



The Ribbon Mixed Use Development 31 Wheat Road, Sydney Transport Impact Assessment

Client // Grocon
Office // NSW
Reference // 12S9018500
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Quality Record

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1. Introduction

1.1 Background

It is understood that a development application (DA) is to be lodged with NSW Planning and Environment (DPE) for a proposed mixed use development on land located between the Western Distributor elevated roadways and within the Darling Harbour/ Cockle Bay tourist and entertainment precinct in the western fringe of Sydney CBD.

The proposed development includes demolition of the existing IMAX building and the construction of a new 23-storey building and a separate two storey building, incorporating a total Gross Floor Area (GFA) of approximately 54,500m² for hotel and serviced apartments, retail, restaurant, function space and a new IMAX cinema.

On 16 June 2014 the Planning Assessment Commission granted consent to SSD-5397, to demolish the IMAX building and construct a 20-storey building for office, retail and entertainment purposes. The new proposal seeks to retain the maximum height (through altered floor to ceiling heights), width, scale and character of the approved form, but change the dominant use from office to serviced apartments, hotel and associated facilities including restaurants and a function room. The uses of entertainment (cinema), Sydney Harbour Foreshore Authority (SHFA) offices and retail remain as previously approved.

Grocon engaged GTA Consultants in December 2015 to address matters raised in the Secretary's Environmental Assessment Requirements (SEARs) and to complete a transport impact assessment for the proposed development.

1.2 Purpose of this Report

This report sets out an assessment of the anticipated transport implications of the proposed development, including consideration of the following:

- i existing traffic and parking conditions surrounding the site;
- ii suitability of the proposed parking in terms of supply (quantum) and layout;
- iii service vehicle requirements;
- iv pedestrian and bicycle requirements;
- v the traffic generating characteristics of the proposed development;
- vi suitability of the proposed access arrangements for the site;
- vii the transport impact of the development proposal on the surrounding road network.

This study has also considered the SEARs for the Environmental Assessment of the proposed development. The SEARs were issued by the NSW Government Department of Planning and Environment for the redevelopment of the IMAX (SSD 7388) on 11 December 2015. Section 7 of the document addresses transport, traffic and car parking, as detailed in Table 1.1.

Table 1.1: Secretary’s Environmental Assessment Requirements (SEARs)

Description	Relevant Section
Traffic modelling and analysis of the total daily and peak hour vehicle, public transport, pedestrian and cycle movements likely to be generated by the proposed development and the likely impact on existing traffic and transport capacity, such as on Wheat Street and Harbour Street	Section 5,6,8
Assessment of the existing and future performance of key intersections providing access to the site, and any upgrades or road improvements required to accommodate the proposed development	Section 8
Assessment of the cumulative impact of traffic volumes from the proposal together with existing, known proposed and approved developments in the area and potential conflict with existing traffic movements in the area	Section 8
Existing and proposed vehicular access, including arrangements for taxis, coaches and vehicle pick up/drop off	Section 8
Service vehicle movements and site access arrangements, including loading dock arrangements, vehicle type and likely arrival / departure times	Section 7
Car parking arrangements, including queuing analysis for the proposed car parking system and car parking provision in accordance with the <i>Sydney Development Control Plan 2012</i> and relevant Australian Standards	Section 4,8
Demonstrate the measures to be implemented to encourage employees and visitors of the development to make sustainable travel choices, including public transport usage, walking and bicycle, including integration with existing networks and provision of end of trip facilities, and work place travel plans	Section 5
Detailed pedestrian modelling to demonstrate that the proposal will not have adverse impacts on pedestrian movement and facilities in the precinct	Section 6
Road safety assessment of any proposed signage, lighting displays and reflectivity visible on roads	To be included as part of detailed design

1.3 References

In preparing this report, reference has been made to the following:

- Several inspections of the site and its surrounds
- City of Sydney Council Local Environment Plan (LEP) 2012
- City of Sydney Council Development Control Plan (DCP) 2012
- Darling Harbour Development Plan No. 1
- Australian Standard, Parking Facilities, Part 1: Off-Street Car Parking AS 2890.1:2004
- Australian Standard, Parking Facilities, Part 2: Off-Street Commercial Vehicle Facilities AS 2890.2:2002
- Australian Standard, Parking Facilities, Part 6: Off-Street Parking for People with Disabilities AS 2890.6:2009
- traffic and pedestrian surveys undertaken by GTA Consultants as referenced in the context of this report
- plans for the proposed development prepared by Hassell, Drawing Number ARC-HSL-DA (whole set), Revision D, dated 11 December 2015
- various technical data as referenced in this report
- other documents and data as referenced in this report.

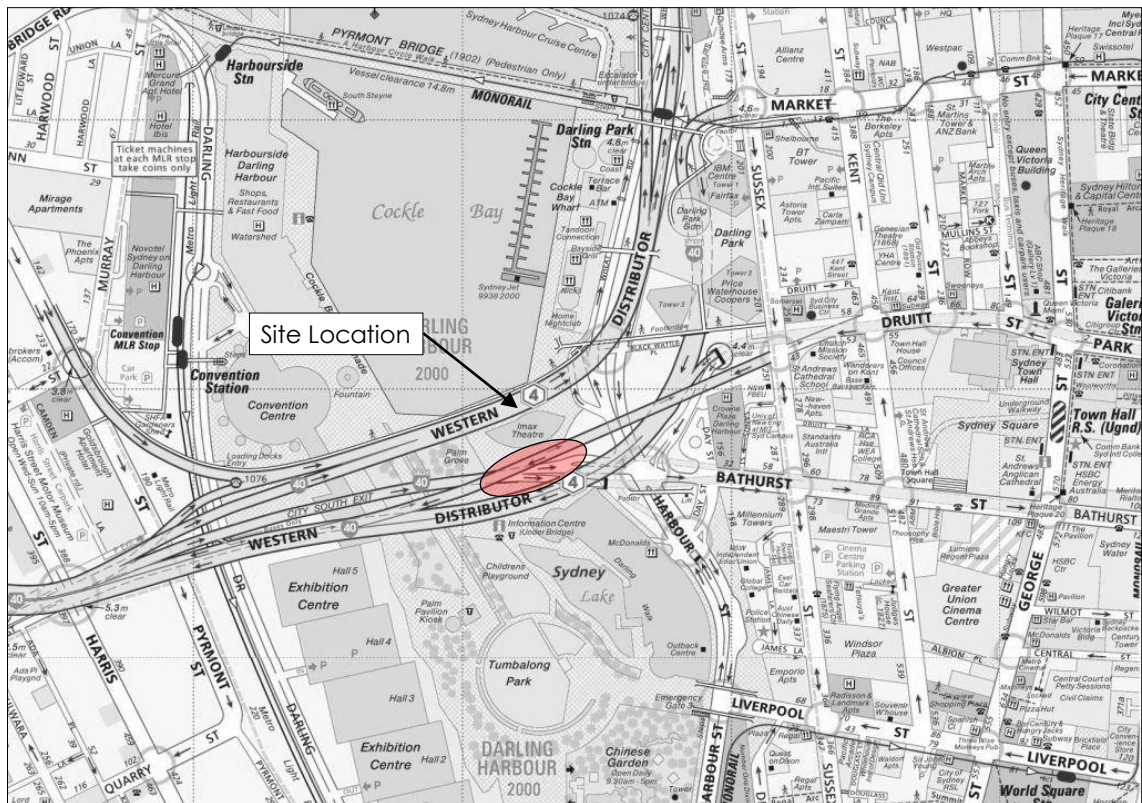
2. Existing Conditions

The subject site is located in a prominent position within Darling Harbour along the western fringe of Sydney CBD. Occupying land between the two Western Distributor elevated roadways, the site of approximately 2,330m² has a frontage primarily north facing to the pedestrian environment of Darling Harbour. The site is under the care and control of SHFA and is occupied by the IMAX Cinema, function centre and associated restaurants/ cafes.

The surrounding properties predominantly include commercial, tourism and retail uses.

The location of the subject site and its surrounding environs is shown in Figure 2.1.

Figure 2.1: Subject Site and its Environs



Basemap source: Sydway Publishing Pty Ltd

2.1 Road Network

2.1.1 Adjoining Roads

Harbour Street

Harbour Street is classified as a State Road and is aligned in a north-south direction east of the site. It is a two-way divided road configured with 2-3 lanes in each direction and set within a 55m wide road reserve.

Harbour Street is a key road in the area and links Chinatown/ CBD western fringe and Ultimo directly with Cockle Bay/ King Street Wharf, Barangaroo (under construction) and further to the Sydney Harbour Bridge. Additional lanes are provided at most intersections, particularly where

Harbour Street intersects with the Western Distributor off-ramp (eastbound), Bathurst Street and Cross City Tunnel (westbound).

Kerbside parking is not permitted at any time along Harbour Street in the vicinity of the site.

Harbour Street is shown in Figure 2.2 and Figure 2.3 and carries approximately 19,000 vehicles per day¹.

Figure 2.2: Harbour Street (looking south)



Figure 2.3: Harbour Street and Wheat Road (looking north)



Wheat Road

Wheat Road is classified as a local road and in the vicinity of the site is aligned in a north-south direction. It is a one-way northbound road configured with a one-lane, 5m wide carriageway, set within a 10m wide road reserve. Wheat Road runs off Harbour Street adjacent to the site and primarily provides access to taxi, bus and loading facilities located adjacent to the site and north of the site, at the rear of the commercial/ retail properties fronting Cockle Bay.

Kerbside parking is permitted, mostly for buses, taxis and for loading purposes along Wheat Road in the vicinity of the site. A limited amount of time restricted parking is also provided north of the site.

Wheat Road is shown in Figure 2.4 and Figure 2.5 and carries approximately 1,000 vehicles per day, north of the site¹.

Wheat Road also provides access to the loading docks and staff parking areas located immediately south of the site with this access and the intersection with Harbour Street shown in Figure 2.6 and Figure 2.7.

¹ Based on the peak hour traffic counts undertaken by GTA in May 2012 and assuming a peak-to-daily ratio of 8% for arterial roads and 10% for local roads.

Figure 2.4: Wheat Road (looking north)



Figure 2.5: Wheat Road (looking south)



Figure 2.6: Wheat Road Taxi/Bus Area (looking south)

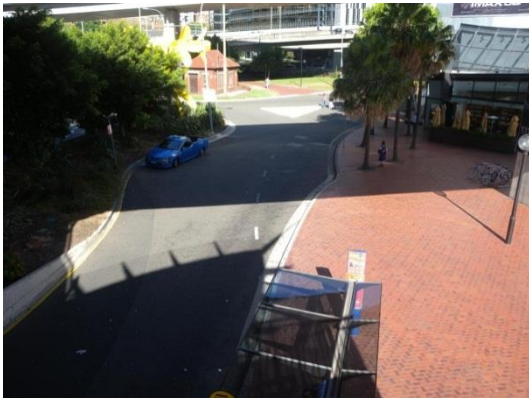


Figure 2.7: Harbour Street/ Wheat Road Intersection



2.1.2 Surrounding Intersections

Harbour Street intersects with Wheat Road at two locations in the vicinity of the site. Both are priority controlled and with movements limited to entry access to Wheat Road from Harbour Street. There is no opportunity to exit Wheat Road to gain direct access to Harbour Street, with the available route via Wheat Road to the north, then using Shelley Street and Erskine Street to filter into the arterial/ CBD road network. The southern Harbour Street intersection is located adjacent to the site and the other is located 60m to the north.

Harbour Street intersects with the Western Distributor off-ramp (eastbound), Bathurst Street and Cross City Tunnel (westbound) where the off-ramps provide exits to an at-grade signalised intersection immediately south of the site.

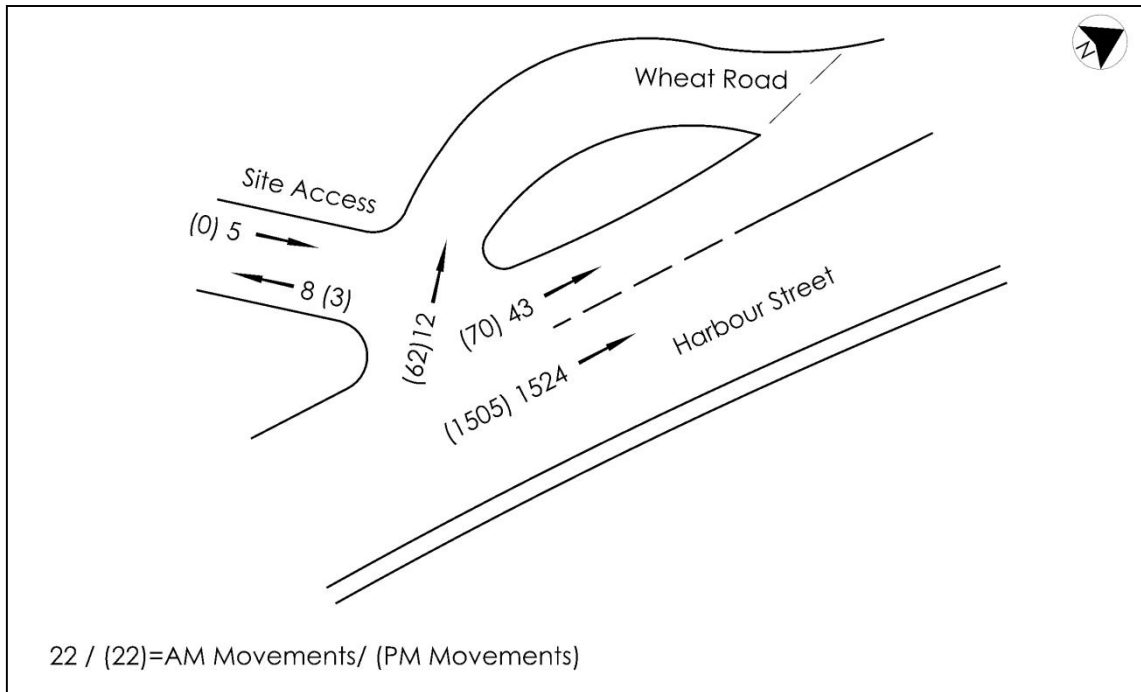
2.2 Traffic Volumes

GTA Consultants completed traffic movement counts on key roads in the immediate vicinity of the site on the 9th May 2012 during the weekday AM (7:30am and 9:30am) and PM (4:30pm and 6:30pm) peak periods. The peak hour traffic volumes are summarised in Figure 2.8.

While it is recognised that the traffic surveys are not strictly current, the operation and function of the area immediately fronting the site has not changed significantly, while also noting that the area is in a constant state of change given the significant construction projects within and surrounding the CBD. This includes the Wynyard Walk and Barangaroo projects which would

further alter 'typical' traffic volumes at present and since 2012. For this reason, the 2012 traffic data is considered an accurate reflection of existing traffic volumes.

Figure 2.8: Existing AM / PM Peak Hour Traffic Volumes



The traffic surveys also identified various transport modes to/ from the local area as detailed in Table 2.1 and Table 2.2.

Table 2.1: AM Peak Hour Local Traffic Summary

Movement	Car	Taxi	Truck	Bus	Total
Site entry	3	0	2	0	5
Site exit	7	0	1	0	8
Wheat Road entry	5	3	2	2	12
Total Movements	15 (60%)	3 (12%)	5 (20%)	2 (8%)	25

Table 2.2: PM Peak Hour Local Traffic Summary

Movement	Car	Taxi	Truck	Bus	Total
Site entry	0	0	0	0	0
Site exit	3	0	0	0	3
Wheat Road entry	4	53	0	5	62
Total Movements	7 (11%)	53 (82%)	0 (0%)	5 (7%)	65

Harbour Street generally carries more than 1,500 northbound vehicles through the local area while Wheat Road provides access to the area immediately east of the site for more than 60 vehicles during the PM peak period. These are mostly made up of taxis picking up or dropping off passengers. Approximately 60 and 130 vehicles use Wheat Road north of the site during the AM and PM peak periods respectively with up to 15 being private cars (during the AM peak). The on-site loading docks and staff parking area generate less than 10 vehicles per hour during any peak hour.

2.3 Car Parking

The existing site does not provide any public car parking spaces however there is currently 5-6 reserved car spaces for building tenants/ staff within the loading dock area located at the rear (south) of the building with access provided via Wheat Road.

A review of publicly available car parks within close proximity of the site (500m radius) indicates a large number of public car parking spaces as outlined in Table 2.3.

Table 2.3: Public Car Parks

Public Car Park	Location	Distance from site	Parking Incentives and discounts
Darling Quarter	1-11 Harbour Street, Sydney	150m	Discounted Weekend Discounted Night Early bird (Mon-Fri)
Harbourside Car Park	100 Murray Street, Pyrmont	400m	Early bird (Mon-Fri) Student discounts 'Park and Save'
Market Street	2 Market Street, Darling Harbour	350m	Discounted Weekend Discounted Night Early bird (Mon-Fri)
Sussex Street	234 Sussex Street, Sydney	250m	Early bird (Mon-Fri)
Dixon Street	1 Dixon Street, Darling Harbour	400m	Discounted Weekend Discounted Night Early bird (Mon-Fri)
Darling Park	201 Sussex Street, Sydney	250m	
Citi Park	204 Sussex Street, Sydney	300m	

Early bird discounts are provided by the majority of the identified car parks as outlined in Table 2.3 and primarily involve incentive programs aimed at staff of the surrounding commercial buildings. The offer includes a discounted parking rate for entry between 6:00am and 9:30am and exit between 3:30pm and 7:00pm Monday to Friday. Weekend discounts are also aimed to capture the weekend visitor of the Darling Harbour retail and entertainment precincts.

