18 Five Year Crash History

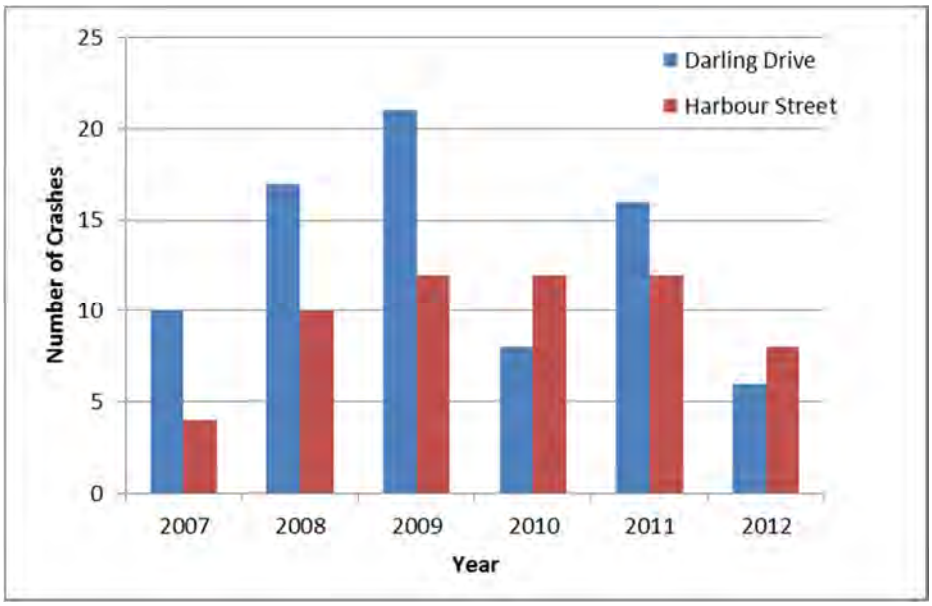


Table 8-13 Highlights of Crash Statistics for Five Years (July 2007- June 2012)

Type of Crash	Harbour Street		Darling Drive	
	Number of Crashes	Percentage	Number of Crashes	Percentage
Total No. of Crashes	58	100%	78	100%
Casualties	34	58.8%	46	59.0%
Non-casualty	24	41.4%	32	41.0%
Intersection, adjacent approaches	10	17.2%	32	41.0%
Rear end	11	19.0%	2	15.4%
Hit pedestrian	11	19.0%	5	6.4%
Opposing vehicle, turning	3	5.2%	11	14.1%
Fatal	0	0	0	0
Wet Surface	17	29.3%	14	17.9%

Source: RMS' crash data

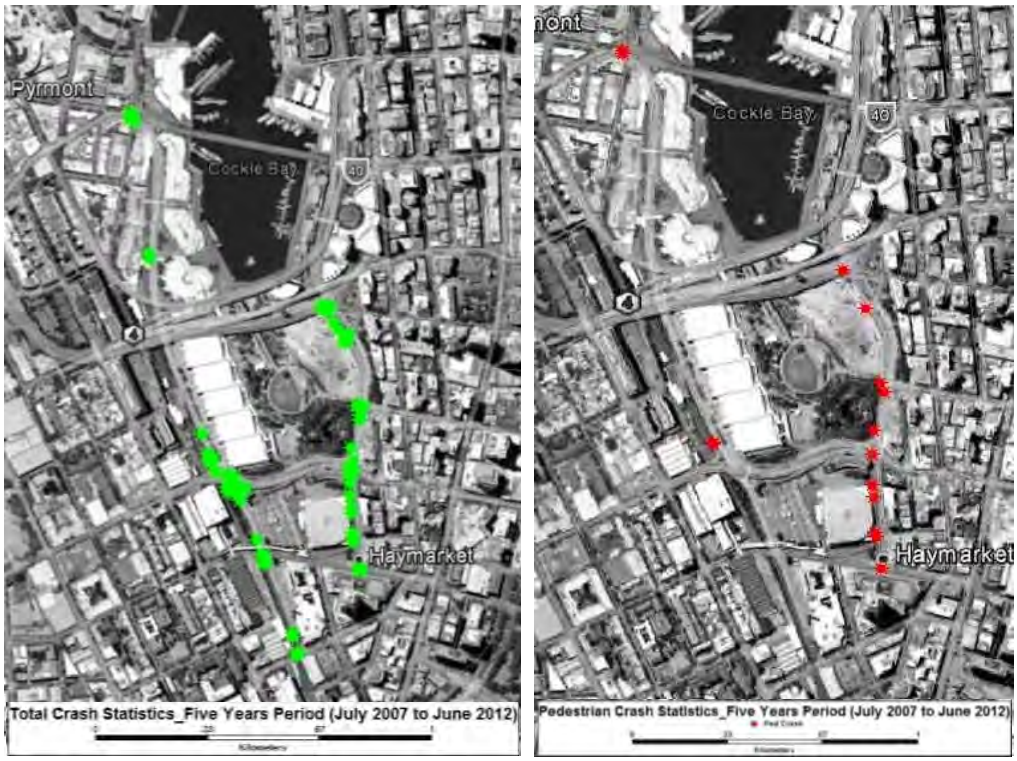
Figure 18 shows that there is a marked reduction in the number of crashes on both Darling Drive and Harbour Street.

The crash data was plotted on a map to identify potential 'black spots'. Figure 19 shows the locations of the crashes recorded by the RMS over a five year period (July 2007 to June 2012). It can be observed that majority of the pedestrian crashes occurred along Harbour Street and the majority occur at the intersections:

- Darling Drive/Pier Street;

- Darling Drive/Hay Street;
- Pier Street/harbour Street/Goulburn Street;
- Harbour Street/Liverpool Street; and
- Harbour Street/Day Street.

Figure 19 RMS Crash Data for a Five year period (July 2007 – June 2012)



8.2 PEDESTRIAN SAFETY ON DARLING DRIVE

The crash statistics revealed five (5) crashes involving pedestrians occurred over a span of five years and were observed to occur at the intersections, notably Darling Drive/Murray Street/Pyrmont Bridge Road and at Darling Drive/Pier Street roundabout.

At the intersection of Darling Drive and Murray Street, pedestrian crossings are integrated with the intersection and have an assigned pedestrian crossing phase in the cycle time while at the Darling Drive / Pier Street roundabout, the pedestrian crossing across is located north of the roundabout and is provided to also cater to the passengers going to and coming from the light rail stop.