It is also understood that the Harbourside Car Park offers a 'park and save' incentive program for IMAX patrons and other recreational precincts within Darling Harbour.

2.4 Public Transport

Given the location of the site within the western fringe of the CBD and the Darling Harbour tourist precinct, the area is well serviced by public transport services. A review of the public transport available in the vicinity of the site is summarised in Table 2.4.

Table 2.4: Public Transport Provision

Service	Route #	Route Description	Location of Stop	Distance to Nearest Stop	Frequency On/Off peak
Bus	500	City to Ryde	Druitt Street	250m	15 min peak only
	504	City to Chiswick			10 min peak/ 30 min off peak
	506, 507, 518	City to Macquarie University			30 min all day
	515	City to Eastwood			40 min off peak only
	520, M52	City to Parramatta			10 min peak/ 15 min off peak
	M50	Coogee to Drummoyne			
Light Rail	Zone 1, 2	Central to Lilyfield	Convention Centre	750m	Every 5 minutes
Train	N/A	Multiple City Rail Lines	Town Hall Station	400m	Regular Services

It is also worth noting that the CBD and South East Light Rail (CSELR) is currently being constructed along George Street, with a light rail stop to be located outside QVB, approximately 500m east of the site. Light rail services will provide alternate transport solutions for commuters travelling to and from the CBD and the inner southern and eastern suburbs. The construction of the CSELR is anticipated to be completed in 2019.

2.5 Pedestrian Infrastructure

The surrounding area experiences high levels of pedestrian activity as a result of the commercial/retail and tourist land uses including the site's existing uses, most notably the IMAX cinemas and associated function facilities. As such, the area surrounding the site has well established pedestrian facilities as detailed below:

- Pedestrian Overpass – 5m wide path located 50m north of site, providing access to Town Hall Station, as shown in Figure 2.10.
- Harbour Street – 5m wide path located 10m south of site (and adjacent to the site), as shown in Figure 2.11.
- Pedestrian Overpass – 10m wide path located 150m north of site, linking Darling Harbour (via the 'Spanish steps') with the CBD, as shown in Figure 2.12.
- Bathurst Street Pedestrian Bridge, as shown in Figure 2.13.
- At-grade pedestrian crossings on the western and southern approaches to the Harbour Street/ Bathurst Street signalised intersection.
- Pyrmont Pedestrian Bridge – 15m wide bridge located 300m north of site, linking Darling Harbour and Pyrmont with the CBD.
- Darling Harbour Walk – located 500m north of site providing access to the CBD.

Figure 2.9: Pedestrian Desire Lines

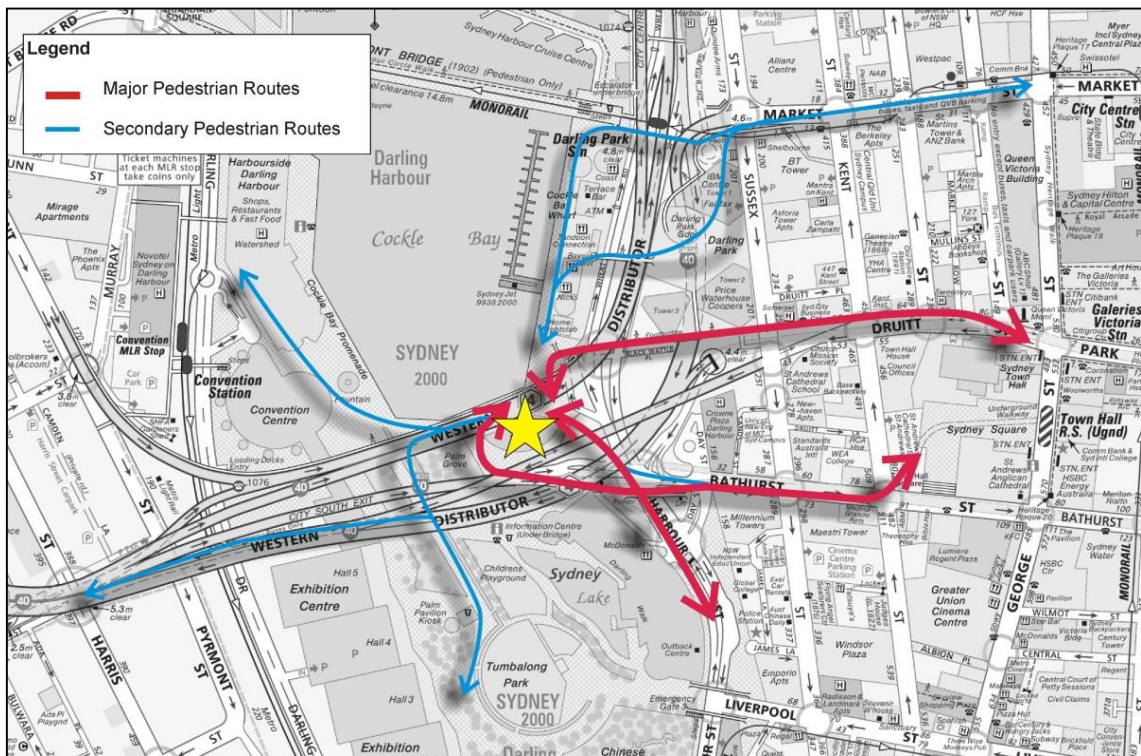


Figure 2.10: Pedestrian Overpass (looking west)



Figure 2.11: Harbour Street Path (looking south)



Figure 2.12: Harbour Street Pedestrian Overpass (looking north)



Figure 2.13: Bathurst Street Pedestrian Bridge (looking east)

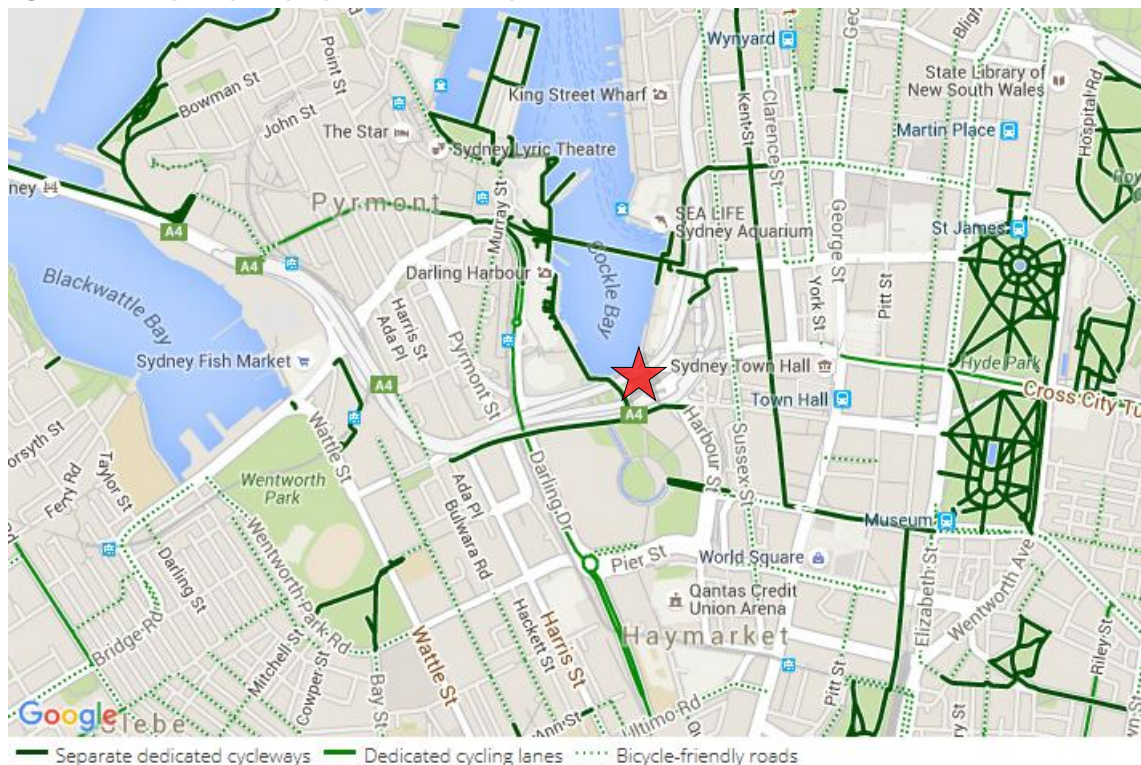


2.6 Cycle Infrastructure

The site is located within close proximity to both on- and off-road cycling facilities as indicated in an extract from the City of Sydney's cycle network map (Figure 2.14). An off-road shared path travels north-south through Darling Harbour connecting Pymont Bridge Road in the north-west with the Union Street separated cycleway and Liverpool Street. This route travels within approximately 100m of the site and provides access to the broader cycling network, including via Pymont Bridge Road and Kent Street north of the site and Darling Road south-west of the site.

It is also noted that end-of-trip facilities in the form of bike racks, providing capacity for six bikes are provided within the pedestrian areas along the frontage of the site.

Figure 2.14: City of Sydney Cycle Network Map

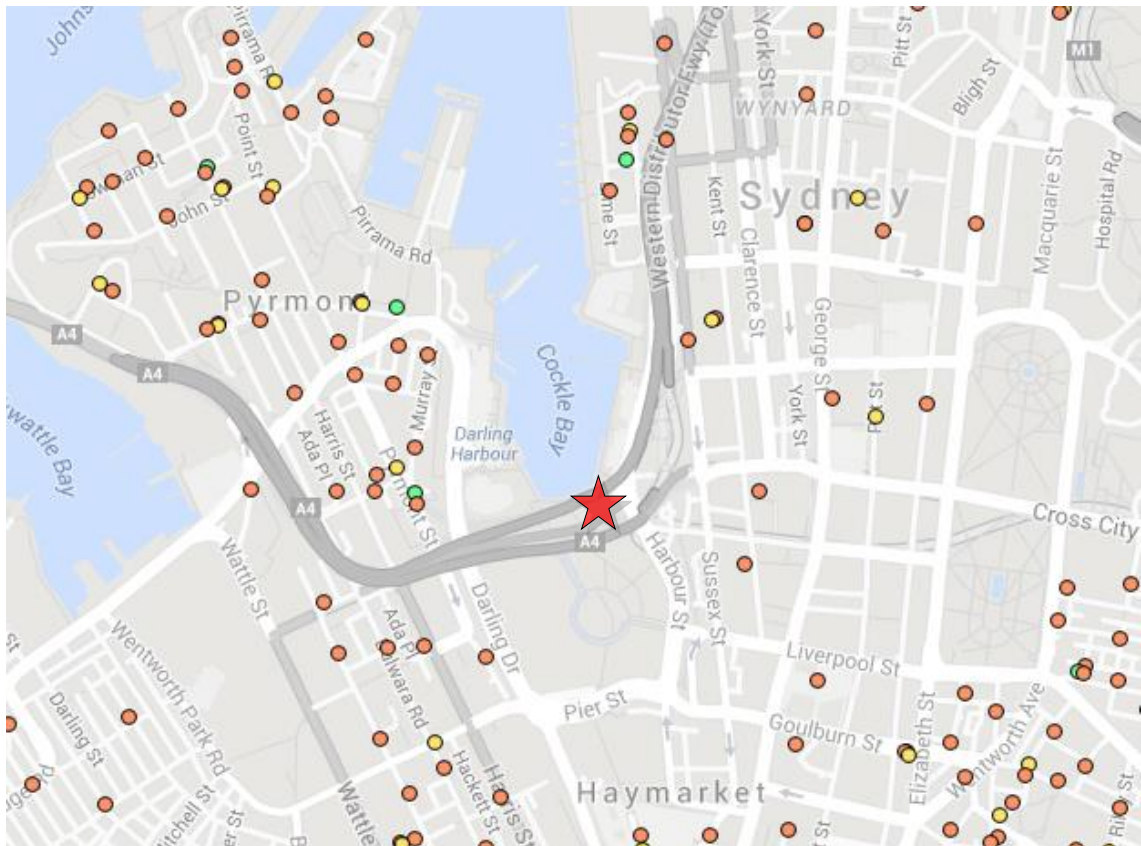


Sourced from: <http://www.sydneycycleways.net/map/> (accessed Dec 2015)

2.7 Car Share

Multiple car sharing pods are located in the vicinity of the site, as detailed in Figure 2.15.

Figure 2.15: Car Share Locations



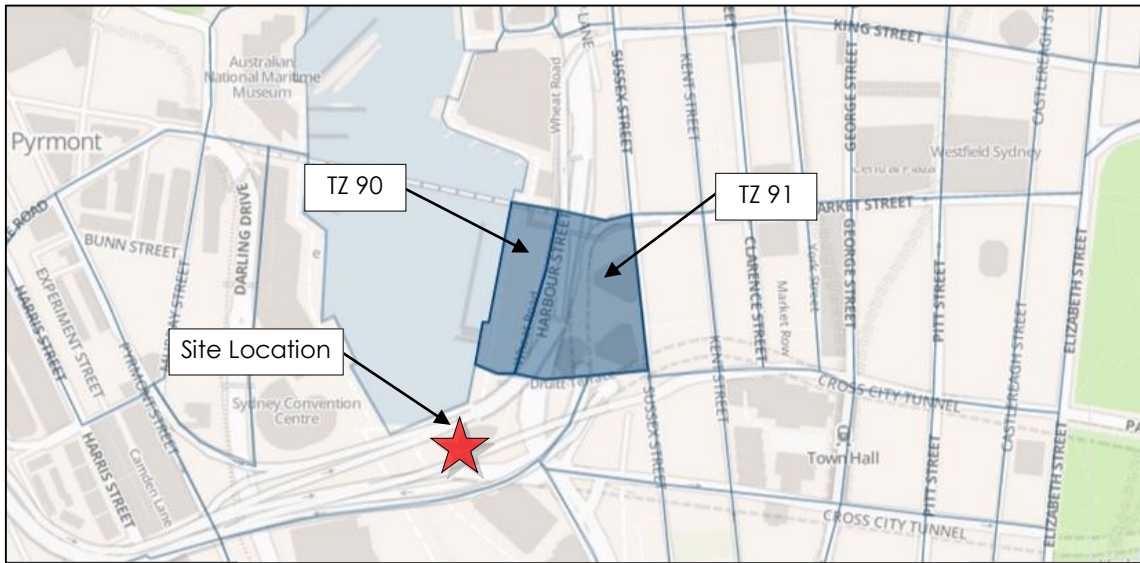
Sourced from: <http://www.cityofsydney.nsw.gov.au/live/residents/car-sharing> (accessed Dec 2015)

2.8 Journey to Work Data

Given the CBD location, an alternative way to determine the travel mode choice is assessing Census Journey to Work (JTW) data. The existing mode share distribution of traffic within the surrounding road network can be found by referencing the 2011 Census JTW data (Bureau of Transport Statistics, 2013). JTW data provides information relating to the origin and destination of journeys to work and includes mode of travel.

The smallest geographical area for which JTW data is available is a Travel Zone (TZ). JTW data was analysed for the principal employment areas adjacent to the subject site (TZ 90 and 91) to understand the current mode share distribution for trips to work. The area analysed was bounded by Sussex Street, Darling Harbour, CCT and Market Street as illustrated in Figure 2.16.

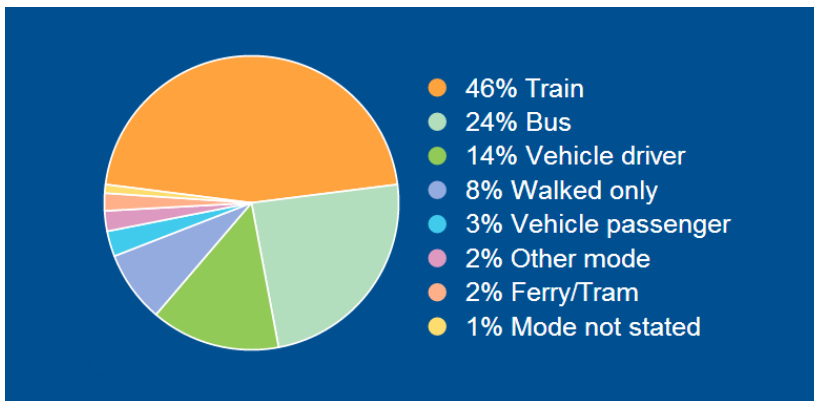
Figure 2.16: Travel Zones Analysed



Source: <http://visual.bts.nsw.gov.au/itwbasic/#90,91>

GTA Consultants undertook analysis of all trips to work made to TZ 90 and 91, the results of which are summarised in Figure 2.17. Of the 8,426 people employed in these two Travel Zones was found that 70% of all journey to work trips were made using public transport (train, bus) with 14% by car (as driver) and 3% by car (as passenger).

Figure 2.17: 2011 Census Data Journey to Work Data (TZ 90 and 91)



Source: <http://visual.bts.nsw.gov.au/itwbasic/#90,91>

3. Development Proposal

3.1 Land Uses

The proposal includes the construction of a mixed use tower over an expanded footprint of 5,060m² comprising 23 levels with 2 levels of retail/ mixed use space, a new IMAX theatre, 21 levels of hotel and serviced apartments and associated facilities including restaurants and function space.

The proposal includes car parking for 170 vehicles within a car stacker facility with access via the ground level and adjacent to the internal loading facilities.

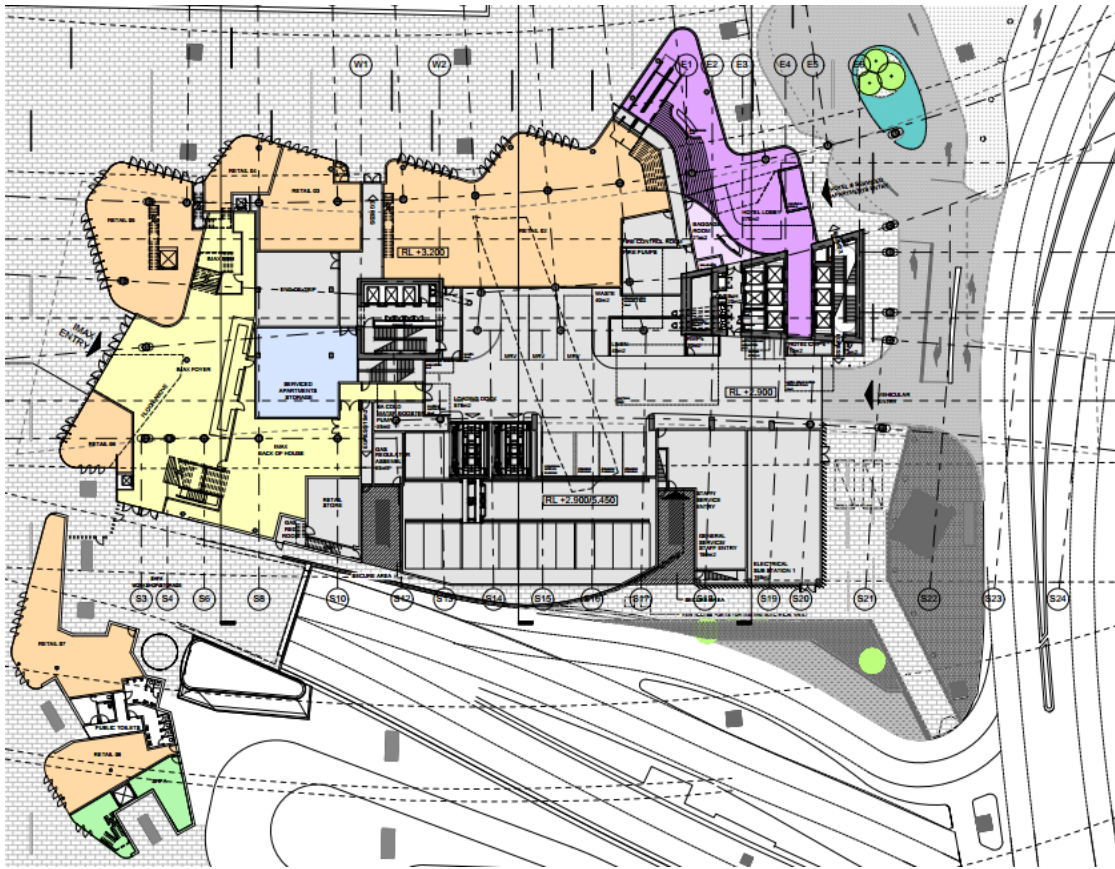
The existing IMAX cinema complex will also form part of the development and be located at the western end of the lower levels. A separate two storey building in the south-west corner of the site will be redeveloped and potentially comprise retail tenancies and SHFA offices. Upgrades to the surrounding public domain forming part of the Darling Harbour precinct is also proposed.

The building uses are summarised in Table 3.1 with a development site plan illustrated in Figure 3.1. The total development covers approximately 54,880m² GFA.

Table 3.1: Development Schedule

Use	Size (GFA)
Retail	1,800m ²
Hotel	32,130m ²
Serviced Apartments	17,280m ²
Cinema	3,220m ²
Commercial	450m ²
Total	54,880m²

Figure 3.1: Proposed Development



Source: Hassell GA Plans – Ground Floor, ARC-HSL-DD-1100 Rev. G, dated 16.12.15

3.2 Vehicle Access

A single approximate 6.5m wide two-way east-west site access driveway will link the on-site ground level loading facilities and car stacker with Wheat Road. This site access driveway has been designed to accommodate access by vehicles up to 8.8m medium rigid vehicles and allows for two vehicles to pass at the key locations. Vehicles will exit the loading and car stacker area through the hotel forecourt to access Wheat Road further to the north.

A porte cochere is proposed as part of the hotel lobby forecourt set-down/ pick-up area. All private vehicles, taxis and hire cars will make use of this area, with a hotel valet service to be an integral part of the day-to-day hotel operations. Buses and coaches, including the Sydney Explorer will also access the area through the porte cochere to access a dedicated bus zone further to the north.

The design includes a 'loop' section whereby valet drivers will be able to circulate in order to access the car stacker facility further to the south. The loop and associated southbound traffic movement would be used by trained and inducted valet drivers only. The interaction of entering vehicles and this activity will be subject to detailed design, however there is a high level of amenity and separation of vehicle movements to ensure safety at all times. Vehicles entering the porte cochere from Harbour Street will always have priority over other movements.

The porte cochere will be able to accommodate four vehicles at any one time with an adjacent travel and/ or parking lane for additional capacity. During peak periods, when hotel guests and/ or functions coincide, the area will be able to accommodate approximately eight vehicles.

Detailed swept paths and associated queuing assessment is included in Appendix A with the forecourt area illustrated in Figure 3.2.

It is envisaged that a detailed management plan would be prepared traffic operations within the forecourt area to minimise the potential for any delays and associated impacts to Harbour Street traffic.

Figure 3.2: Proposed Forecourt and Porte Cochere



Source: Hassell GA Plans – Ground Floor, ARC-HSL-DD-1100 Rev. G, dated 16.12.15

3.3 Car Parking

The proposed development will provide a total of 170 car parking spaces within a car stacker facility, with access via the Harbour Street site access driveway. The car stacker will be spread over a significantly smaller area than that required for a typical car park and includes five levels (some with reduced height clearances) with access via two transfer cabins to reduce the likelihood of queuing on entry, particularly during the PM peak period.

The car stacker will be managed and controlled by the hotel valet service to ensure both efficient and safe operation at all times.

The suitability of the car parking provision and layout is discussed in Section 4 of this report. Traffic operations within the basement are generally consistent with the previous development approval.

3.4 Pedestrian Facilities

Given the site's location as part of the Darling Harbour precinct and having regard to the high level of existing pedestrian activity generally surrounding (and associated with) the site, pedestrian amenity is a key project component.

With this mind, pedestrian access is proposed via several locations, detailed as follows:

- Hotel and serviced apartments – access via the eastern end of the building via a forecourt and foyer as part of the ground lobby.
- Cinema complex – access via the western end to a ground lobby.
- Retail tenancies – multiple accesses along the northern frontages and within the Darling Harbour precinct.

Serviced apartment guests that make direct use of the valet service associated with the car stacker will be able to access the lobby lifts via a direct connection along the site access driveway.

The suitability of the proposed pedestrian facilities is discussed in Section 5 of this report.

3.5 Bicycle Facilities

The development plans show an end of trip facility adjacent to the IMAX cinema, with direct access along the northern site frontage and through the site access driveway. The final number of dedicated bicycle spaces will be determined as part of detailed design, however it is envisaged that provision will be in accordance with the requirements of City of Sydney's Development Control Plan (DCP) and Local Environmental Plan (LEP), including provision of showers and lockers for use by staff.

The suitability of the bicycle provisions is discussed in Section 5 of this report.

3.6 Loading Areas

A dedicated loading area with capacity for seven service vehicles is proposed within the ground level and has been designed to provide for the day-to-day servicing needs of the hotel/ serviced apartments, together with IMAX and retail tenancies.

The loading facilities are proposed as follows:

- Three loading bays on the northern side for use by 8.8m medium rigid vehicles.
- One loading bay on the southern side for use by 6.4m small rigid vehicles.
- Three bays on the southern side for use by cars, vans, couriers etc.

The suitability of the proposed loading arrangements is discussed in Section 6 of this report.

3.7 Building Clearances

The development plans show a minimum clearance of 1.5m between the building structure and the Western Distributor elevated roadways and is in accordance with the minimum Roads and Maritime Services (RMS) requirements for set-backs to allow maintenance.

4. Car Parking

4.1 Car Parking Requirements

The proposed development is to be located on land within Darling Harbour and is therefore under the management and control of SHFA and bounds the western edge of the Council of the City of Sydney. Given the site's proximity, GTA Consultants has referenced LEP 2012 and DCP 2012 for the on-site car parking requirements.

A review of the car parking requirement rates and the development schedule results in an LEP 2012 car parking requirement for the proposed development as summarised in Table 4.1.

Table 4.1: LEP 2012 Car Parking Requirements

Description	Size (GFA), No.	Parking Rate (maximum)	Maximum Parking Requirement
Hotel	402 rooms	1 space for every 4 bedrooms up to 100 bedrooms, and 1 space for every 5 bedrooms more than 100 bedrooms	85 spaces
Serviced Apartments	159 apartments (including 267 bedrooms)	1 space for every 4 bedrooms up to 100 bedrooms, and 1 space for every 5 bedrooms more than 100 bedrooms	58 spaces
Function Centre	1,092m ²	1 space per 30m ²	36 spaces
Total			179 spaces

4.2 Adequacy of Parking Supply

The development proposes a total of 170 car parking spaces within the car stacker and intended for use by the hotel (including function centre) and serviced apartments with little, or no allocation of parking for the retail tenancies and IMAX. This provision is less than Council's maximum car parking requirement of 179 spaces and is therefore appropriate for such a development in this location.

It should be noted that the car stacker is also able to accommodate accessible parking requirements given adequate clearances (width and height) both close to the transfer cabins and within the porte cochere. The valet arrangements will ensure users' needs are able to be met.

The proposed car stacker supplier has incorporated such accessibility requirements as part of other similar facilities, with detailed feedback generally supporting such an approach.

4.3 Car Parking Layout Review

Given that the car park is proposed to be a car stacker arrangement, the typical assessment against the requirements of the Australian Standard for Off Street Car Parking (AS/NZS2890.1:2004 and AS/NZS2890.6:2009) is not necessarily applicable. That said, the site access driveway and associated transfer cabins, together with on-site queuing capacity and analysis are referenced to ensure appropriate design. This assessment included a review of the following:

- transfer cabin dimensions and accessibility
- adjacent structures
- turnaround facilities
- access driveway dimensions and height clearances
- on-site queuing, including car stacker assessment
- set-down/ pick-up facilities
- parking for persons with disabilities
- motorcycle parking.

Details of this review are provided below. This review indicates that the proposed car stacker/ loading areas and site access driveway are expected to operate satisfactorily, albeit within an area that will be required to provide for a variety of users at various times of the day.

The site access driveway runs in an east-west direction and provides access to the on-site loading areas and car stacker directly via Harbour Street. The driveway is approximately 6.5m wide (with adjacent pedestrian path), with the two car stacker transfer cabins accessible by vehicles up to 99th percentile cars. Queuing for six vehicles within the property boundary is possible, with the valet service also being provided a total theoretical capacity of approximately 15 vehicles parked along the travel path to the car stacker. The queuing analysis is detailed in Section 8.4 of this report.

The car stacker has been designed with capacity for 170 vehicles with the two transfer cabins located at the western end of the loading area and site access driveway. The facility has been designed in accordance with industry standards with respect to transfer cabin dimensions, service rates and height clearances and in consultation with the proposed supplier (Hercules).

A total of five motorcycle spaces are also located along the northern side of the loading area.

The seven loading bays are proposed with the following breakdown:

- Three loading bays on the northern side for use by 8.8m medium rigid vehicles.
- One loading bay on the southern side for use by 6.4m small rigid vehicles.
- Three bays on the southern side for use by cars, vans, couriers etc.

All loading bays have been designed to ensure service vehicles can enter and exit the site in a forward direction and generally in accordance with the requirements of AS2890.1:2004 and AS2890.2:2002. Detailed swept paths and associated queuing assessment is included in Appendix A.

5. Sustainable Transport Infrastructure

5.1 Bicycle End of Trip Facilities

As discussed, the proposed development will occupy land within the Darling Harbour precinct and is therefore under the management and control of SHFA and bounds the western edge of City of Sydney. Given the site's proximity, City of Sydney's DCP 2012 has been referenced for the on-site bicycle parking requirements.

DCP 2012 requires hotel and serviced apartments to provide bicycle parking based on the number of staff. At this stage, it is understood that the absolute maximum number of staff required for the hotel and serviced apartments will be 280 staff. Further consideration of this and comparison against other hotel sites suggests that the maximum number of staff on-site at any one time is more likely to be 200, therefore both of these values have been assessed.

A review of the car parking requirement rates and the development schedule results in a DCP 2012 bicycle parking requirement for the proposed development as summarised in Table 5.1.

Table 5.1: DCP 2012 Bicycle Parking Requirements

Land Use Type	Size	Minimum Parking Rate	Minimum Parking Provision
Hotel and serviced apartments	669 rooms (402 hotel and 267 serviced apartment rooms)	1 per 20 rooms	34 spaces
	200 staff (likely maximum)	1 per 4 staff	50 spaces
	280 staff (absolute maximum)		70 spaces
Function Centre	1,092m ²	1 per 40m ² GFA	27 spaces
TOTAL			111-131 spaces

As shown in Table 5.1, it is suggested that the proposed development provide up to 70 bicycle parking spaces for staff and 61 spaces for guests.

At this stage, the exact number and layout of bicycle spaces within the end of trip facilities is unknown however it is recommended that a minimum of 50 staff spaces and 60 guest spaces (for a total provision of 110 spaces) be provided.

Access to the end of trip facilities is proposed via a dedicated access centrally located along the sites northern façade and directly within the Darling Harbour precinct. An alternate access is also provided via the site access driveway.

5.2 Walking and Cycling Network

5.2.1 Pedestrian Network

The proposed development is located within the expansive Darling Harbour precinct pedestrianised area. The development will integrate with the City of Sydney's existing local pedestrian network, with the hotel / serviced apartments lobby and forecourt designed to integrate with the existing north-south and east-west pedestrian desire lines. This provides a convenient link between the site and major transport hubs in the CBD, including Town Hall and Wynyard (and future CSELR stops), via the pedestrian overpass 40m north of the site which provides direct access to Sussex Street. This bridge is accessible via a lift and stairs from Darling Harbour.

West of the site, pedestrian access is provided via the Darling Harbour precinct to Harbourside and Pyrmont and beyond.

5.2.2 Cycle Network

The proposed development will link with the City of Sydney's existing local and regional bicycle network. Cycle access west of the site is provided through Darling Harbour which provides a key link to Pyrmont Bridge Road and Anzac Bridge, connecting with the inner western suburbs.

The pedestrian and cycle bridge 40m north of the site provides access to Sussex Street, Druitt Street and the CBD, providing access to the inner Sydney bicycle network (ramp to/ from CBD, lift/ stairs to/ from Darling Harbour). The Kent Street bi-directional, separated cycleway is located 300m east of the site which provides direct bicycle access to Sydney Harbour Bridge. Direct access to the eastern suburbs would be via Druitt Street, and the bicycle shoulder lanes on Park Street and William Street. Bicycle access south of the site will be via Darling Harbour/ Darling Park as well the bicycle shoulder lanes on Darling Drive.

The recently completed The Goods Line (previously The Ultimo Pedestrian Network) also provides improved and direct pedestrian and bicycle access between Darling Harbour and Railway Square further south.

5.3 Public Transport

The NSW Bureau of Transport Statistics² shows that 70% of commuter trips made to and from select Travel Zones in Sydney's CBD (TZ 90, 91) are made by public transport. This number is broken down as follows:

- 46% commuter trips made by train
- 24% commuter trips made bus
- 2% by ferry/ tram.

It is therefore expected that the proposed development will have a similar high demand for public transport.

The site is accessible by a number of modes of public transport. Pedestrian links to Town Hall Railway Station are approximately 750m walking distance, providing direct access to nine train lines and highly frequent train services. The CSELR, currently under construction will also further improve this access to public transport services, with the proposed QVB stop 500m east of the site.

Buses to the inner west are accessed via Druitt Street, a distance of approximately 250m. The inner west light rail is accessible from the Convention Centre, approximately 750m west of the site, providing a convenient mode of transport for the inner western suburbs as far as Leichhardt/ Lilyfield.

5.4 Green Travel Plan

Travel plans are designed to reduce the reliance on private car travel, or at least single occupant vehicles to destinations by boosting and encouraging the use of active and sustainable transport modes.

² <http://visual.bts.nsw.gov.au/tz/>

Large organisations use travel planning as an effective tool to meet a range of different travel-related goals. Examples include initiatives to reduce traffic congestion and/ or parking demand (both on and off-street), reduce absenteeism, improve staff retention, increase physical activity, improve air quality and to improve morale.

Each site has unique characteristics so the objectives, programs, initiatives and measures contained in the travel plan must be tailored and site specific. Successful travel plans are iterative processes supported by senior management and generally delivered by a full-time staff member (or team). It is recommended that a green travel plan be prepared for the proposed development to reduce single occupant vehicle usage and encourage the use of active and sustainable transport modes.