The reconfiguration of Darling Drive and the confinement of the loading activities away from Darling Drive are achieved by the transfer of truck parking, loading and queuing within the loading dock facilities as part of the PPP. The management of loading activities within the loading docks potentially minimises the risks to other road users on Darling Drive and promotes safety for pedestrians and cyclists. Two new pedestrian crossing facilities will be installed on Darling Drive linking the light rail with the core facilities via enhanced pedestrian links. These crossings are located at a reasonable distance from the loading dock entrance and exits to

ensure the proper sight distances are maintained for both the pedestrian crossing and the truck driver.

Pedestrian safety measures are incorporated in the overall management plans for both construction and operation but may need to be constantly reviewed to assess any deficiencies brought about by unforeseen operational changes within the facilities. A more detailed road safety audit could be undertaken to determine future measures to reinforce the safety and ensure minimal risks to road users.

8.3 PEDESTRIAN SAFETY ON HARBOUR STREET

The crash statistics revealed 19% of the crashes on Harbour Street involved a pedestrian of which 5 of the 11 records occurred in the section between Hay Street and Goulburn Street. This section has one way vehicle directional flow and no pedestrian crossing except at the intersection of Pier St/Harbour St/Goulburn. Records from previous studies reported medium to heavy pedestrian activity in the block east of the SEC precinct due to the proximity of Chinatown.

Future proposals by others associated with the Chinatown Public Domain Plan include provision for a pedestrian crossing facility across Harbour Street south of Goulburn Street. The type of treatment is yet to be finalised but current initiatives are in place to address this issue.

Other pedestrian crashes on Harbour Street were observed to occur at the intersections with Goulburn Street, Liverpool Street, Day Street and Bathurst. These intersections have pedestrian crossing facilities integrated with the signal phasing.

A more detailed road safety audit could be undertaken to assess any gaps and deficiencies at the intersections in order to determine a more appropriate treatment.

9 CONSTRUCTION TRAFFIC IMPACT AND MANAGEMENT

9.1 BACKGROUND

A Preliminary Construction Management Plan has been prepared by Lend Lease Project Management and Construction (LLPM&C) for the PPP development application. The document outlines the indicative management plans relating to the construction works in the PPP and The Haymarket Precinct. With each Stage 2 DA, a Construction Management Plan will be prepared.

This section presents excerpts from the above document relevant to Traffic and Pedestrian Management during construction of The Haymarket Precinct, including description and layouts of the planned mitigation arrangements demonstrating how, during the development, the pedestrian and vehicular movements will be addressed to minimise impact.

9.2 SITE BOUNDARY

Figure 20 below depicts the indicative hoarding locations proposed within the Southern Sector and identifies areas indicatively accessible to the general public and areas cordoned off for the

construction works. The construction of the Southern Sector buildings is proposed to proceed in stages with further detail provided with stage 2 DA submissions

Figure 20 Construction Site Boundaries

9.3 CONSTRUCTION VEHICLE ACCESS

The primary construction heavy vehicle egress will be via the established Darling Drive network to the West of the development. This will involve vehicles accessing Darling Drive from the North using Pyrmont Bridge Road, Pyrmont and vehicles accessing Darling Drive from the South using Ultimo Road and Harris Street, Ultimo.

In the later phases of development of the precinct, construction access will be via Harbour Street to the east of the southern sector.

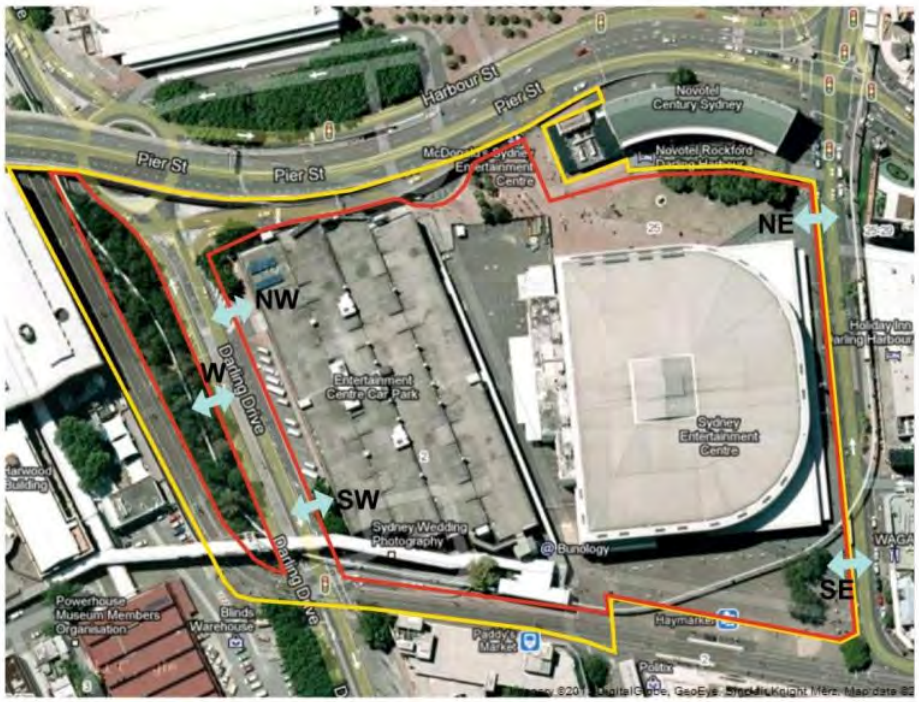
Traffic movements and vehicles will conform to current Roads and Maritime Services (RMS) requirements.

All vehicles accessing the site will conform to the “Traffic controls at work sites” manual, and Australian Standard 1742 – Traffic control, and only certified traffic controllers shall be used to direct vehicles outside of the construction boundaries. Traffic movements and vehicles to the site shall maintain the existing entry and egress points currently used by the existing Precinct, especially to Darling Drive.

The main and entry for construction materials and vehicles servicing the west, north west and south west development lots shall be from the west, off Darling Drive. The south east, north east and north development lots will be access from Harbour Street.

All vehicles will use the entry and exit gates located generally as shown on Figure 21.

Figure 21 Access to Site (indicative) – The Haymarket Precinct



On site construction access routes will be established within the construction boundaries with hoists transporting personnel and materials within each building.

The truck movements anticipated will be spread evenly throughout the construction programme. Usually the bulk truck movements would be during the excavation phase, however, our adopted design means there is no big bulk excavation activity thereby reducing the heavy vehicle activity upfront.

During the course of the development it is anticipated that vehicle movements for such trades as Demolition, Civil, Piling, Detail Excavation, Structure, Façade, Internal Finishes and Public Domain works shall occur.

Based on the programme and volume of materials required, it is estimated that approximately 3-4 trucks per hour will access the site for the duration of the development. In such instances such as concrete pours. This volume will increase, but shall be controlled (as the preferred supply plant s within 1km of the development) to alleviate any congestion to the surrounding traffic network.

9.4 PARKING

Onsite parking will not be allowed during construction. Measures will be implemented to encourage the use of good public transport systems already in place for construction staff and workers. This will be conveyed through all subcontract documentation and site inductions. Timetables shall be provided for all bus routes and the three closest railway stations serviced by bus routes.

9.5 PEDESTRIAN ACCESS

Development of the Southern Sector will be undertaken in stages with pedestrian access adjusted progressively to respond to those stages. Future Stage 2 DAs will provide further detail regarding pedestrian access during construction generally adopting the following principles:

- Hoardings will be erected to prevent public entry into constructions areas;
- Public access along existing desire lines around construction areas will generally be maintained unless noted otherwise below;
- The existing elevated pedestrian walkway from Harris Street will be terminated at the western side of the light rail corridor with a new lift and stairway provided to connect with Hay Street;
- The elevated walkway between the SEC Carpark and the SEC will be closed from commencement of demolition of the SEC Carpark;
- The southern portion of the Boulevard will be completed by December 2016 to connect with the Northern and Central Sector portion of the Boulevard;
- Pedestrian access along Darling Drive will be controlled during realignment works to facilitate the staged construction of the road works and to ensure public safety.

The pedestrian diversion from Exhibition light rail station will be coordinated with the construction works of the Southern Sector.

9.6 TRAFFIC MANAGEMENT MEASURES

Appropriate directional signage and traffic control will be provided to ensure vehicles enter and leave the site with minimal disturbance to other road users and so they are advised of any changes in road conditions.

Temporary road closures, single lane access and relocations during the construction period will be subject to coordination with the appropriate authorities. All traffic related issues and changes shall also be presented to Stakeholders as part of the consultation process. These will, wherever and whenever possible, are carried out in non-peak periods.

9.7 STAGED DEMOLITION OF SYDNEY ENTERTAINMENT CENTRE AND SYDNEY ENTERTAINMENT CENTRE CARPARK

While the demolition of the SEC car park is proposed to facilitate the initial development stages of the Haymarket on the western side of the site, the Sydney Entertainment Centre will remain in operation until December 2015. Prior to December 2015, the car parking needs of the SEC will be serviced by the public carparking facilities beneath Darling Walk and other adjacent public car parking stations.

9.8 SUMMARY

The traffic and pedestrian management plan outlined in the Construction Management Plan is generally aimed at mitigating any potential impacts that may be attributed to the construction works. Risks to the public and the construction crew would be minimised through the implementation of the construction management plans specifically prepared for the SICEEP construction works of the PPP and The Haymarket. The Plan will be regularly updated to address any new outcomes identified through constant monitoring as the works progress.

10 SUMMARY

10.1 CONCLUSIONS

The overall assessment of the SICEEP (detailed in the Main Report)was undertaken to assess existing and future transport conditions surrounding the precinct (site wide with consideration of the SICEEP Whole of Precinct development that will be delivered in stages. The outcomes of the assessment highlight key features of the SICEEP development that would support the overall efficiency of the transport network servicing the whole site.

The transport assessment of The Haymarket Precinct (this Report) focusses on access and the connectivity of the precinct with the external network for all modes of transport and cites the key features of the whole precinct that will contribute to this, including design elements of the proposal:

***Generally**:*

- Hyder has used the base model prepared by Mott MacDonald and have updated the base model to reflect network changes for the existing and future conditions. Hyder undertook calibration and validation and results indicated that the base model complies with the criteria for calibration and validation of a model (i.e. the GEH assessment criteria) based on the UK Design Manual for Roads and Bridges requirements. Hyder concluded the base model was 'fit for purpose'.

The Haymarket Public Transport

- The Haymarket site is well served by public transport.
- The Haymarket development design generally provides enhanced access to the public transport services through the creation of more direct travel paths through pedestrian boulevards and walkways.

The Haymarket Parking

- Parking provision within The Haymarket precinct complies with the minimum requirements set by the RMS Guidelines for specific land use development.
- Parking rates being sought for the residential component are justified on the basis of comparable developments in the immediate vicinity of the development.

The Haymarket Road Network/Intersection Operational Performance

- The modelling undertaken by Hyder indicate that optimised signal cycle settings at all intersections analysed in this study will improve intersection performance and maintain level of service at acceptable levels. Signalised intersections which are directly adjacent to The Haymarket development include Darling Drive / Hay Street intersection which will require minor adjustment to the signal layout and operation and the Harbour Street / Pier

Street / Goulburn Street intersection which will require signal coordination with adjacent signals.

- The overall operational performances of the intersections have been demonstrated as maintained in 'status quo' for Friday event traffic.
- The results of the intersection modelling indicate that the one way road system proposed for the Theatre carpark and NW Haymarket development lot carpark egress (which sits within the adjacent PPP scope of works) would significantly improve operational performance of adjacent intersections such as Darling Drive/Pier St intersection and Pier Street/Goulburn St/Harbour Street intersection.
- With the exception of Pyrmont Bridge Road/Murray Street/Darling Drive intersection, the operational performances of the key Haymarket intersections (Darling Drive/Hay Street and Darling Drive/Pier Street) are considered satisfactory for Saturday event traffic. Pyrmont Bridge Road/Murray Street/Darling Drive is a key access intersection that links the SICEEP study area to the external network to the north and west. This intersection provides access for vehicles entering and leaving the SICEEP study area, including the Haymarket Precinct. It is estimated that around 3-4 % of the east-west peak hour through traffic at this intersection is associated with the PDA. This volume is expected to have only a marginal impact on the overall performance of the intersection in the context of the greater PPP works.
- The results of modelling indicate that the impact of The Haymarket development does not impose conditions on the intersections worse than what would have otherwise occurred through existing traffic.
- The reconfiguration and realignment of Darling Drive will still have the capacity to accommodate existing traffic plus additional traffic to be generated by the developments, including the PPP and The Haymarket.
- The new development lot vehicular accesses to Harbour Street (2 of), Darling Drive (1 of) and loop toad (1 of) are appropriate and will not result in detrimental impacts to road network.