The Green Travel Plan would include:

- a 'reach' transport goal/ target to reduce single occupant vehicle travel demand
- infrastructure to support walking, cycling, motorcycling and public transport access to the site
- programs to reduce drive-alone travel behaviour by staff, visitors and customers
- staff travel coordinator responsibilities
- monitoring tools and an evaluation program to document performance.

6. Pedestrian Capacity Assessment

6.1 Existing Footpath Capacity

An assessment of the existing pedestrian footpaths and facilities surrounding the site from a pedestrian capacity perspective has been completed as part of this assessment to understand any such minor impacts associated with increased pedestrian activity associated with the proposal.

Pedestrian surveys have been completed along the Harbour Street pedestrian footpath during the weekday AM, midday and PM peak periods with the results summarised in Table 6.1

Table 6.1: Peak Hour Wheat Road Pedestrian Volumes

Direction of Travel	8:00am-9:00am	12:30pm-1:30pm	5:00pm-6:00pm
Northbound	43	48	56
Southbound	25	40	79
Two-way	68	88	135

The results indicate that the two-way pedestrian volumes peaked at 135 pedestrians during the PM peak hour. Further to this, on-site observations indicate that more pedestrians (up to two-thirds) have an origin-destination in Darling Harbour (west of the site) while the remainder arrive/ depart via Cockle Bay/ King Street Wharf and the pedestrian overpass north of the site. This is consistent during the AM and PM peaks, while the distribution is more evenly spread during the midday peak.

It is noted that the surveys were completed at a time when several small events were being held both within the existing building and in the vicinity and as such, the pedestrian volumes are considered typical and representative of the existing pedestrian movements in the vicinity of the site. Further to this, pedestrians use the area to meet and/ or wait for buses (Sydney Explorer) with no observed conflict between pedestrians at any time.

6.1.1 Background

To understand whether there is adequate capacity on existing footpaths to accommodate peak pedestrian demands while ensuring the safety and convenience for pedestrians, Fruin Theory³, as reproduced in the 'Transit Capacity and Quality of Service Manual – 2nd Edition – Part 7'⁴ has been used, which involves evaluating the pedestrian capacity and level of service (LOS) of an area.

To assess pedestrian LOS, the criteria of 'Pedestrian Flow Rate' has been adopted. Pedestrian flow rate, measured in pedestrians per metre per minute, is the number of pedestrians that pass a point during a specific period of time.

The width used in this assessment is the 'Effective Walkway Width'. The Transit Capacity and QSM, illustrates that the width of a walkway includes an unused buffer depending on walls and other obstruction and in general, 500mm is deducted from the overall width next to a wall or walkway edge and 300mm next to other obstructions, including walls up to about 1 metre high.

Table 6.2 presents the LOS criteria based on 'Pedestrian Flow Rate' and Figure 6.1 presents a graphical representation of the walkway LOS.

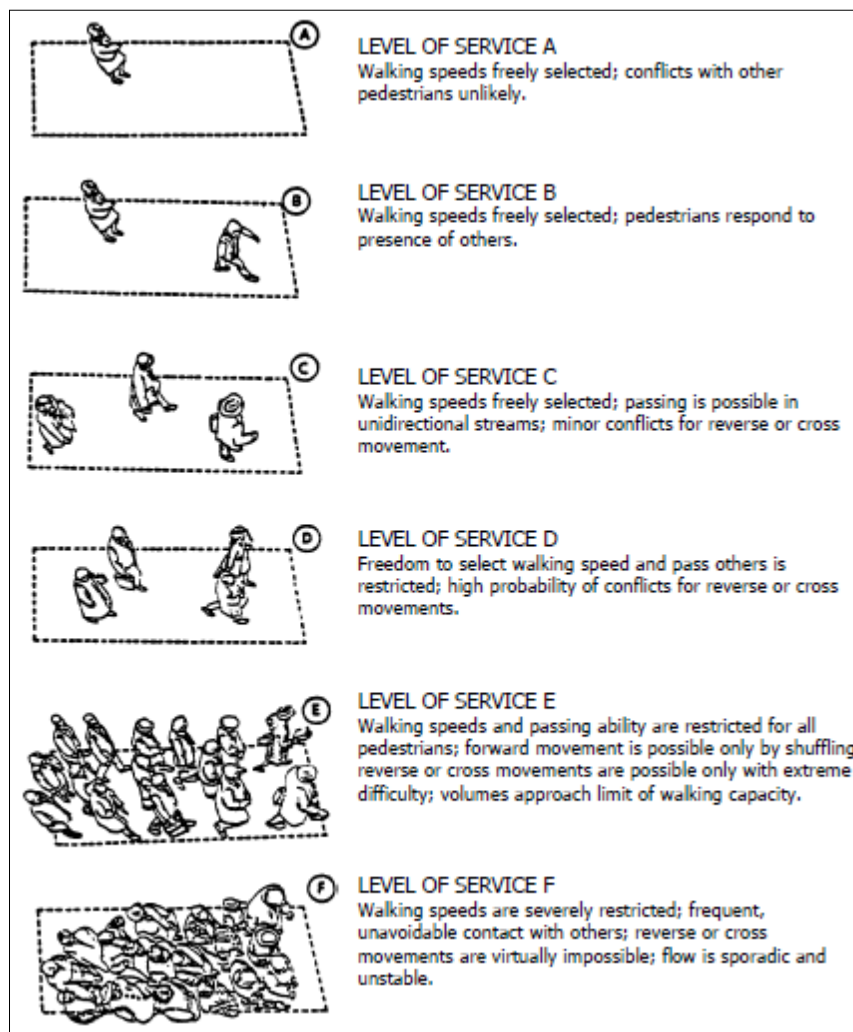
³ Fruin, John J. 1987 *Pedestrian Planning and Design – Revised Edition*

⁴ Transportation Research Board 2003 *Transit Capacity and Quality of Service Manual – 2nd Edition – Part 7*

Table 6.2: Pedestrian Level of Service on Walkways

LOS	Flow per Unit Width (ρ / m/ min)
A	0-23
B	23-33
C	33-49
D	49-66
E	66-82
F	Variable

Figure 6.1: Illustration of Fruin Theory Walkway Levels of Service⁵



Source: Transportation Research Board 2003 Transit Capacity and Quality of Service Manual – 2nd Edition – Part 7

6.1.2 Assessment

Table 6.3 presents the results of the pedestrian LOS assessment for the study location under the existing layout. The assessment was completed for the peak 15 minute intervals during the study

⁵ Fruin, John J. 1987 *Pedestrian Planning and Design – Revised Edition*

hour. The walkway widths used are based on observations of whether pedestrians used the full footpath width or left a buffer to obstructions, such as avoiding a wall or other obstruction.

Table 6.3: Existing Pedestrian LOS Assessment – 1-hour Survey

Peak Pedestrian Volume (p)		Walkway Width (m)	Flow Rate [1] (p/ m/ min)	LOS
(p/ 15min)	(p/ min)			
55	3.7	4	1	A

[1] rounded up to the nearest whole number.

Table 6.3 indicates that based on existing pedestrian volumes the pedestrian LOS for the study location is 'A' and currently operates well over a 15, or 1 minute peak. Overall, existing footpaths operate well with no queuing or delay at any time or location.

6.2 Future Footpath Capacity

A review of the future pedestrian activity associated with the proposed development assumes the following maximum patrons at the complex;

- Hotel/ serviced apartments – 1,000 guests and 280 staff
- Function centre – 350 patrons
- IMAX – 300 patrons and 20 staff
- Retail – 300 patrons and 50 staff

Based on the above, the maximum peak demand of people making use of the proposed development uses at any one time is 2,300 people.

Given the nature of the proposed development, it is likely that the main pedestrian activity will involve people leaving the building during the morning with a peak demand in the evening given that people generally return to the hotel/ serviced apartments or attend a function or IMAX. It is likely that this peak demand will occur relatively evenly between 5:00pm and 7:00pm.

As the pedestrian movements will be relatively spread out with no land use causing a peak influx or outflow of pedestrians in a short period of time, and the existing pedestrian facilities in the vicinity of the site operating at a LOS A, the proposed development is not considered to have a detrimental effect on the surrounding pedestrian network.

6.3 Pedestrian Amenity

The development plans show that one of the real improvements is gained through the provision of an activated site frontage along the northern and eastern boundaries and how this space interacts with the Darling Harbour and Cockle Bay public domain.

The proposal includes a building frontage in approximately the same location as the existing, however with the removal of the existing grade change and stairs leading to the main pedestrianised zone. Greater capacity has thus been gained through the design to maintain pedestrian thoroughfare and meets the demand associated with high pedestrian activity during major events.

Overall, the pedestrian areas in the vicinity of the site will function well, with improved amenity, activation and interaction throughout the area.

7. Loading Facilities

7.1 Loading Requirements

City of Sydney provided the most relevant comparison for requirements for loading associated with the proposed development. DCP 2012 sets out rates for loading facilities for different development types. A review of these rates and the floor area schedule results in a requirement as summarised in Table 7.1.

Table 7.1: DCP 2012 Loading Requirements

Use	No. / Size (GFA)	Loading Rate	Loading Requirement
Hotel	402 rooms	1 space per 50 hotel rooms, then 1 space per 100 hotel rooms	5 spaces
Hotel reception, lounge, bar and restaurant	3,125m ²	1 space per 400m ² of hotel reception, lounge, bar and restaurant GFA for the first 2,000m ² , then 1 space per 8,000m ² thereafter	5 spaces
Serviced Apartments	159 dwellings	1 space for the first 50 dwellings, plus 0.5 spaces for every 50 dwellings or part thereafter	3 spaces
Shops, shopping centres	1,800m ²	1 space per 350m ²	5 spaces
Total			18 spaces

Based on the above, the proposed development is required to provide up to 18 loading spaces under DCP 2012.

7.2 Proposed Loading Arrangements

It is proposed to provide a total of 7 dedicated loading bays within the ground level loading area comprising the following:

- Three loading bays on the northern side for use by 8.8m medium rigid vehicles.
- One loading bay on the southern side for use by 6.4m small rigid vehicles.
- Three bays on the southern side for use by cars, vans, couriers etc.

This provision is consistent with the previous approval.

Loading for the development would largely be utilised during off-peak times with most loading likely to occur before 3:00pm and prior to the peak car stacker demand during the weekday PM peak.

With a detailed dock management system designed to make efficient use of the available space, the proposed loading arrangements are expected to be capable of supporting the servicing requirements of the site. Further dock management details will be developed as part of detailed design and once an anchor tenant (and other tenants) are confirmed (subject to approvals).

7.3 Wheat Road Layout

The existing bus facilities, including the Sydney Explorer bus stop located within Wheat Road adjacent to the eastern boundary of the site is expected to be maintained, albeit with a redesigned layout, as part of the proposed development.

The bus zone and set-down/ pick-up arrangements will be formalised to accommodate any future additional demand and includes removal of the loading zone, kerb re-alignment, bus zone relocation combined with a courier/ passenger set-down/ pick-up area. It is noted that the building design allows for minimum 4.6m height clearances offset 0.5m from the bollards to ensure appropriate access by the largest vehicle (including double decker bus).

These changes are expected to improve the operation of the area and will allow heavy vehicles to pass a stationary 14.5m long bus, a scenario which is not currently possible. The layout is illustrated in Figure 7.1.

Figure 7.1: Proposed Forecourt and Bus Facilities



Source: Hassell GA Plans – Ground Floor, ARC-HSL-DD-1100 Rev. G, dated 16.12.15

8. Traffic Impact Assessment

8.1 Traffic Generation

8.1.1 Design Rates

LEP 2012 and DCP 2012 seek to restrict car parking provisions with the objective of reducing the traffic generation potential of a development site.

Hotel and Serviced Apartments

RMS Guidelines⁶ specify traffic generation rates for various land uses and associated parking provisions. The RMS Guide does not provide a traffic generation rate for hotels and instead recommends that analysis of proposed hotel developments be based on surveys of similar existing hotels.

GTA has previously undertaken surveys of similar CBD hotels which found an average trip generation rate of 0.17 movements and 0.15 movements per room in the AM and PM peak hours respectively, with taxis representing on average 65% of vehicle trips.

The RMS Guidelines update⁷ provides traffic generation rates per car space for high density residential flat dwellings of 0.15 trips per car space and 0.12 trips per car space in the AM and PM peak respectively. In this instance, the rates are considered appropriate for the serviced apartment component of the development.

Table 8.1: Proposed Development Traffic Generation

Land Use	Peak Hour	Indicative No.	Peak Hour Traffic Generation Rate	Peak Hour Movements
Hotel	AM	402 Hotel Rooms	0.17 movements per room	68
	PM		0.15 movements per room	60
Serviced Apartments	AM	58 car spaces[1]	0.15 movements per car space	9
	PM		0.12 movements per car space	7
TOTAL			AM	75
			PM	67

[1] Based on the maximum provision as discussed in Section 4.1.

Function Centre

As there is no guidance on the trip generation rate of a function centre, a rate has been calculated based on first principles assuming the following:

- Maximum capacity of the function space is 350 people based on a rate of one person per 3m².
- It is unlikely that an event with maximum capacity will occur during a peak PM period, these will more likely occur in the weekends (i.e. weddings) or later (after 6:30pm) in the evening (i.e. dinner functions). Therefore the visitor rate is assumed to be 50% of capacity (175 patrons) during the PM peak hour.

⁶ Guide to Traffic Generating Developments (RMS, 2002)

⁷ Guide to Traffic Generating Development Technical Direction – Updated Surveys (RMS, 2013)

- It is assumed that 70% of visitors will arrive via public transport or walking/cycling as per the Journey to Work data profile, with 30% assumed to arrive by private vehicle equating to 53 people in the PM peak hour.
- Assuming the same arrival profile as a hotel, 65% of patrons (34 people) arriving by car will do so by taxi, and 35% (19 people) by private vehicle (to use the car stacker).

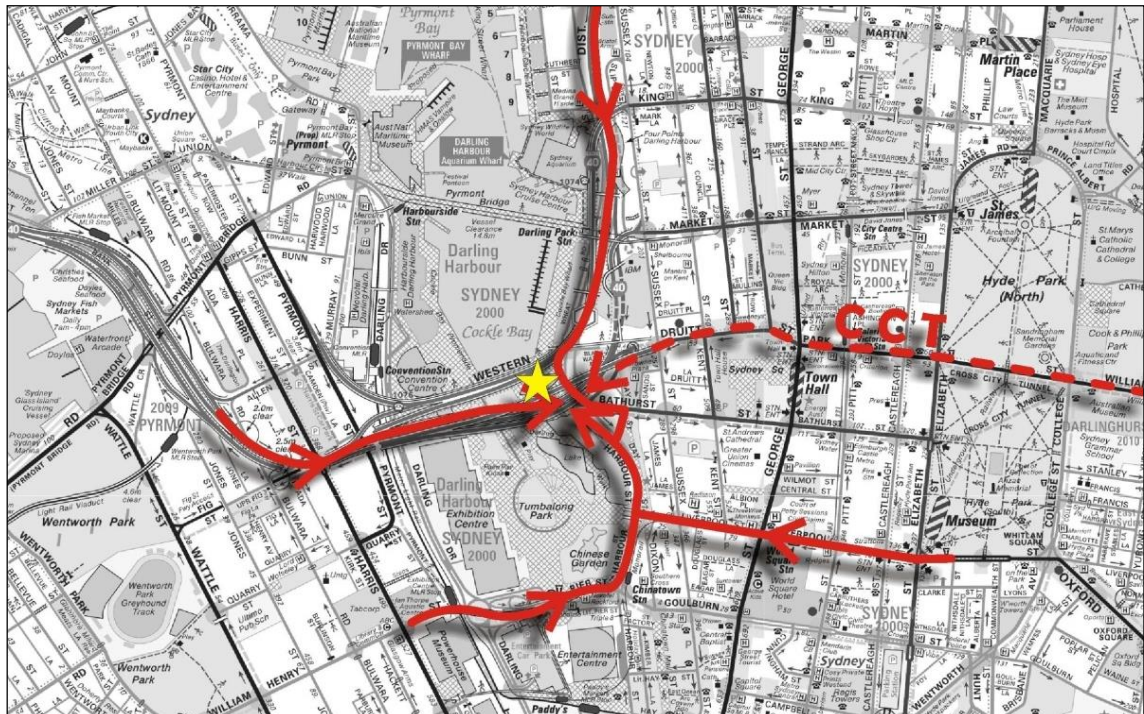
It is reasonable to assume the arrival/ departure profile of the hotel and serviced apartments will see the majority arriving during the PM peak period and departing during the AM peak period. As discussed above, the function centre has been assessed during the PM peak hour. Therefore, and for the purposes of assessing the arrival profile and resultant worst-case queuing impacts, it has been assumed that up to 90% of vehicles will arrive to the site during the PM peak hour.

8.2 Distribution and Assignment

Although the directional distribution and assignment of traffic generated by the proposed development will be influenced by a number of factors, most notably the configuration of access points to the site and the configuration of the arterial road network in the immediate vicinity of the site, all vehicles will approach via Harbour Street (south) and exit the site via Wheat Road to the north.

Having consideration for the above and for the purposes of estimating vehicle movements, an even split between all approach and departure routes has been assumed. The review of the typical approach and departure routes is illustrated in Figure 8.1 and Figure 8.2.