***The Haymarket** Pedestrian*

- The development will provide improved pedestrian linkages notably the main boulevard within the Public Realm linking the Ultimo Pedestrian Network to the south and Harbourside to the north. The main boulevard will be up to 20m wide and will have sufficient capacity to cater to peak pedestrian demand anticipated during events at the PPP. It also provides the main linkage between The Haymarket, Darling Central and Bayside.

***The Haymarket** Cycleway*

- Cycle connections can be enhanced via a dual lane two-way segregated cycle path on the west side of Darling Drive north of the Pier Street roundabout. South of the roundabout, the cycle way will split and link into the existing single lane, one-way cycle way network on either side of Darling Drive.

DGR's

- The requirements of the DGR's have been adequately assessed in this Transport and Traffic impact Assessment (including TMAP and road safety assessment).

10.2 RECOMMENDATIONS

Public Transport

- Pedestrian access to public transport has been improved through the creation of pedestrian boulevards and more direct routes to public transport hubs, stops and stations (including Central Railway station). There are no recommendations arising from this Haymarket study which affect the public transport infrastructure itself however the improved pedestrian access will likely result in an improvement in public transport patronage.

Parking

- It is recommended that the parking rates be adopted in accordance with this report

Road Network/Intersection Operational Performance

- Cycle time optimisation to existing signals to remain at the Harbour Street / Pier Street / Goulburn Street intersection to improve coordination with existing adjacent signalised intersections. This will require liaison and consultation with the RMS Traffic Management Centre.
- The signals at the Darling Drive / Hay Street intersection will require minor layout adjustment to coordinate with site access.
- Coordination is required with the proposed PPP laneway from the Theatre and how it interfaces with the PDA NW building access and the tie in to Darling Drive. This will be addressed in the Design Development stage of the PPP.
- The realignment of Darling Drive would accommodate future traffic volumes and will not result in detrimental impacts to the overall road network.
- The new development lot vehicular accesses to harbour street (2 of), Darling Drive (1 of) and loop toad (1 of) are appropriate and will not result in detrimental impacts to road network.

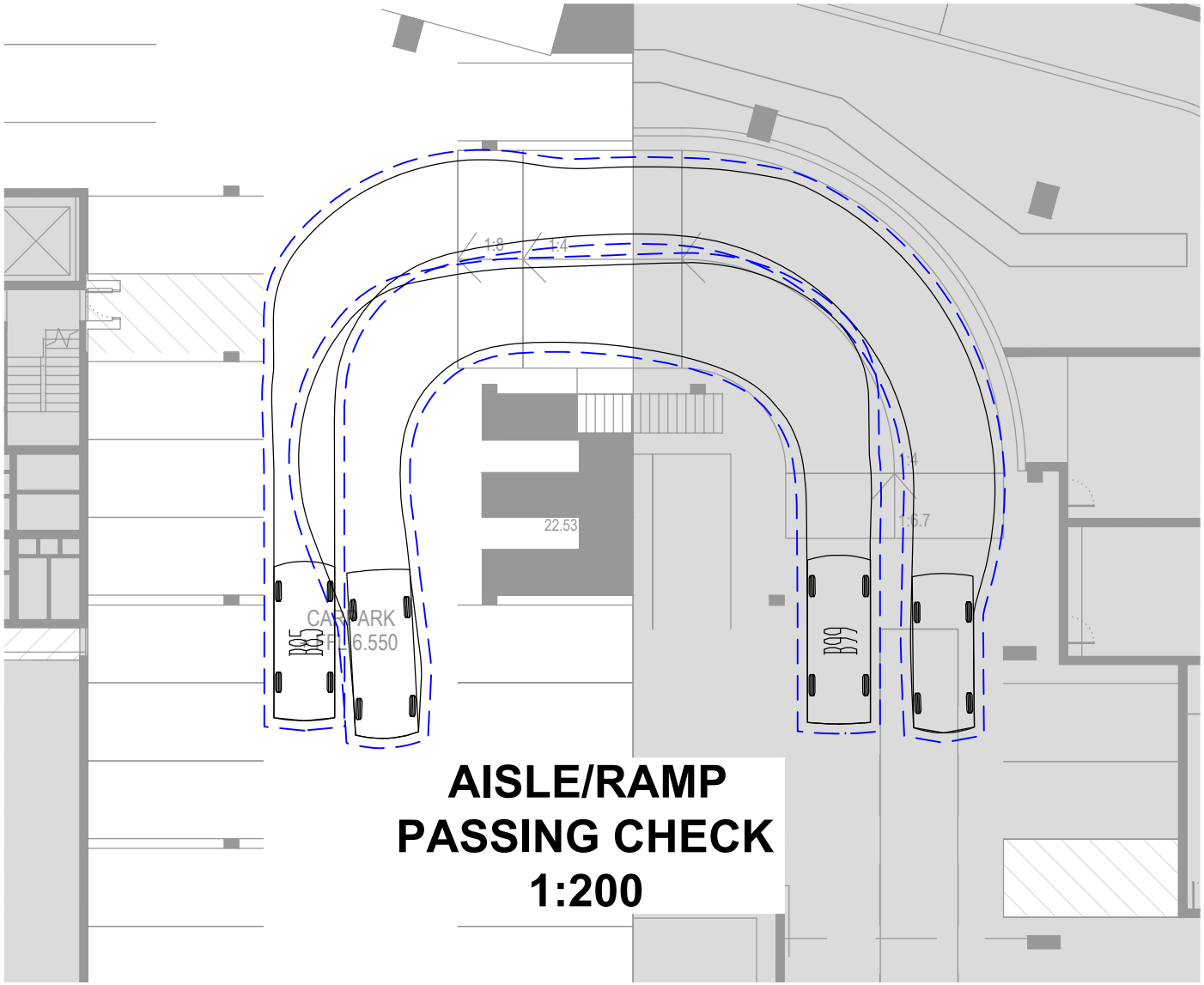
Pedestrian

- It is recommended that the proposed pedestrian routes provided throughout the PDA be enhanced through interactive wayfinding and signage to facilitate connectivity in all directions.
- Ongoing initiatives of the Ultimo Pedestrian Network Plan and the Chinatown Public Domain Plan (both by others) also address external pedestrian connectivity to major transport nodes adjacent to The Haymarket Precinct. Interfacing with the improved external pedestrian network will enhance accessibility of The Haymarket Precinct and further strengthen linkages with public transport.

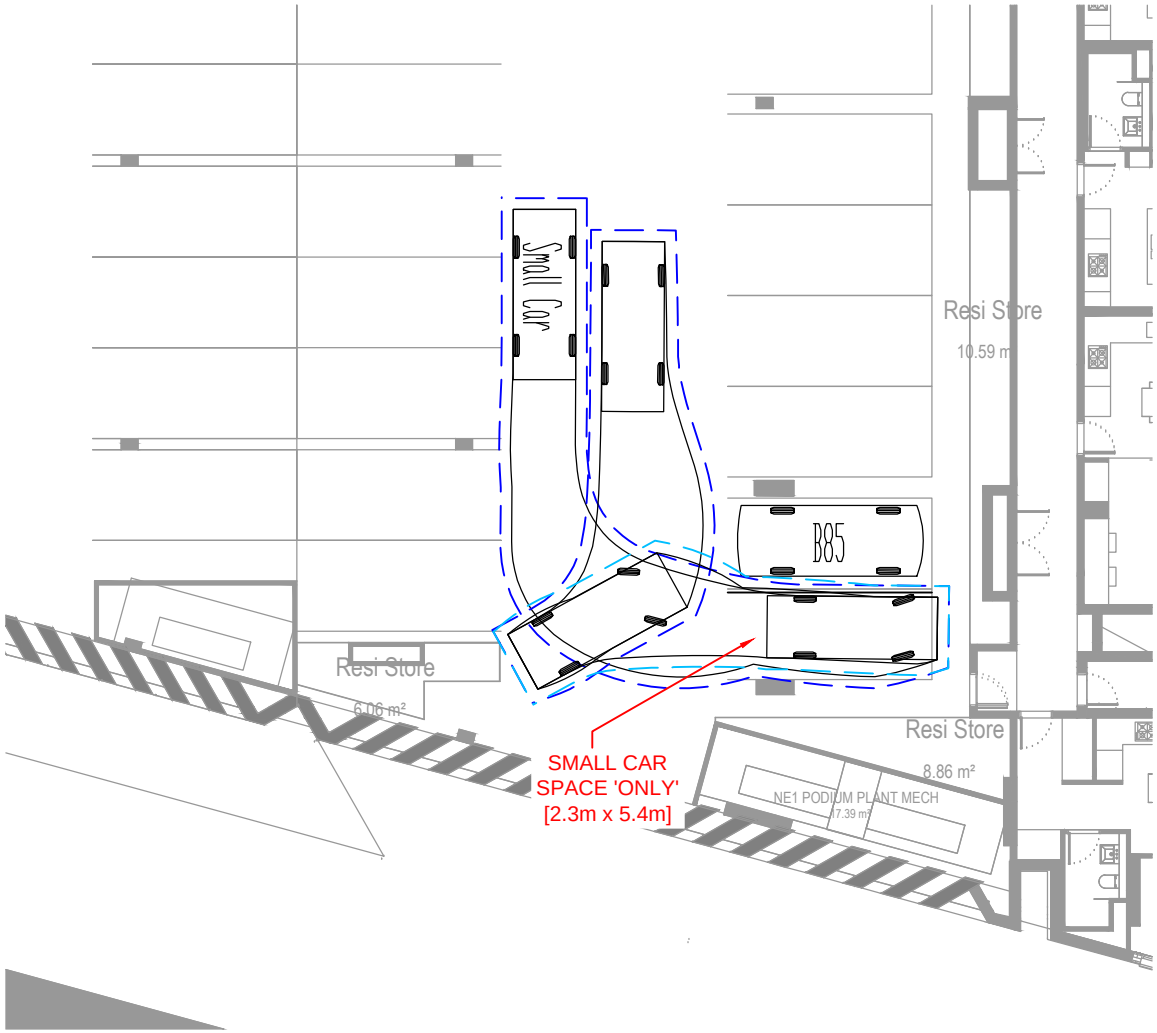
Cycleway

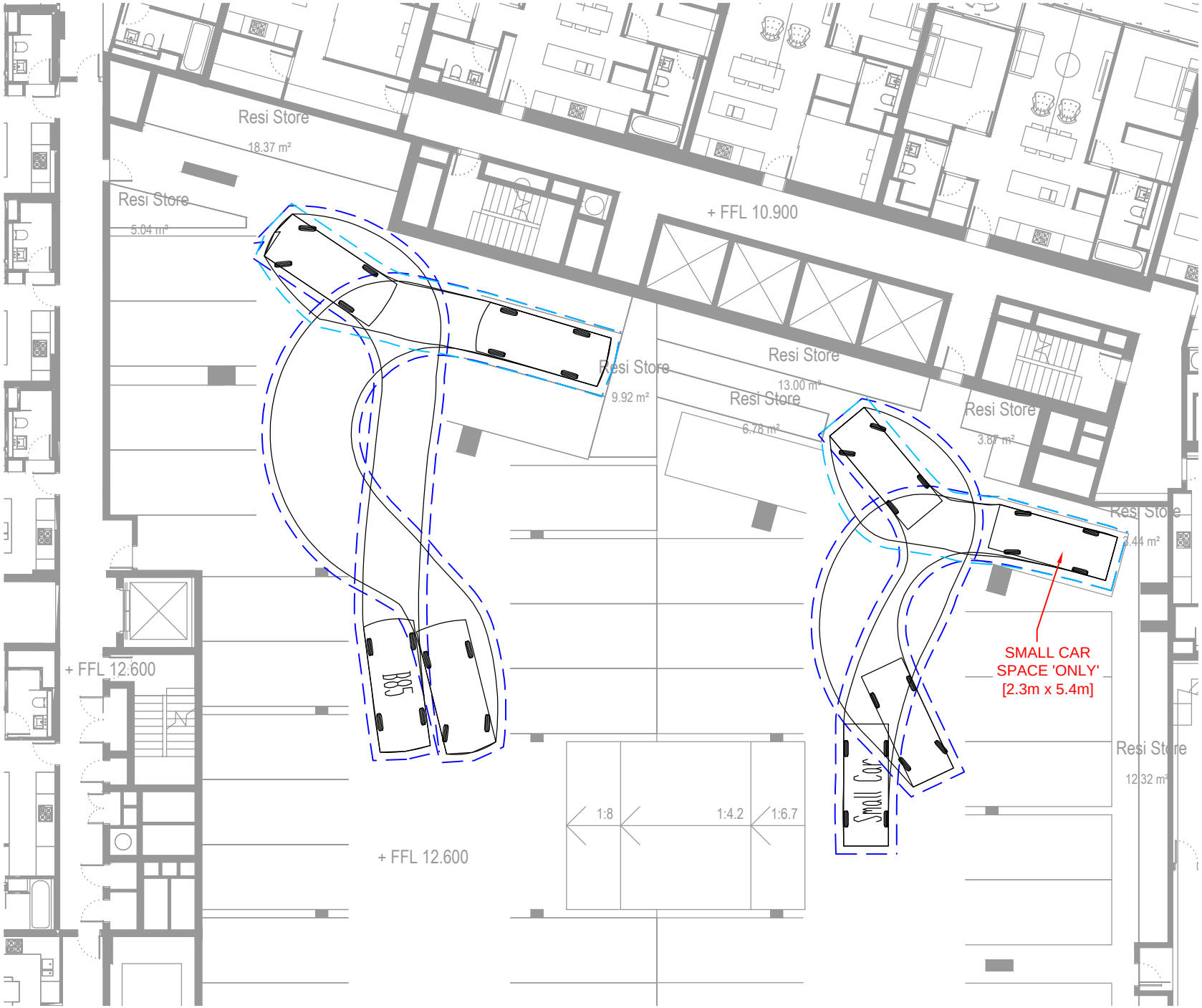
- As with the improved pedestrian amenity, the proposed augmentation of the city wide cycleway proposed along Darling Drive should be supported.
- Furthermore, the installation of support facilities (such as secure cycle parking) within the precinct is recommended to encourage the use of cycle and increasing the mode share according to the current targets for sustainable transport