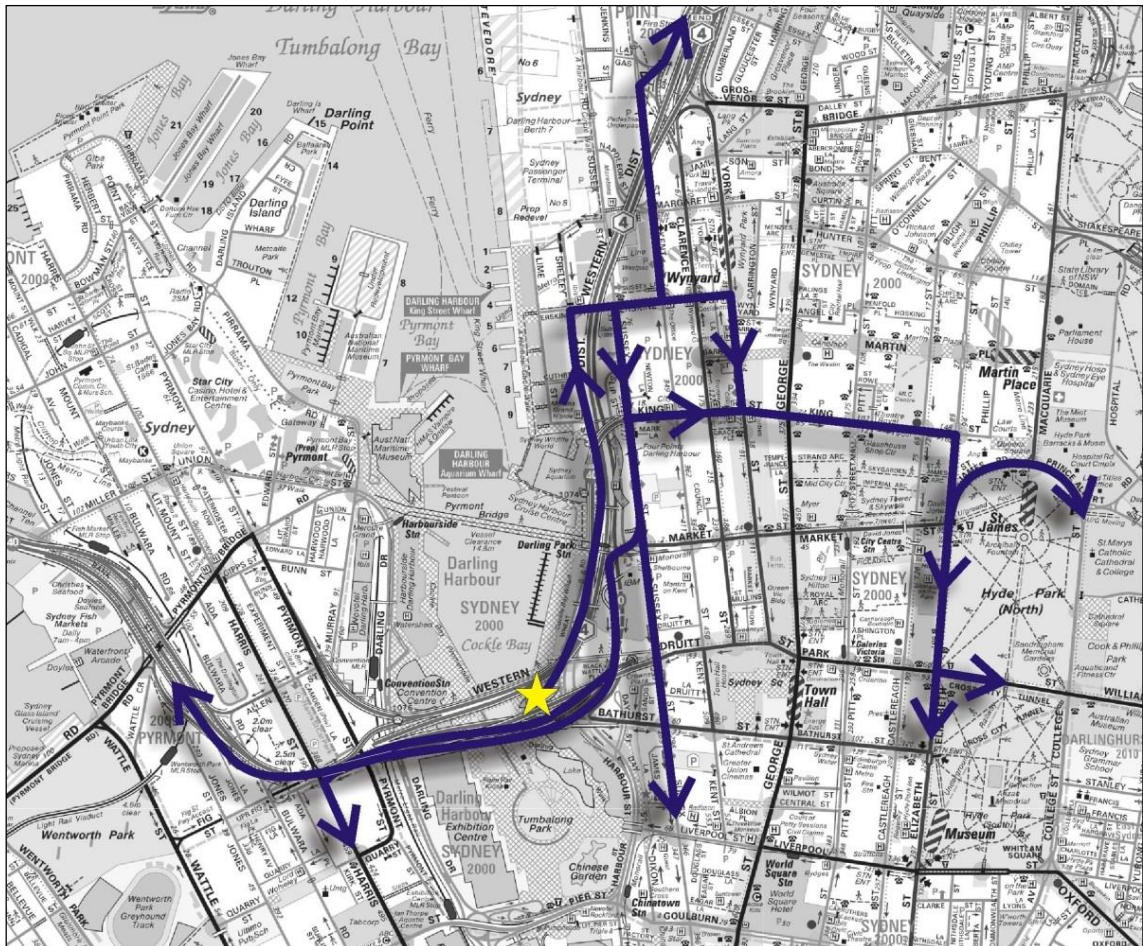
Figure 8.1: Vehicle Arrival Routes



The site is generally well located to provide efficient access by all vehicles on approach with the arterial road network surrounding the site generally providing access for all vehicles. This is particularly the case for the northern approach (SHB, Western Distributor and Harbour Street), western approach (Western Distributor) and eastern approach (CCT).

The departure routes are more complex however vehicles are able to generally keep to the arterial road network. Wheat Road will carry all vehicles exiting the site with the only exit route available via the north to Shelley Street and Erskine Street. Sussex Street, King Street, Elizabeth Street and the Western Distributor are all key roads in the vicinity and will combine to dissipate traffic on exit from the site.

Figure 8.2: Vehicle Departure Routes



During the AM peak hour, Wheat Road (north of the site) is expected to carry an additional 70 vehicles and Harbour Street (south of Wheat Road) is expected to carry an additional 113 additional vehicles (60 associated with the hotel and serviced apartments, and 53 with the function centre) during the PM peak hour.

On departing the site, vehicles will be required to use Wheat Road to Shelley Street and into Erskine Street. These vehicles will dissipate the further they travel away from the site given the several available routes.

8.3 Traffic Impact

Given that all traffic generated by the development will enter the site from Harbour Street (northbound) and exit the site via Wheat Road (northbound), the impact on the operation of the intersections of Harbour Street/ Bathurst Street and Shelley Street/ Erskine Street is expected to be

minimal, with site generated traffic typically being evenly distributed amongst the surrounding road network.

Against existing traffic volumes in the vicinity of the site, the additional traffic generated by the proposed development could not be expected to compromise the safety or function of the surrounding road network.

8.4 Queuing Analysis

As discussed, the on-site car spaces are to be provided within a car stacker with capacity for 170 vehicles. The car stacker includes provision of two transfer cabins to move vehicles to/ from the car stacker spaces and to ensure that the transfer cabins are able to service the anticipated traffic generated by the site, an assessment has been completed to determine the likely queues and delays that may be experienced by users of the site during peak flow conditions.

As previously mentioned, the peak arrival time at the site will be during the weekday PM peak. Demand for the car stacker is calculated based on the 90% arrival rate of the 35% of hotel guests that arrive by private vehicle (21 vehicles), the 9 vehicles associated with the serviced apartments, and the 19 vehicles associated with the function centre. The resultant demand is 46 vehicle movements in the PM Peak.

The equation for calculating queue lengths is detailed in Figure 8.3 with a summary of the analysis presented below.

Figure 8.3: Equation for Calculating Queue Lengths

Equation 17-37 is used to calculate the 95th-percentile queue.

$$Q_{95} \approx 900T \left[\frac{v_x}{c_{m,x}} - 1 + \sqrt{\left(\frac{v_x}{c_{m,x}} - 1 \right)^2 + \frac{\left(\frac{3600}{c_{m,x}} \right) \left(\frac{v_x}{c_{m,x}} \right)}{150T}} \right] \left(\frac{c_{m,x}}{3600} \right)$$

where

- Q_{95} = 95th-percentile queue (veh),
- v_x = flow rate for movement x (veh/h),
- $c_{m,x}$ = capacity of movement x (veh/h), and
- T = analysis time period (h) ($T = 0.25$ for a 15-min period).

Source: Highway Capacity Manual 2000

The car stacker service rate has been determined using information provided in consultation with equipment supplier Hercules. Using equation 17-37 in Figure 8.3 and adopting an effective service rate for the transfer cabins of 83.5 veh/ hr ($C_{m,x}$) and a vehicle arrival rate (V_x) of 46 veh/ hr results in a 95th percentile queue of up to 4 vehicles (or 25m).

There is an on-site area prior to the car stacker where queuing for six vehicles within the property boundary is possible. The remaining valet lane area and porte cochere provide for a total theoretical maximum of 15 vehicles parked along the travel path to the car stacker without impacts on other porte cochere activity, buses and Harbour Street.

8.4.1 Porte Cochere Operations

The peak demand expected at the porte cochere is also anticipated during the PM peak with a maximum demand of 113 vehicles. This assumes that all vehicles associated with the hotel and function space use the porte cochere (including private vehicles that use the valet service) and

that serviced apartment vehicles do not generally use the porte cochere and go directly to the car stacker.

The porte cochere has been designed to formally accommodate four vehicles, with the ability for vehicles to also make use of the adjacent lane during peak times whilst still maintaining a functional area.

The operations of the porte cochere are considered to be critical to the overall functionality of the site and will require implementation of a detailed management plan comprising on-site traffic management as a minimum during peak times. In the event that queuing does occur, valet would manage the area accordingly and also potentially make use of the valet lane to allow vehicles to both wait and recirculate as required.

8.4.2 Emergency Site Access Management Plan

In the event that the car stacker breaks down and becomes inaccessible, an emergency traffic management plan is to be put into effect. Details of the plan and its execution are to be developed during the detailed design stage.

8.5 Construction Traffic Impact

A construction traffic management plan will be prepared prior to works commencing on-site.

Construction vehicle access to/ from the site will be via Harbour Street and Wheat Road at the eastern end and limited to specific work hours in order to limit the impact on other surrounding land uses. No construction vehicles will be permitted to park along any roads on approach to the site.

9. Conclusion

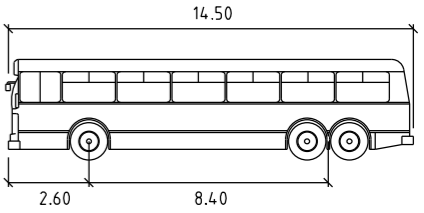
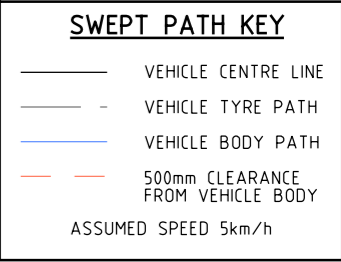
Based on the analysis and discussions presented within this report, the following conclusions are made:

- i The proposed development is located at the southern end of the Darling Harbour on the western fringe of the CBD and is well served by a combination of existing public transport services (CBD train and bus services) and an extensive pedestrian network.
- ii The development generates a City of Sydney LEP 2012 parking requirement of a maximum 179 spaces.
- iii The proposed supply of 170 spaces is appropriate given the proximity of the site to various public transport services and active travel facilities.
- iv The proposed ground level site access driveway, loading facilities and parking layout is consistent with the dimensional requirements as set out in the Australian Standard for Off Street Car Parking (AS/NZS2890.1:2004).
- v The provision for bicycle facilities and end of trip facilities is not currently designed however is expected to meet the requirements of NSW Planning Guidelines. It is recommended that the proposed development also include options for visitor bicycle parking to be located adjacent to building within the surrounding Darling Harbour pedestrian precinct.
- vi The implementation of a Green Travel Plan (and associated Transport Access Guide) will further reduce reliance on the private vehicles for staff and visitors.
- vii Pedestrian modelling (using Fruin LOS) indicates that the pedestrian facilities in the vicinity of the site currently operate at a LOS A. The maximum peak number of people on site at any one time is assumed to be 2,300 with ingress and egress likely to be fairly even across the day with a peak pedestrian demand likely between 5pm and 7pm. As there is no land use that is likely to create an influx or outflow of pedestrians in a small time period, the proposed development is not considered to have a detrimental effect on the surrounding pedestrian network.
- viii The northern frontage of the site improves the pedestrian amenity while providing an at-grade activated space.
- ix The provision of loading facilities accommodating up to 7 vehicles within 3 dedicated loading bays (up to 8.8m medium rigid vehicles) and courier spaces with access provided via Harbour Street/ Wheat Road is appropriate given the anticipated loading requirements of the site together with complimentary uses/ dock management and waste management plan.
- x The site is expected to generate 70 vehicle movements in the AM peak and less than 115 vehicle movements in the PM peak with an additional 115 vehicles associated with passenger set-down/ pick-up in Wheat Road.
- xi There is adequate capacity in the surrounding road network to cater for the traffic generated by the proposed development. The majority of traffic will remain on the arterial road network on approach and departure, with the exception of Wheat Road.
- xii The design allows for 6-7 vehicles to queue within the property boundary without impacting on northbound traffic on Harbour Street. This is appropriate based on queuing analysis of the PM peak hour demand.
- xiii Provision is made for all access arrangements to operate safely and efficiently with the design of the Wheat Road area to ensure no direct access to Harbour Street for exiting vehicles.

- xiv The operational efficiency of the Harbour Street/ Wheat Road intersections in the vicinity of the site are to be maintained at all times. Minor mitigating road improvement works as part of the development are recommended to minimise any impacts and retain, within practical limitations, the level of safety and operational efficiency that would have existed without the development.
- xv A construction traffic management plan will be prepared for the development prior to commencement of work.

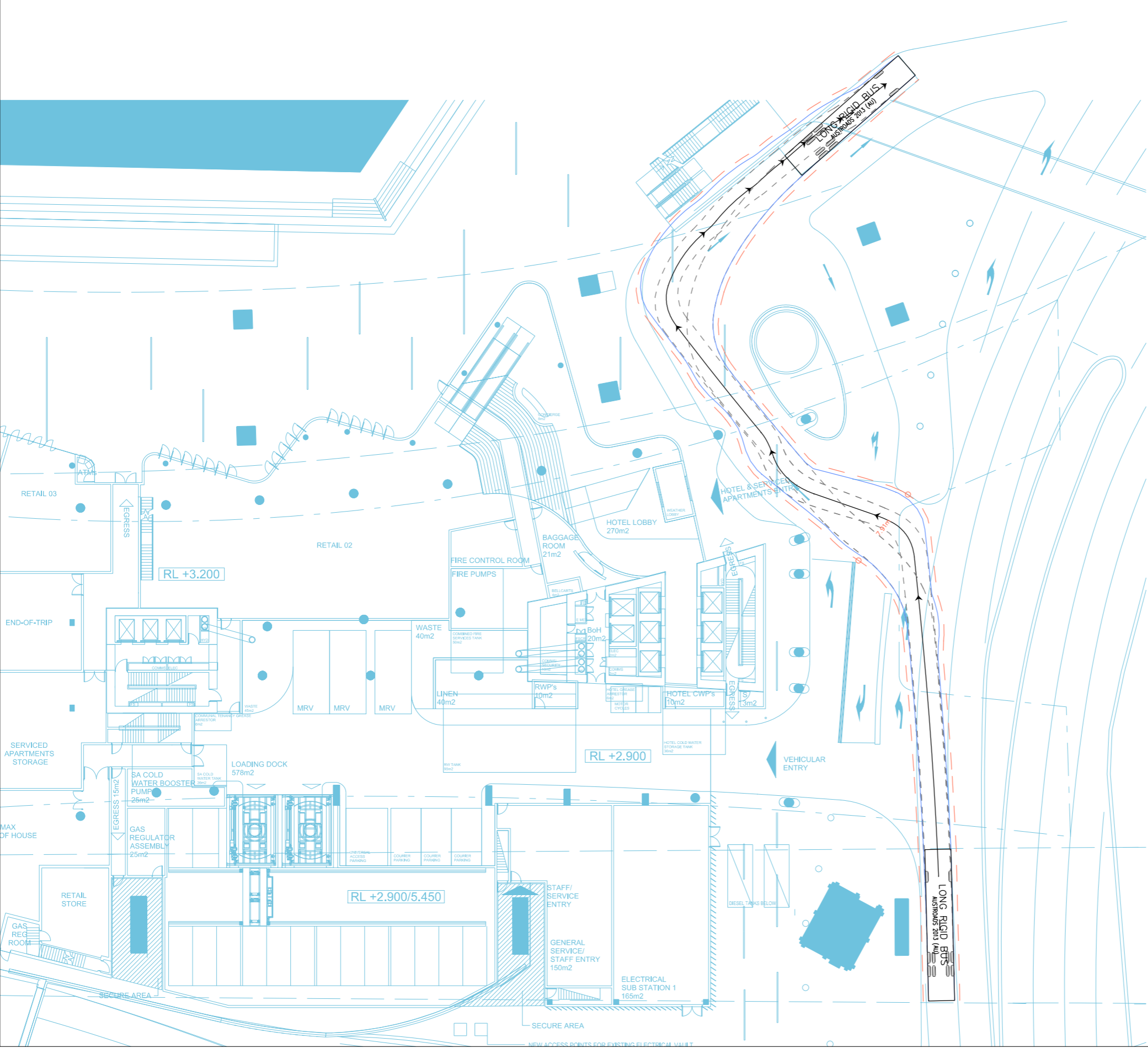
Appendix A

Swept Paths and Queuing Assessment



LONG RIGID BUS metres

Width	: 2.50
Track	: 2.50
Lock to Lock Time	: 6.0
Steering Angle	: 46.3



PLOTTED BY: brendan.kilpatrick ON: 17/12/2015 AT: 1:28:37 PM 129018500-02-01-P2.dgn

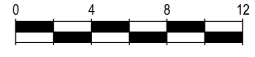
Melbourne 03 9851 9600
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 Canberra 02 6243 9400
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 Gold Coast 07 5510 4814
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 Perth 08 6316 4634