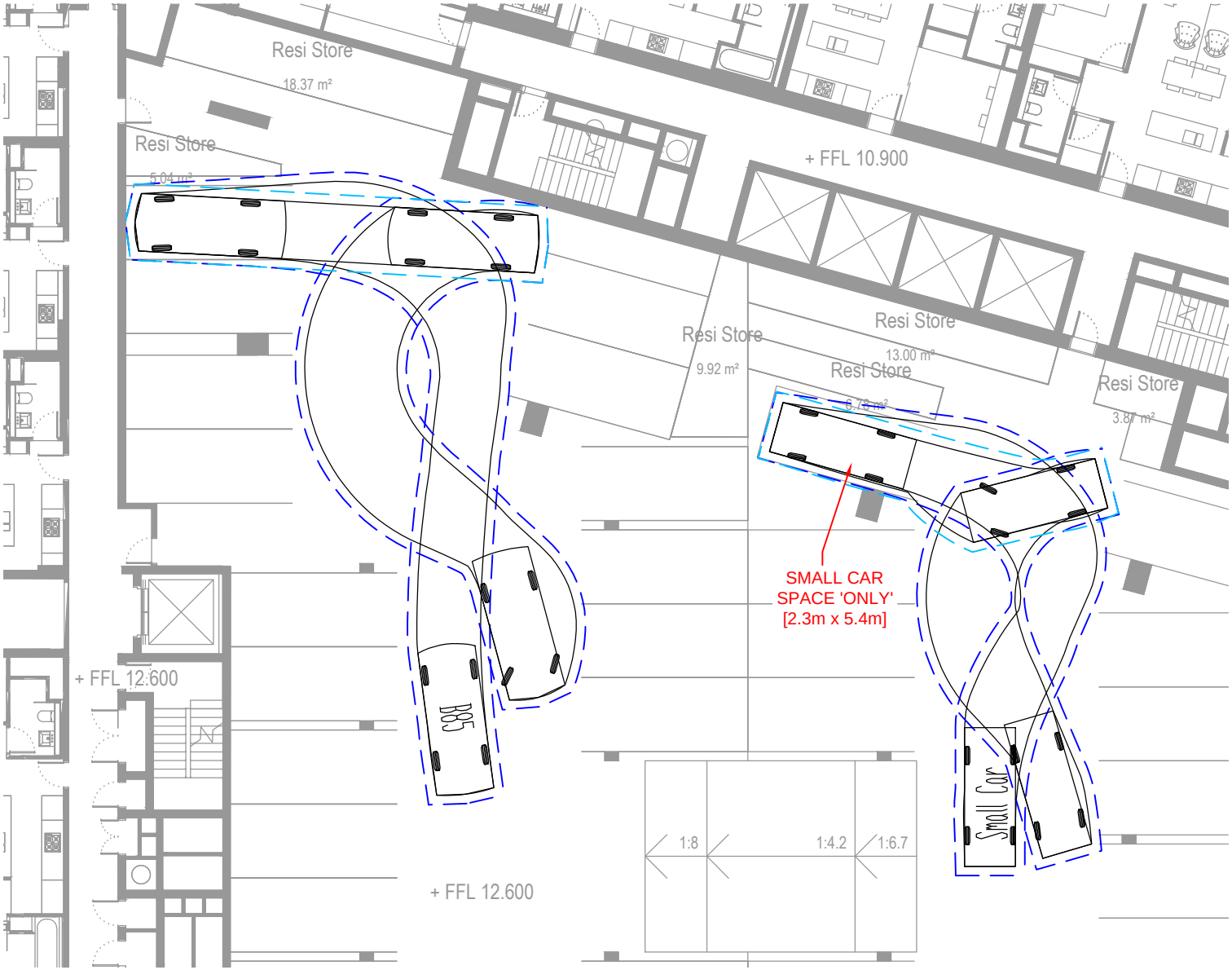
Appendix B Swept Path Diagrams

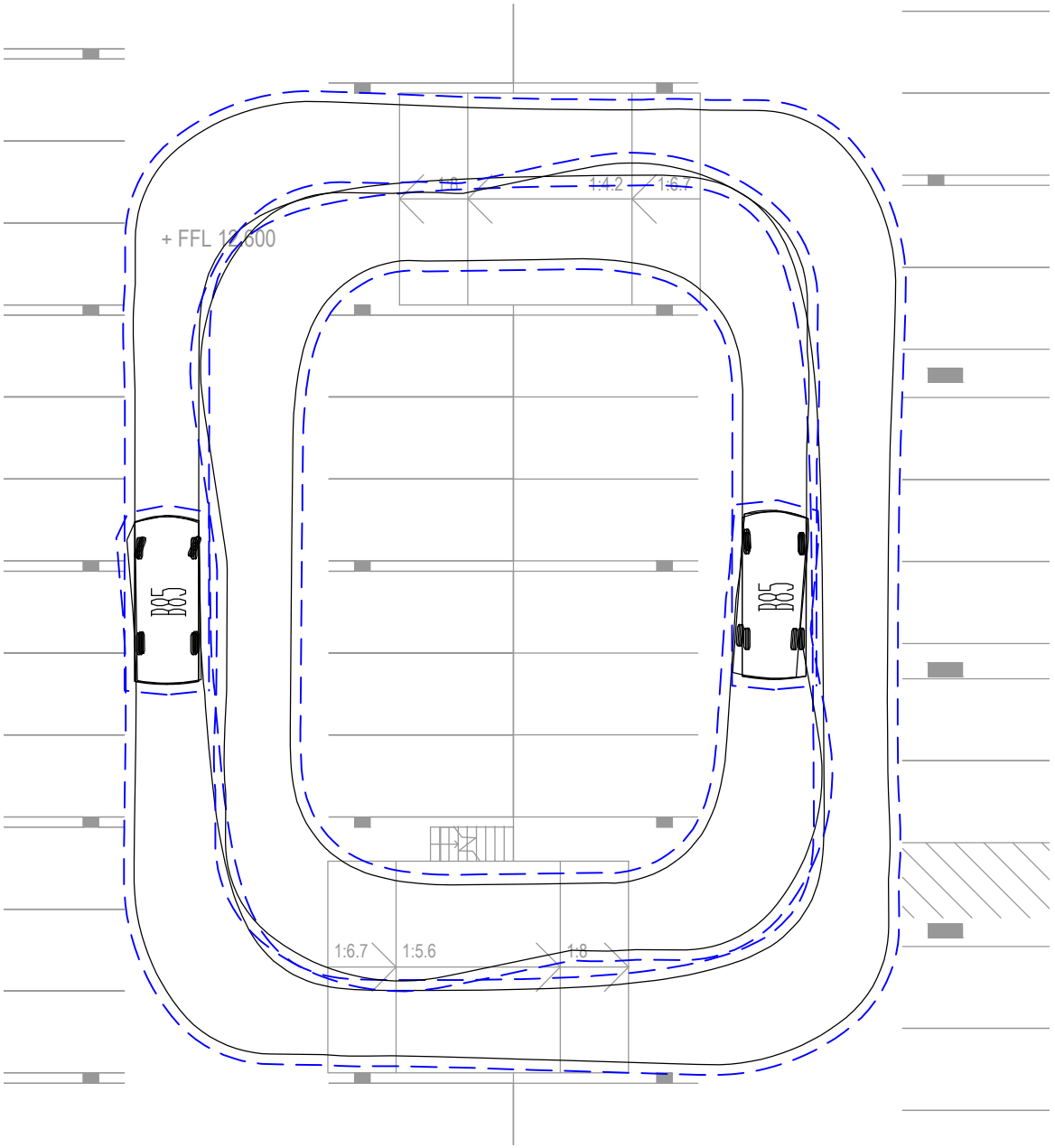


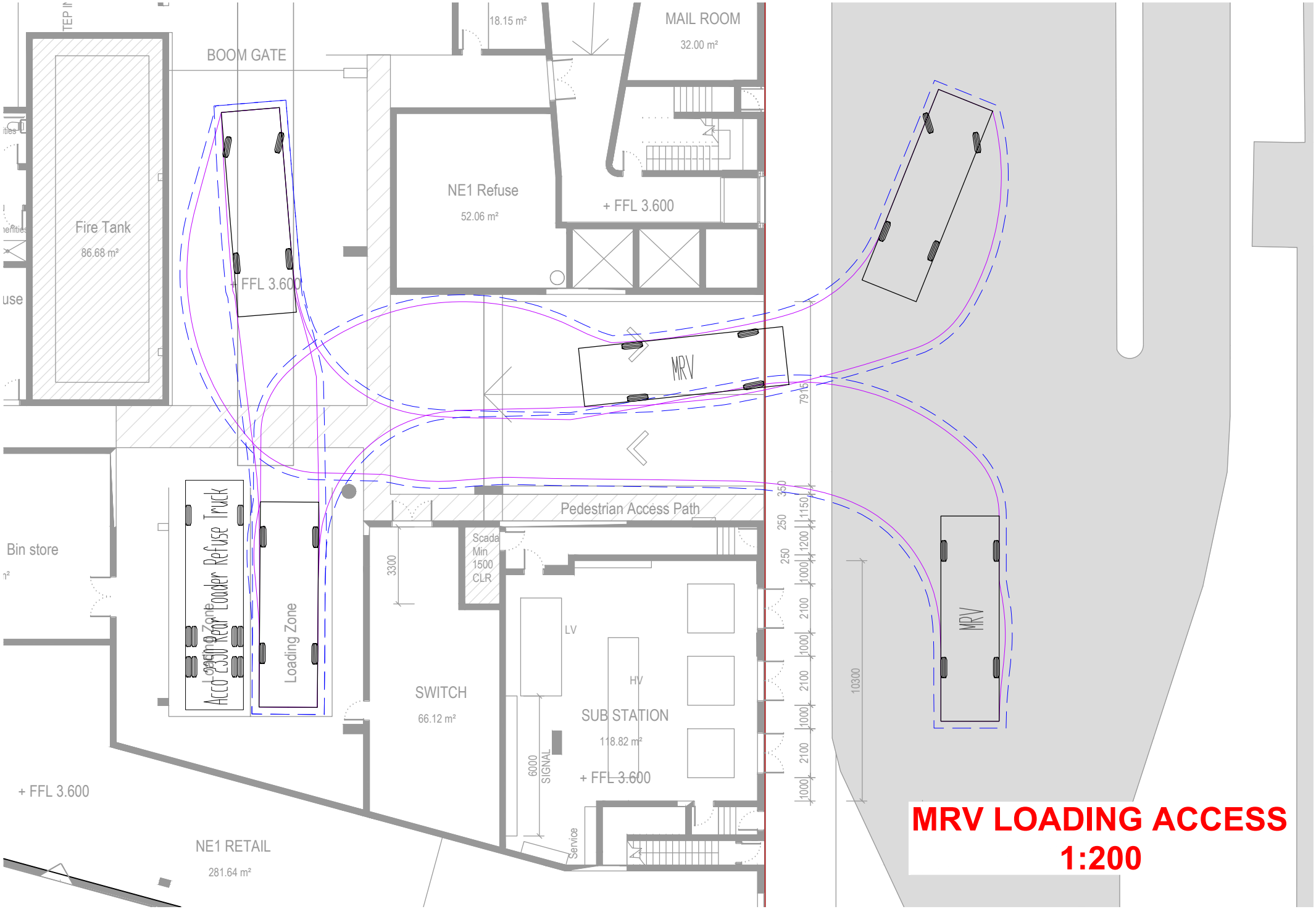
AISLE/RAMP PASSING CHECK 1:200


Small Car
B85
Resi Store
10.59 m²
Resi Store
6.06 m²
Resi Store
8.86 m²
NE1 PODIUM PLANT MECH
17.39 m²
SMALL CAR
SPACE 'ONLY'
[2.3m x 5.4m]