PRELIMINARY PLAN
 FOR DISCUSSION PURPOSES ONLY
 SUBJECT TO CHANGE WITHOUT
 NOTIFICATION

THE RIBBON, DARLING HARBOUR
 PORTE COCHERE CONCEPT PLAN
 SWEPT PATH ASSESSMENT

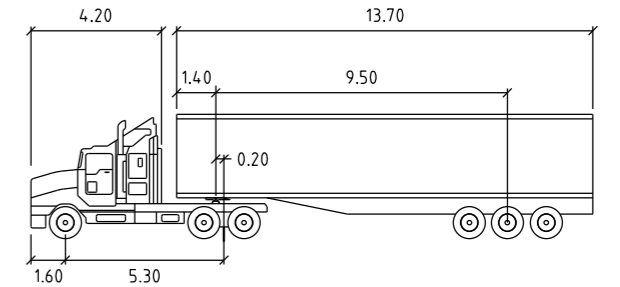
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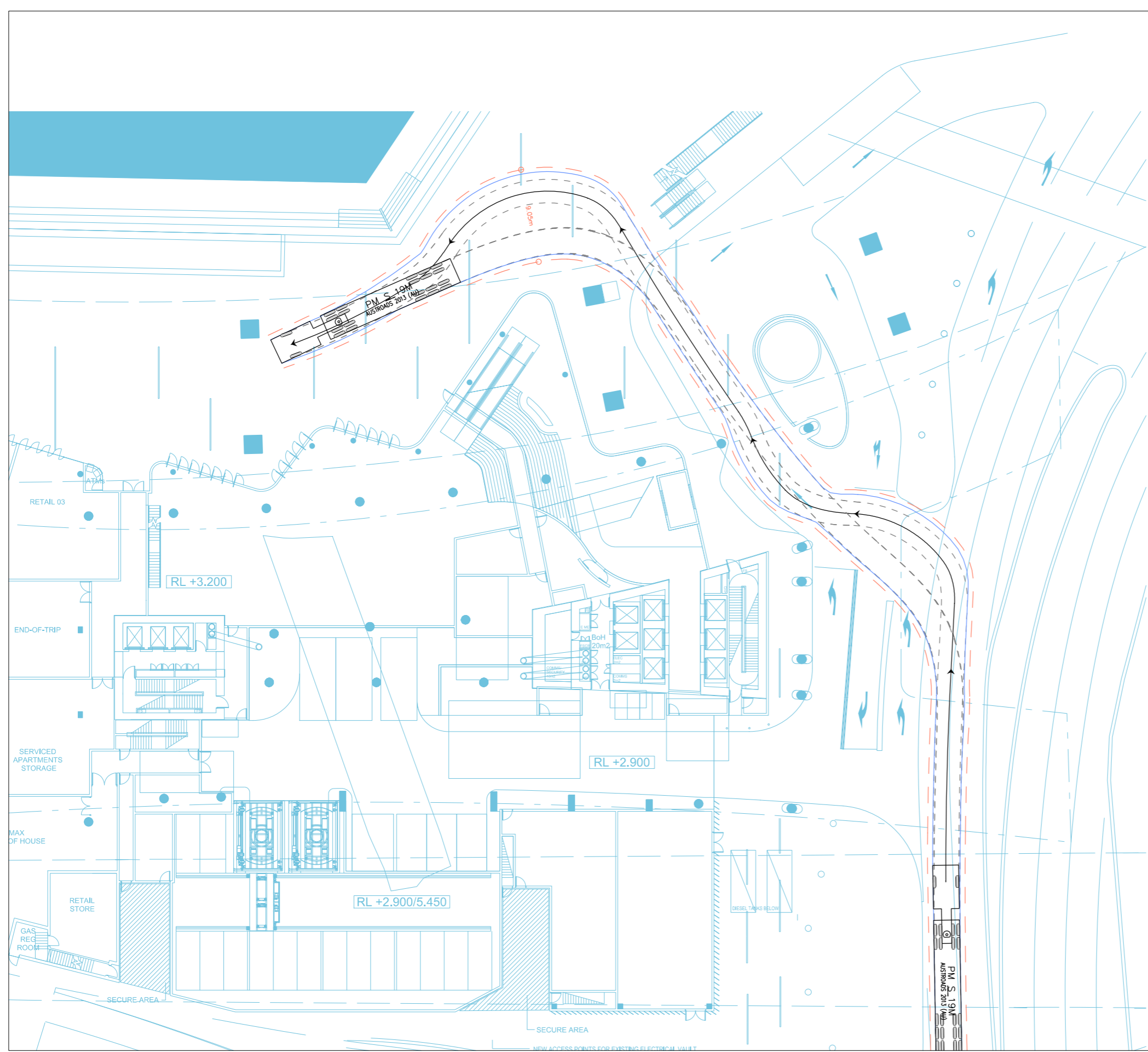
SWEPT PATH KEY

- VEHICLE CENTRE LINE
- - VEHICLE TYRE PATH
- VEHICLE BODY PATH
- - 500mm CLEARANCE FROM VEHICLE BODY

ASSUMED SPEED 5km/h



PM S 19M	metres		
Tractor Width	: 2.50	Lock to Lock Time	: 6.0
Trailer Width	: 2.50	Steering Angle	: 27.8
Tractor Track	: 2.50	Articulating Angle	: 70.0
Trailer Track	: 2.50		



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PRELIMINARY PLAN
 FOR DISCUSSION PURPOSES ONLY
 SUBJECT TO CHANGE WITHOUT
 NOTIFICATION

**THE RIBBON, DARLING HARBOUR
 PORTE COCHERE CONCEPT PLAN
 SWEPT PATH ASSESSMENT**

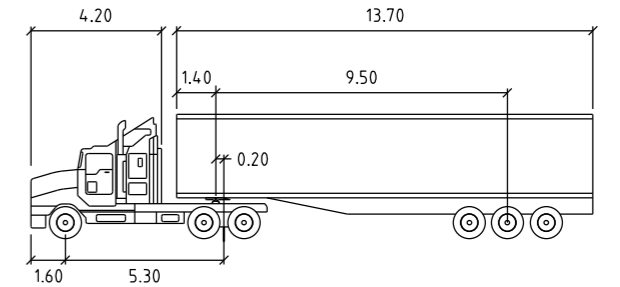
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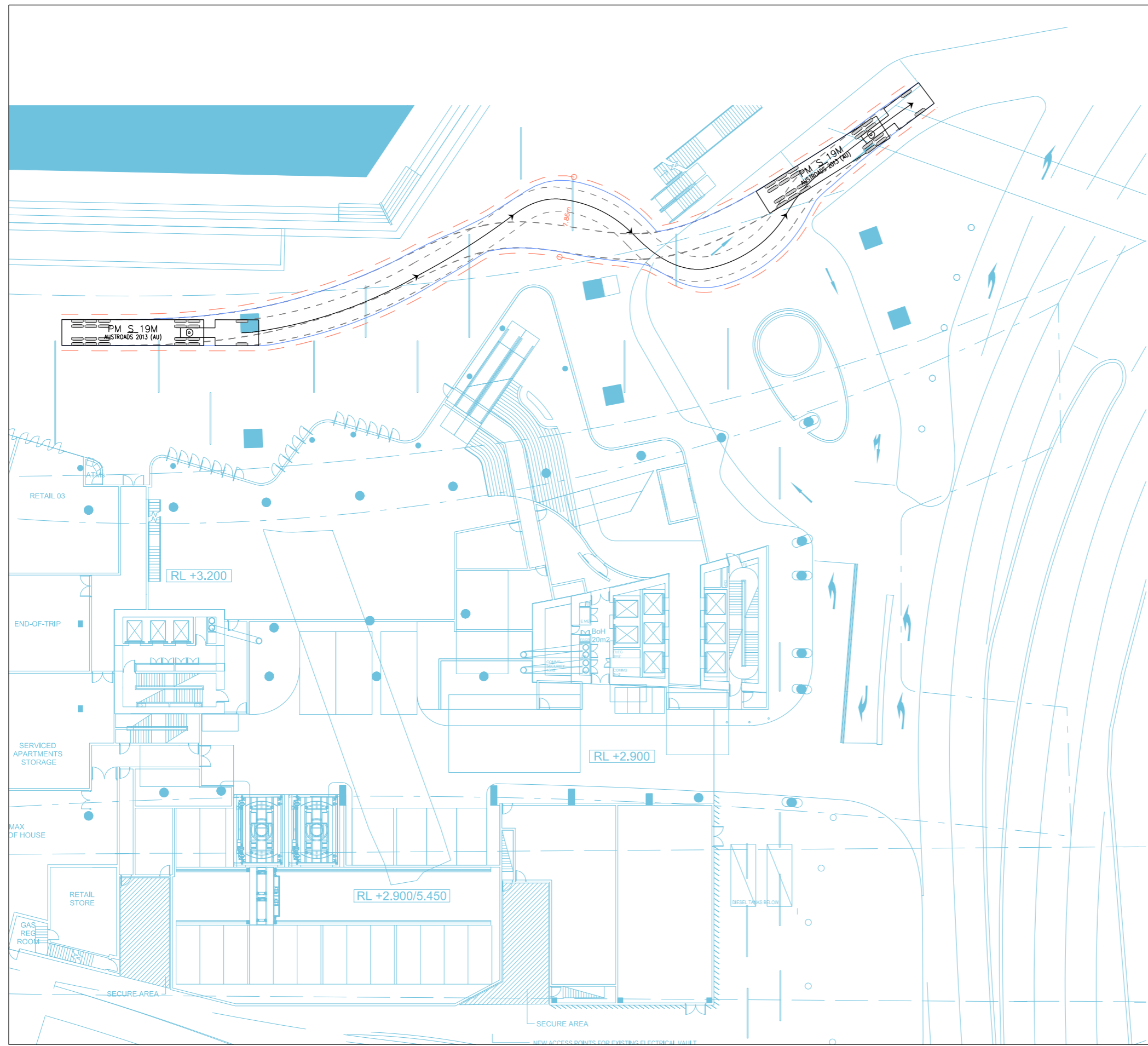
SWEPT PATH KEY

- VEHICLE CENTRE LINE
- - VEHICLE TYRE PATH
- VEHICLE BODY PATH
- - 500mm CLEARANCE FROM VEHICLE BODY

ASSUMED SPEED 5km/h



PM S 19M	metres		
Tractor Width	: 2.50	Lock to Lock Time	: 6.0
Trailer Width	: 2.50	Steering Angle	: 27.8
Tractor Track	: 2.50	Articulating Angle	: 70.0
Trailer Track	: 2.50		



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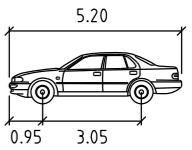
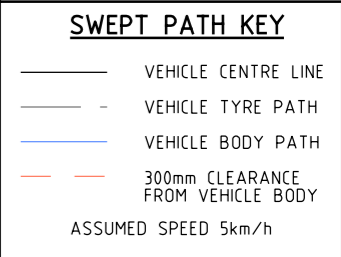


PRELIMINARY PLAN
 FOR DISCUSSION PURPOSES ONLY
 SUBJECT TO CHANGE WITHOUT
 NOTIFICATION

**THE RIBBON, DARLING HARBOUR
 PORTE COCHERE CONCEPT PLAN
 SWEPT PATH ASSESSMENT**

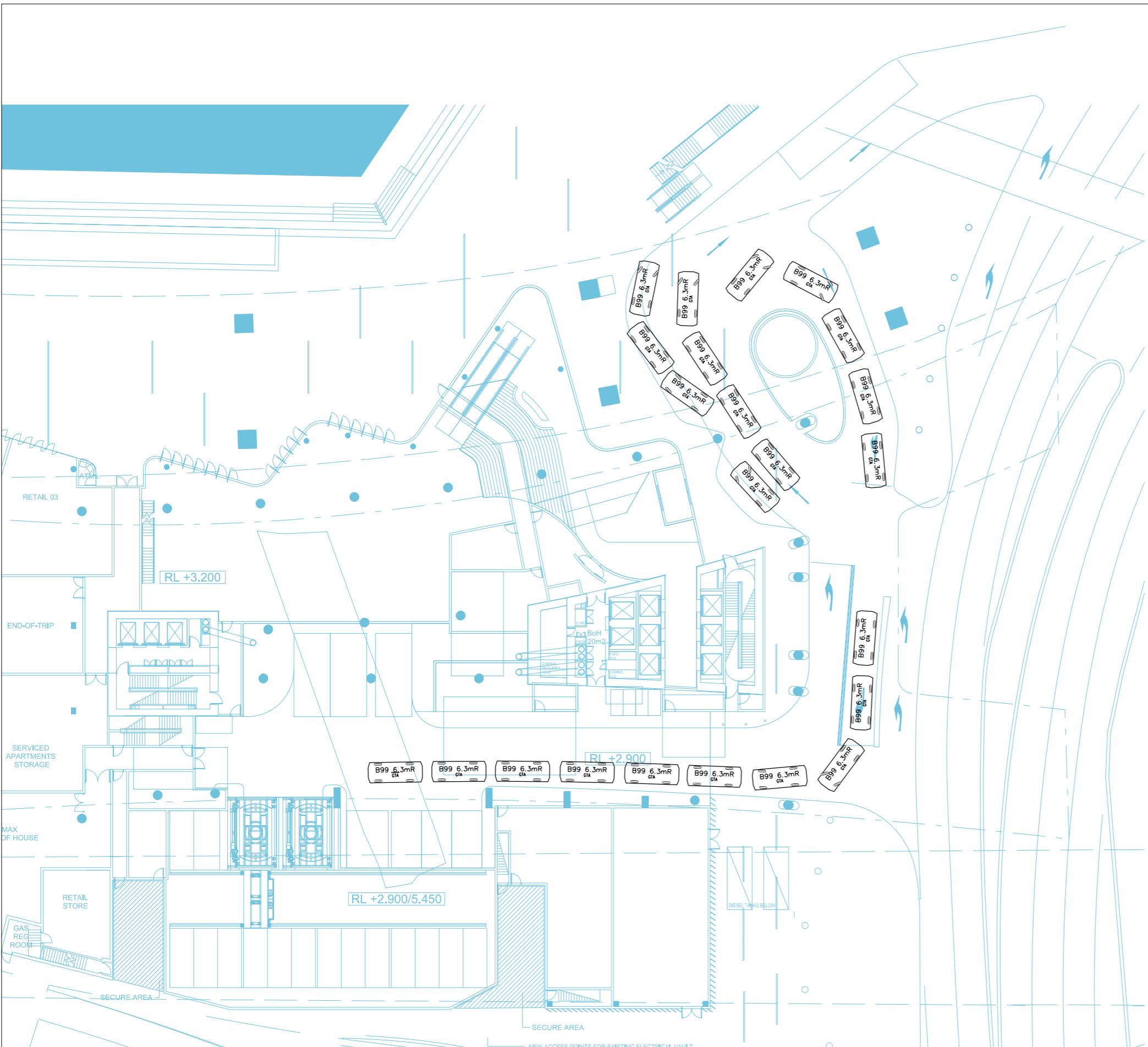
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APPROVED: BDM DRAWING NO. 129018500-02-03-P2 SHEET: 03 OF 13



B99 6.3mR metres

Width	: 1.94
Track	: 1.77
Lock to Lock Time	: 6.0
Steering Angle	: 34.0



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PRELIMINARY PLAN
 FOR DISCUSSION PURPOSES ONLY
 SUBJECT TO CHANGE WITHOUT
 NOTIFICATION

THE RIBBON, DARLING HARBOUR
 PORTE COCHERE CONCEPT PLAN
 VALET QUEUEING CAPACITY

DATE: 17.12.2015
 SCALE: 1:400@A3

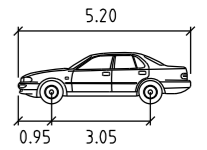


APPROVED: BDM
 DRAWING NO. 129018500-02-04-P2
 SHEET: 04 OF 13

SWEPT PATH KEY

- VEHICLE CENTRE LINE
- - VEHICLE TYRE PATH
- VEHICLE BODY PATH
- - 300mm CLEARANCE FROM VEHICLE BODY

ASSUMED SPEED 5km/h



B99 6.3mR metres

Width	: 1.94
Track	: 1.77
Lock to Lock Time	: 6.0
Steering Angle	: 34.0



PLOTTED BY: brendan.kilpatrick ON: 17/12/2015 AT: 1:27:44 PM 129018500-02-05-P2.dgn

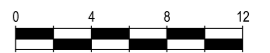
Melbourne 03 9851 9600
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 Canberra 02 6243 9400
 Adelaide 08 8334 3600
 Gold Coast 07 5510 4814
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 Perth 08 6316 4634