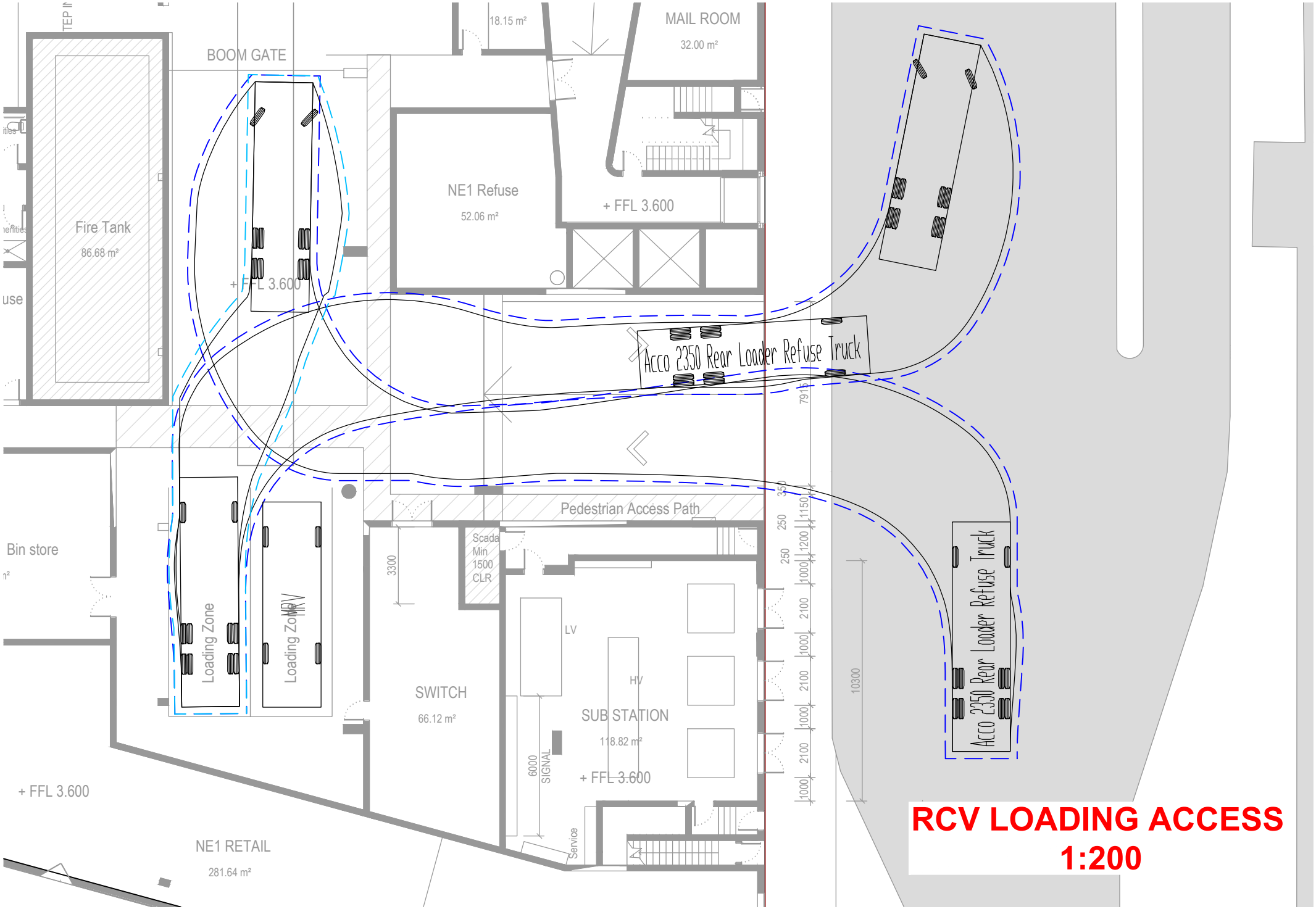

Resi Store
18.37 m²
Resi Store
5.04 m²
+ FFL 10.900
Resi Store
9.92 m²
Resi Store
13.00 m²
Resi Store
6.78 m²
Resi Store
3.87 m²
Resi Store
3.44 m²
Resi Store
12.32 m²
+ FFL 12.600
+ FFL 12.600
R85
Small Car
SMALL CAR
SPACE 'ONLY'
[2.3m x 5.4m]
1:8
1:4.2
1:6.7


Resi Store
18.37 m²
Resi Store
5.04 m²
+ FFL 10.900
Resi Store
9.92 m²
Resi Store
13.00 m²
Resi Store
Resi Store
3.87 m²
SMALL CAR
SPACE 'ONLY'
[2.3m x 5.4m]
+ FFL 12.600
B85
Small Car
1:8
1:4.2
1:6.7
+ FFL 12.600


+ FFL 12.600
1:8
1:4.2
1:6.7
B85
B85
1:6.7
1:5.6
1:8



MRV LOADING ACCESS
1:200


BOOM GATE
18.15 m²
MAIL ROOM
32.00 m²
NE1 Refuse
52.06 m²
+ FFL 3.600
Fire Tank
86.68 m²
+ FFL 3.600
Acco 2350 Rear Loader Refuse Truck
Pedestrian Access Path
Bin store
Loading Zone
Loading Zone MRV
Scada
Min
1500
CLR
3300
SWITCH
66.12 m²
LV
HV
SUB STATION
118.82 m²
+ FFL 3.600
6000
SIGNAL
Service
+ FFL 3.600
NE1 RETAIL
281.64 m²
Acco 2350 Rear Loader Refuse Truck
7915
350
250
250
1150
1200
1000
2100
1000
2100
1000
2100
1000
2100
1000
10300
RCV LOADING ACCESS
1:200