PRELIMINARY PLAN
 FOR DISCUSSION PURPOSES ONLY
 SUBJECT TO CHANGE WITHOUT
 NOTIFICATION

**THE RIBBON, DARLING HARBOUR
 PORTE COCHERE CONCEPT PLAN
 SWEPT PATH ASSESSMENT**

DATE: 17.12.2015 SCALE: 1:400@A3

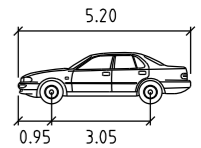


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SWEPT PATH KEY

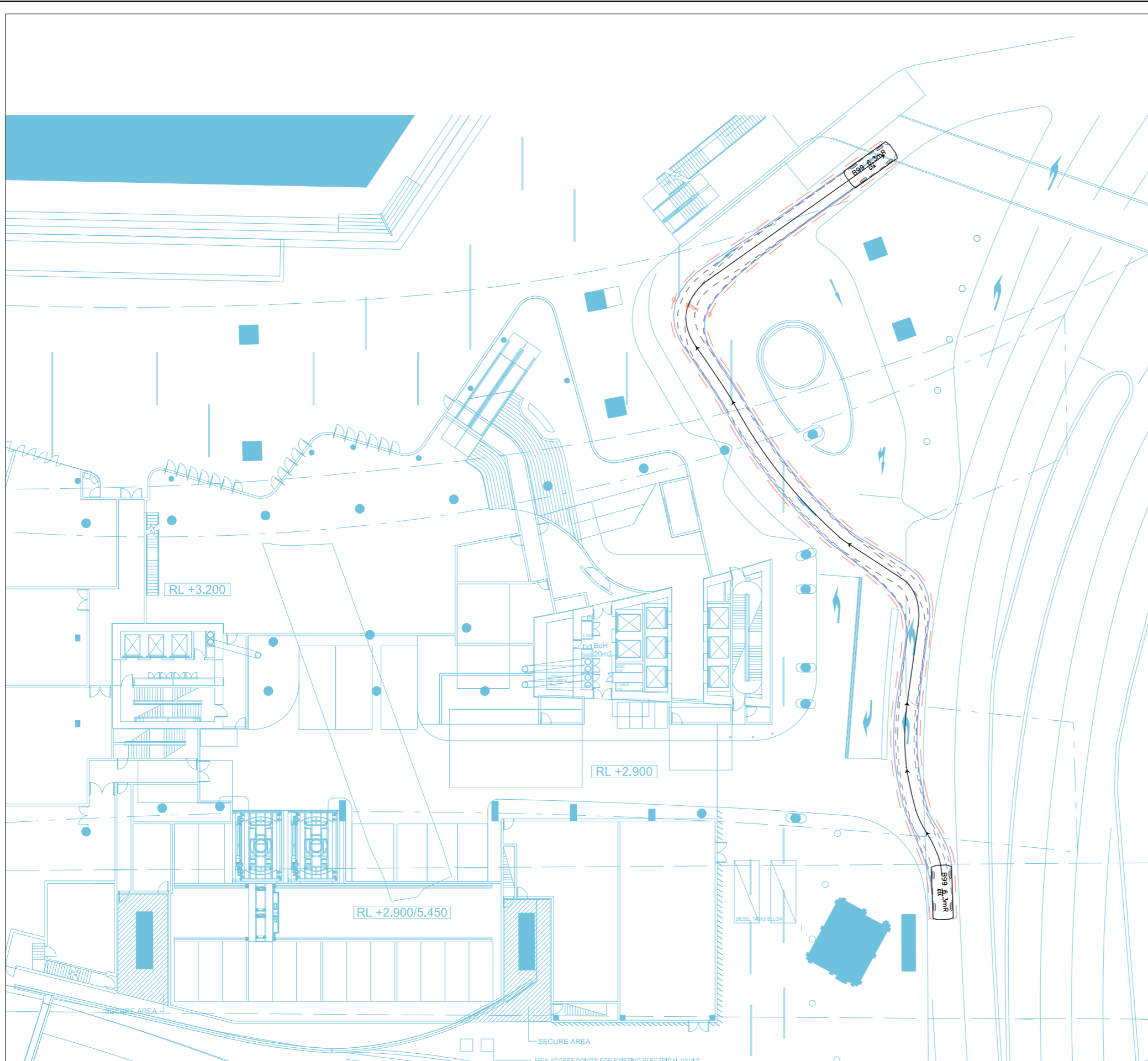
- VEHICLE CENTRE LINE
- - VEHICLE TYRE PATH
- VEHICLE BODY PATH
- - 300mm CLEARANCE FROM VEHICLE BODY

ASSUMED SPEED 5km/h



B99 6.3mR metres

Width	: 1.94
Track	: 1.77
Lock to Lock Time	: 6.0
Steering Angle	: 34.0



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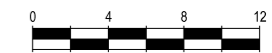
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 Canberra 02 6243 9400
 Adelaide 08 8334 3600
 Gold Coast 07 5510 4814
 Townsville 07 4722 2765
 Perth 08 6316 4634



PRELIMINARY PLAN
 FOR DISCUSSION PURPOSES ONLY
 SUBJECT TO CHANGE WITHOUT
 NOTIFICATION

**THE RIBBON, DARLING HARBOUR
 PORTE COCHERE CONCEPT PLAN
 SWEPT PATH ASSESSMENT**

DATE: 17.12.2015 SCALE: 1:400@A3

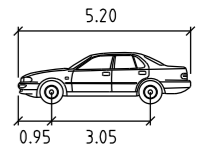


APPROVED: BDM DRAWING NO. 129018500-02-06-P2 SHEET: 06 OF 13

SWEPT PATH KEY

- VEHICLE CENTRE LINE
- - VEHICLE TYRE PATH
- VEHICLE BODY PATH
- - 300mm CLEARANCE FROM VEHICLE BODY

ASSUMED SPEED 5km/h



B99 6.3mR metres

Width	: 1.94
Track	: 1.77
Lock to Lock Time	: 6.0
Steering Angle	: 34.0



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 Canberra 02 6243 9400
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 Perth 08 6316 4634



PRELIMINARY PLAN
 FOR DISCUSSION PURPOSES ONLY
 SUBJECT TO CHANGE WITHOUT
 NOTIFICATION

**THE RIBBON, DARLING HARBOUR
 PORTE COCHERE CONCEPT PLAN
 SWEPT PATH ASSESSMENT**

DATE: 17.12.2015 SCALE: 1:400@A3

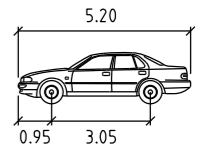


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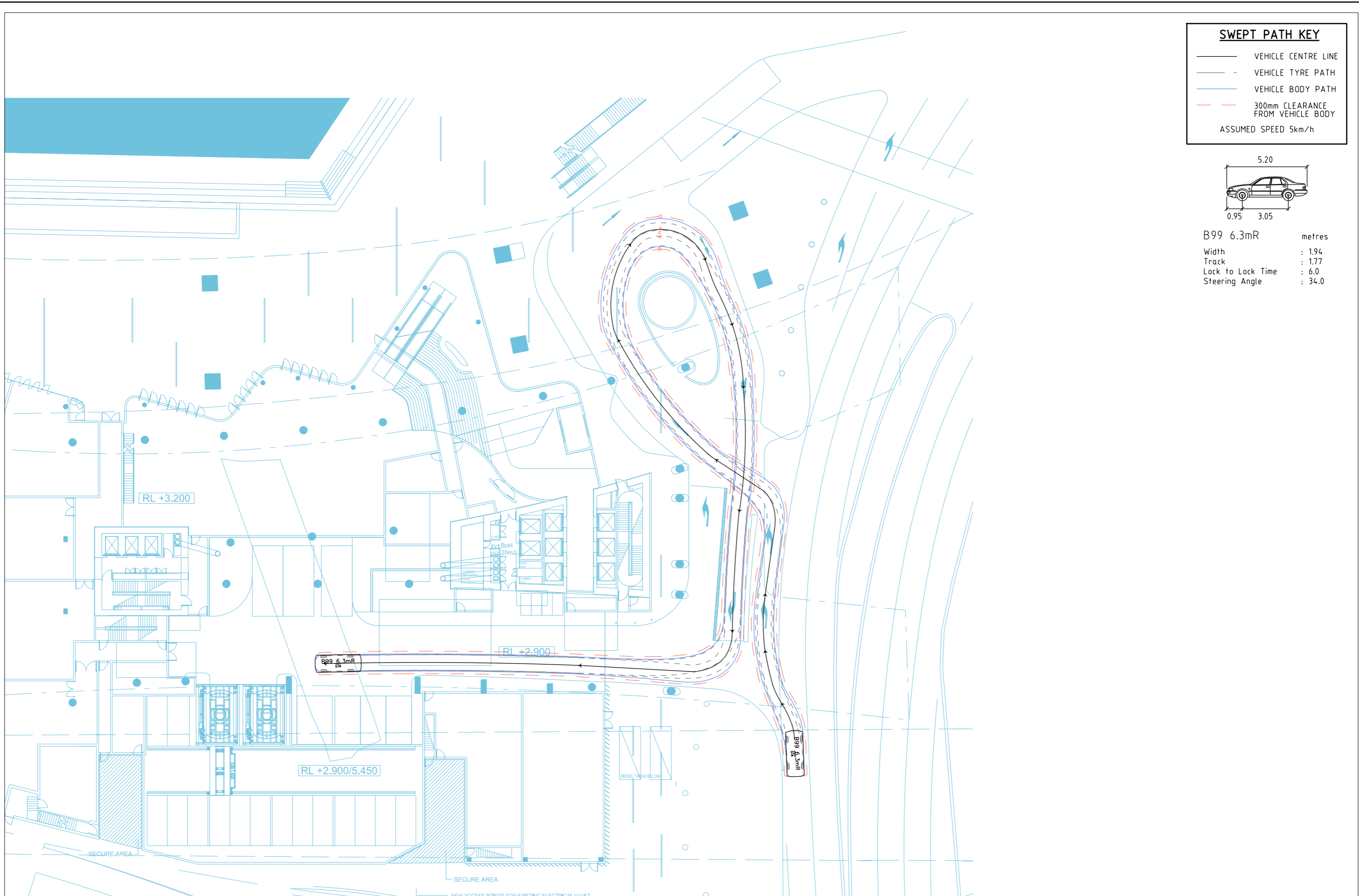
SWEPT PATH KEY

- VEHICLE CENTRE LINE
- - VEHICLE TYRE PATH
- VEHICLE BODY PATH
- - 300mm CLEARANCE FROM VEHICLE BODY

ASSUMED SPEED 5km/h



B99 6.3mR	metres
Width	: 1.94
Track	: 1.77
Lock to Lock Time	: 6.0
Steering Angle	: 34.0



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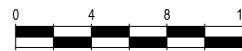
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PRELIMINARY PLAN
 FOR DISCUSSION PURPOSES ONLY
 SUBJECT TO CHANGE WITHOUT
 NOTIFICATION

**THE RIBBON, DARLING HARBOUR
 PORTE COCHERE CONCEPT PLAN
 SWEPT PATH ASSESSMENT**

DATE: 17.12.2015 SCALE: 1:400@A3

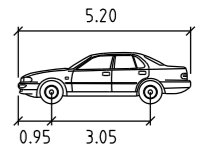


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SWEPT PATH KEY

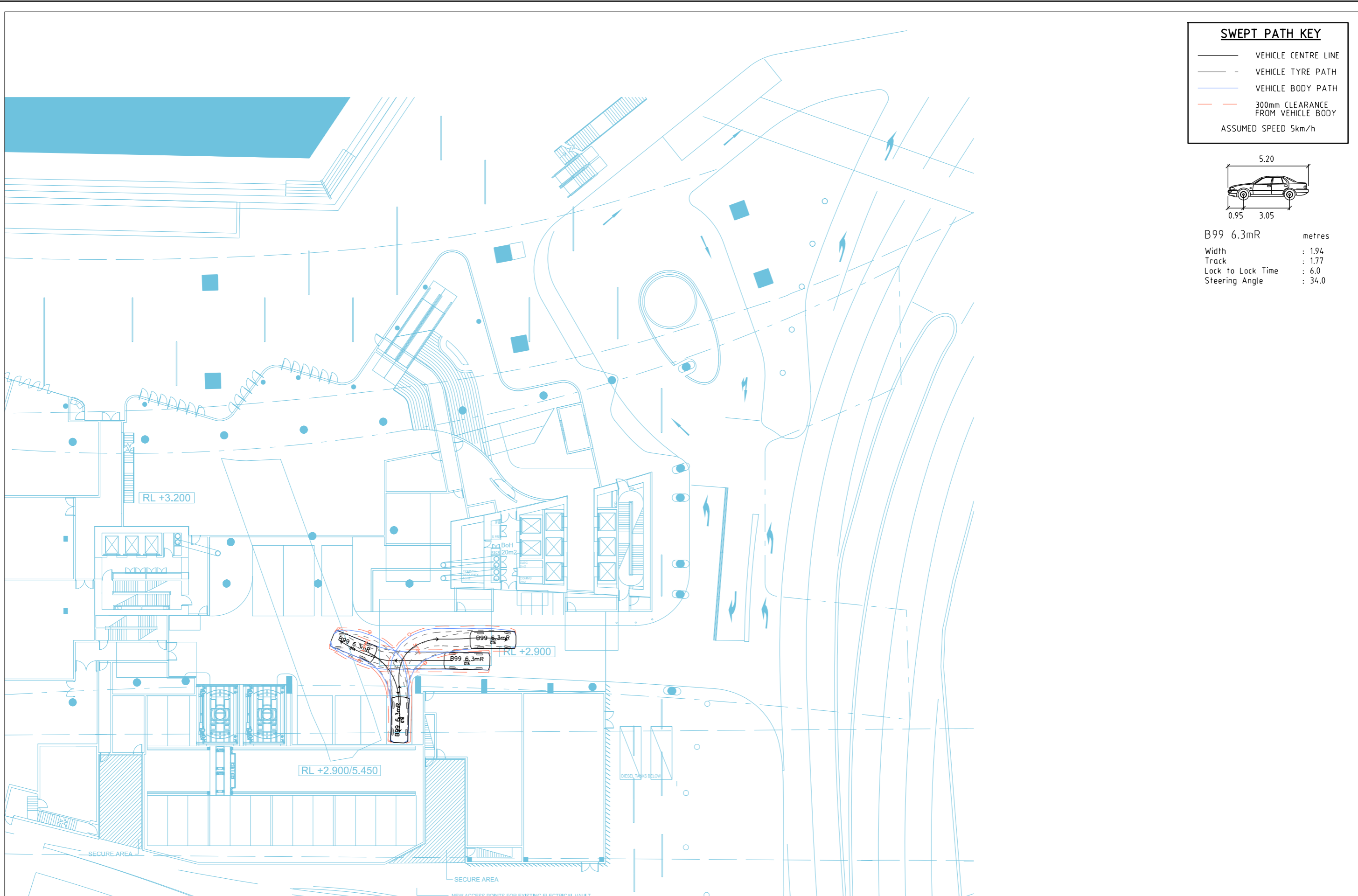
- VEHICLE CENTRE LINE
- - VEHICLE TYRE PATH
- VEHICLE BODY PATH
- 300mm CLEARANCE FROM VEHICLE BODY

ASSUMED SPEED 5km/h



B99 6.3mR metres

Width	: 1.94
Track	: 1.77
Lock to Lock Time	: 6.0
Steering Angle	: 34.0



PLOTTED BY: brendan.kilpatrick ON 17/12/2015 AT 11:26:31 PM 129018500-02-09-P2.dgn

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 Perth 08 6316 4634



PRELIMINARY PLAN
 FOR DISCUSSION PURPOSES ONLY
 SUBJECT TO CHANGE WITHOUT
 NOTIFICATION

**THE RIBBON, DARLING HARBOUR
 PORTE COCHERE CONCEPT PLAN
 SWEPT PATH ASSESSMENT**

DATE: 17.12.2015 SCALE: 1:400@A3

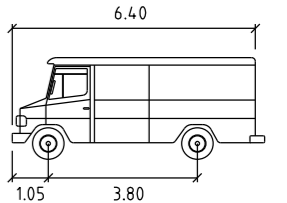


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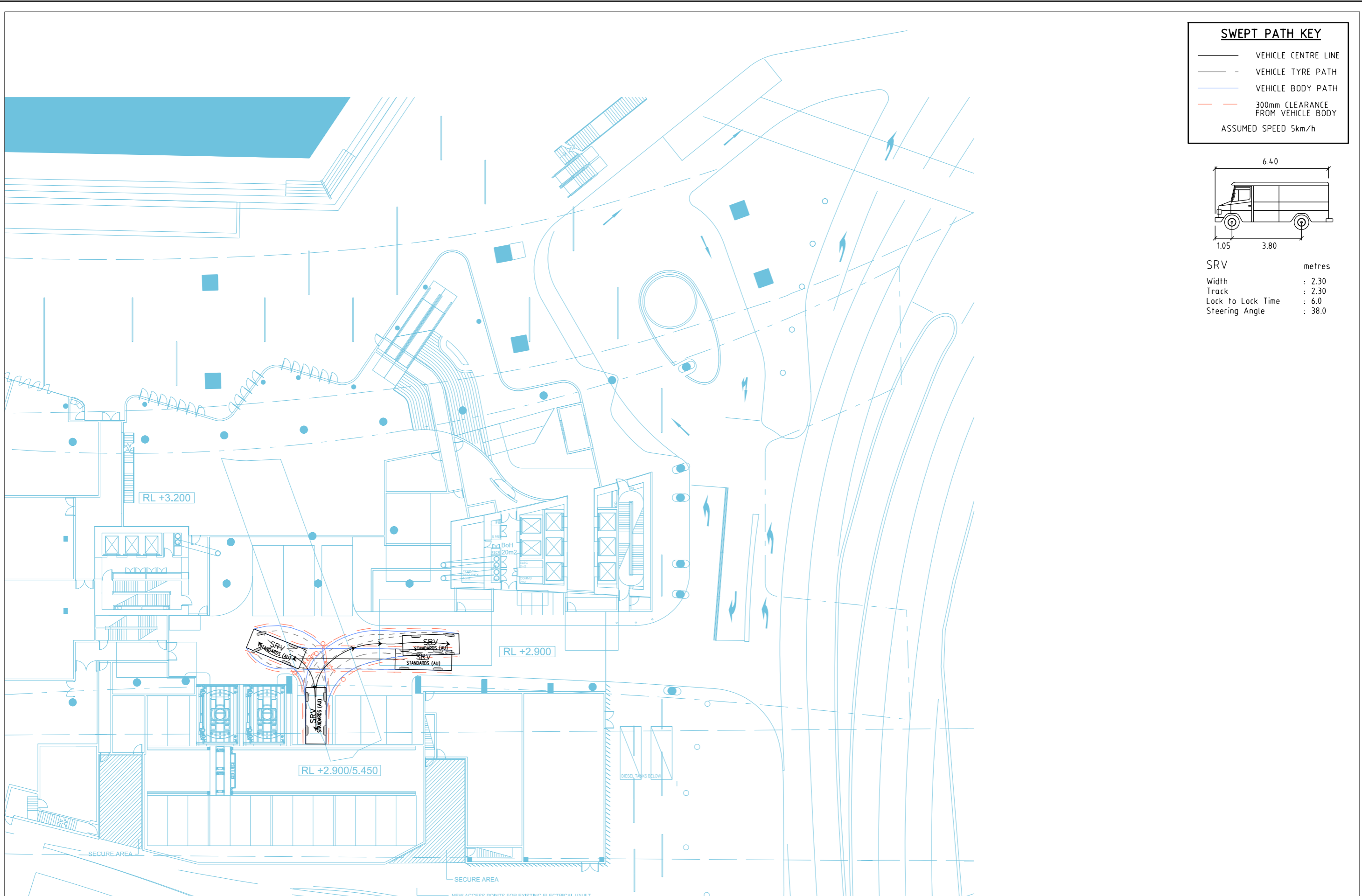
SWEPT PATH KEY

- VEHICLE CENTRE LINE
- - VEHICLE TYRE PATH
- VEHICLE BODY PATH
- - 300mm CLEARANCE FROM VEHICLE BODY

ASSUMED SPEED 5km/h



SRV	metres
Width	: 2.30
Track	: 2.30
Lock to Lock Time	: 6.0
Steering Angle	: 38.0



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PRELIMINARY PLAN
 FOR DISCUSSION PURPOSES ONLY
 SUBJECT TO CHANGE WITHOUT
 NOTIFICATION

**THE RIBBON, DARLING HARBOUR
 PORTE COCHERE CONCEPT PLAN
 SWEPT PATH ASSESSMENT**

DATE: 17.12.2015
 SCALE: 1:400@A3

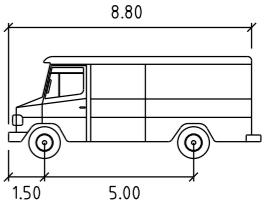


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 SHEET: 10 OF 13

SWEPT PATH KEY

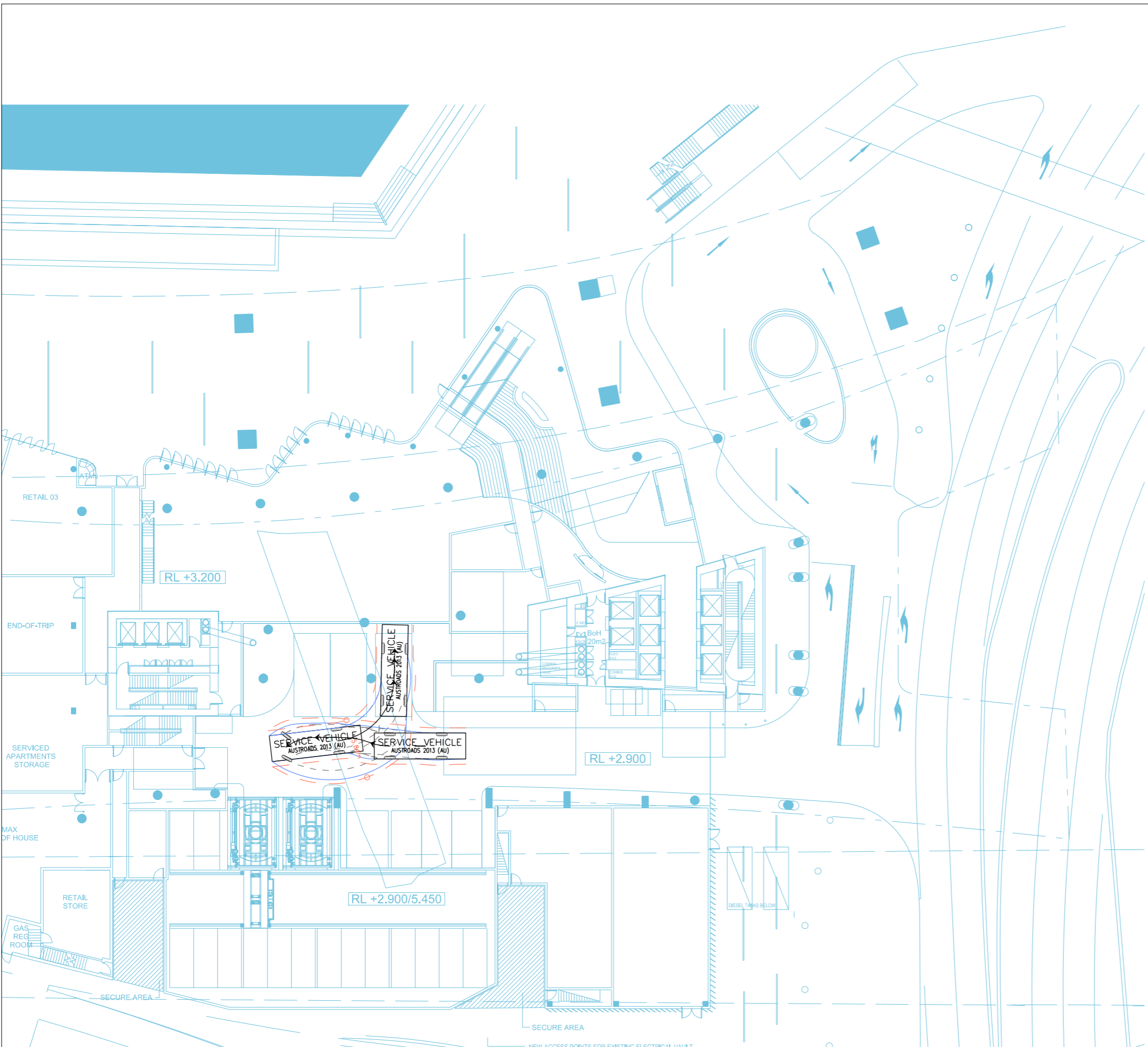
- VEHICLE CENTRE LINE
- - VEHICLE TYRE PATH
- VEHICLE BODY PATH
- - 500mm CLEARANCE FROM VEHICLE BODY

ASSUMED SPEED 5km/h



SERVICE VEHICLE metres

Width	: 2.50
Track	: 2.50
Lock to Lock Time	: 6.0
Steering Angle	: 38.7



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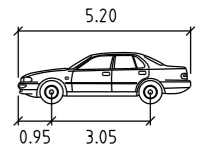
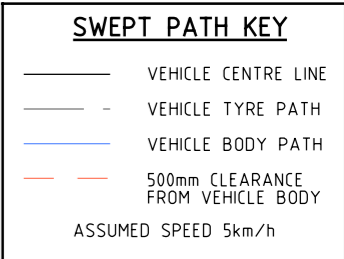
PRELIMINARY PLAN
 FOR DISCUSSION PURPOSES ONLY
 SUBJECT TO CHANGE WITHOUT
 NOTIFICATION

**THE RIBBON, DARLING HARBOUR
 PORTE COCHERE CONCEPT PLAN
 SWEPT PATH ASSESSMENT**

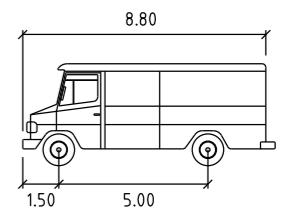
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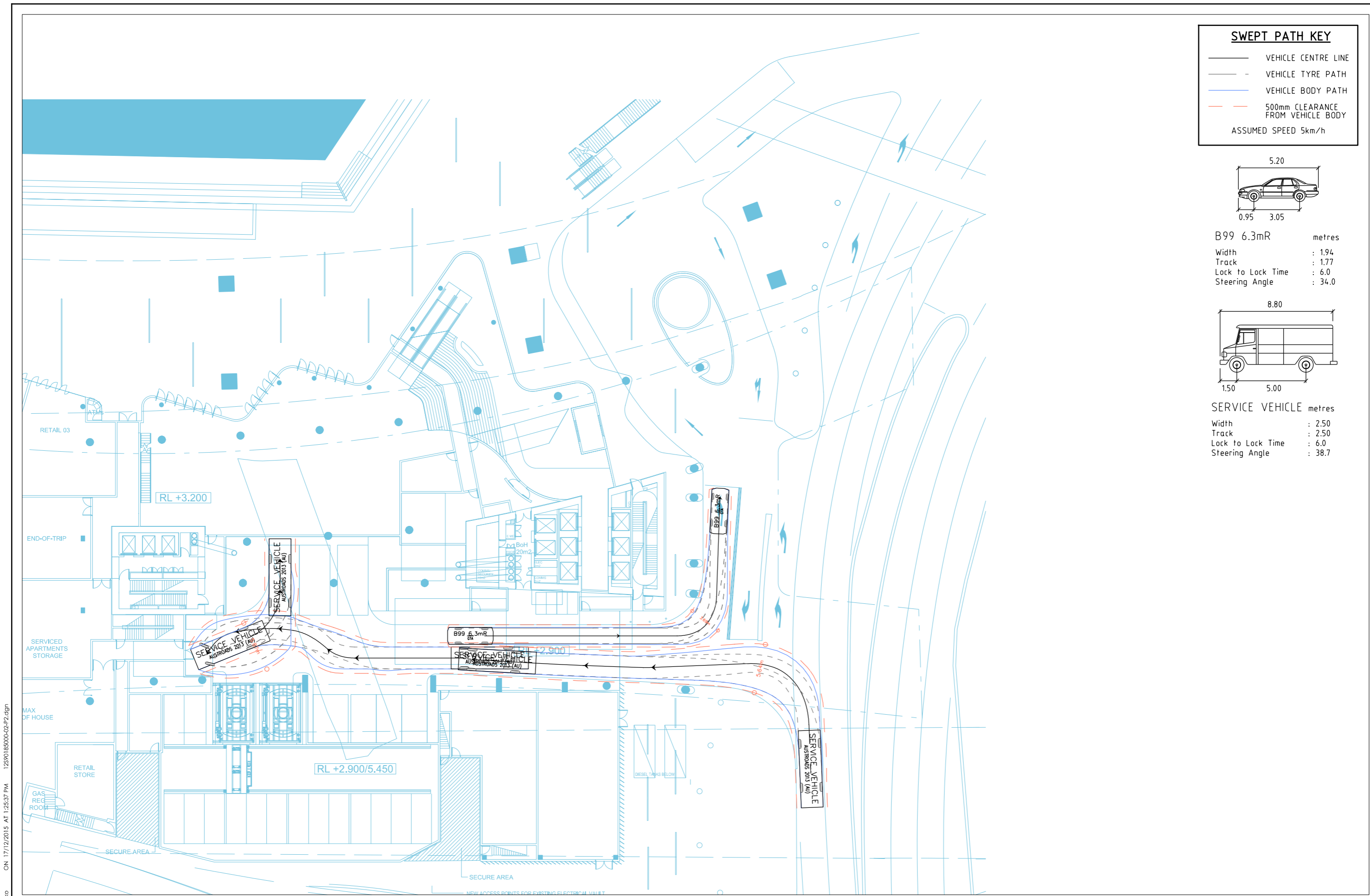
SHEET: 11 OF 13



B99 6.3mR metres
 Width : 1.94
 Track : 1.77
 Lock to Lock Time : 6.0
 Steering Angle : 34.0



SERVICE VEHICLE metres
 Width : 2.50
 Track : 2.50
 Lock to Lock Time : 6.0
 Steering Angle : 38.7



PLOTTED BY: brendan.kilpatrick ON: 17/12/2015 AT 1:25:37 PM 129018500-02-P2.dgn

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PRELIMINARY PLAN
 FOR DISCUSSION PURPOSES ONLY
 SUBJECT TO CHANGE WITHOUT
 NOTIFICATION

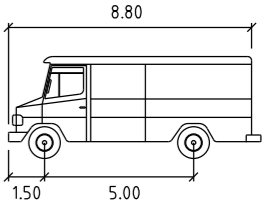
THE RIBBON, DARLING HARBOUR
 PORTE COCHERE CONCEPT PLAN
 SWEPT PATH ASSESSMENT

DATE: 17.12.2015 SCALE: 1:400@A3
 APPROVED: BDM DRAWING NO. 129018500-02-12-P2 SHEET: 12 OF 13

SWEPT PATH KEY

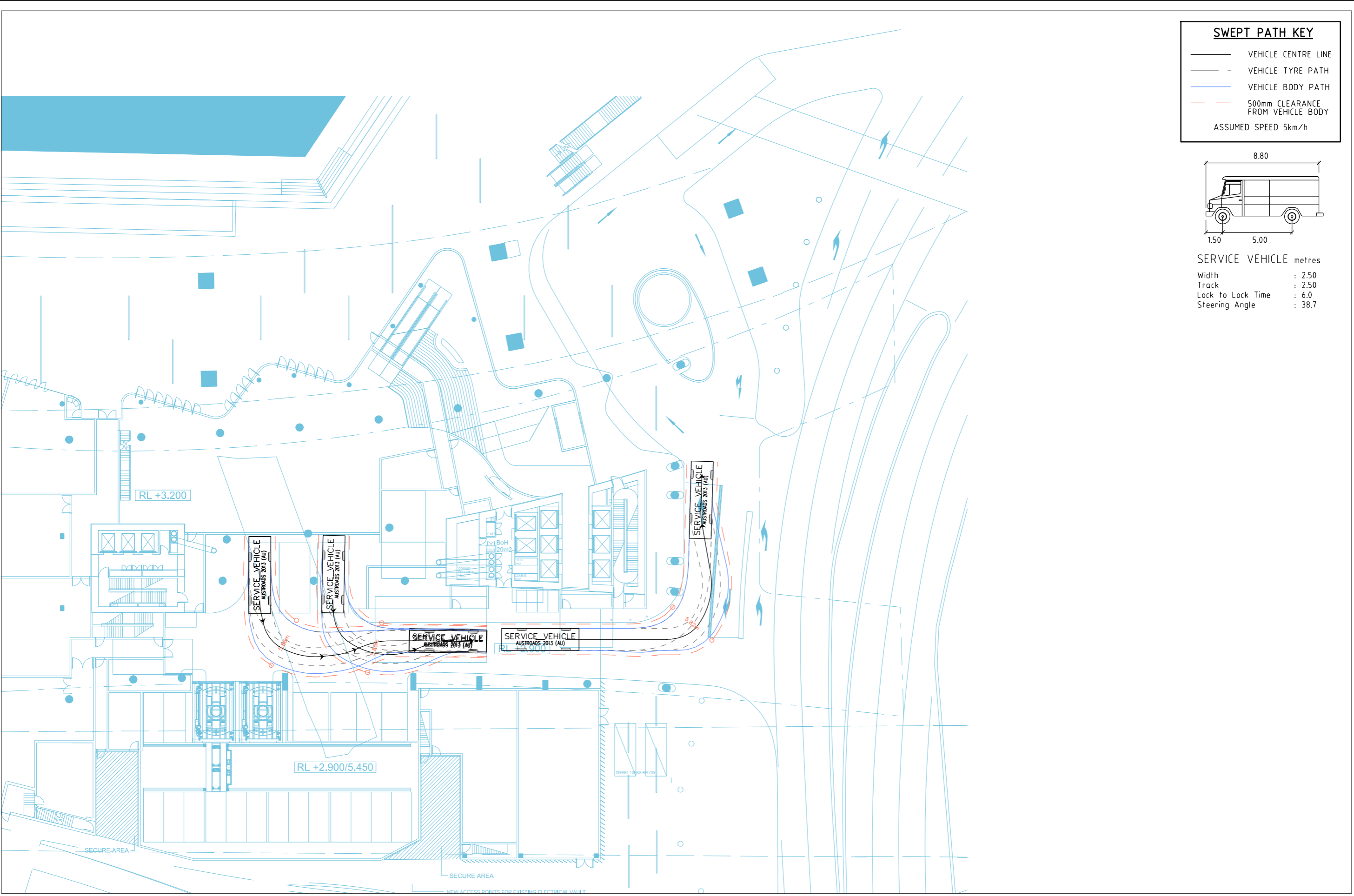
- VEHICLE CENTRE LINE
- - VEHICLE TYRE PATH
- VEHICLE BODY PATH
- - 500mm CLEARANCE FROM VEHICLE BODY

ASSUMED SPEED 5km/h



SERVICE VEHICLE metres

Width	: 2.50
Track	: 2.50
Lock to Lock Time	: 6.0
Steering Angle	: 38.7



PLOTTED BY: brendan.kilpatrick ON: 17/12/2015 AT: 1:25:22 PM 129018500-02-P2.dgn

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PRELIMINARY PLAN
 FOR DISCUSSION PURPOSES ONLY
 SUBJECT TO CHANGE WITHOUT
 NOTIFICATION

**THE RIBBON, DARLING HARBOUR
 PORTE COCHERE CONCEPT PLAN
 SWEPT PATH ASSESSMENT**

DATE: 17.12.2015
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 APPROVED: BDM
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SHEET: 13 OF 13

Melbourne

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PERTH WA 6000
P +618 6361 4634
E perth@gta.com.au