



**TRAFFIC AND PARKING IMPACT ASSESSMENT OF  
WAHROONGA SENIORS LIVING / AGED CARE DEVELOPMENT - STAGE 2  
AT 4-10 NERINGAH AVENUE SOUTH, WAHROONGA**



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**Development Type:**           **Wahroonga Seniors Living / Aged Care Development - Stage 2**

**Site Address:**               **4-10 Neringah Avenue South, Wahroonga**

**Prepared for:**               **HammondCare**

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## 1 INTRODUCTION

McLaren Traffic Engineering was commissioned by HammondCare to provide a Traffic and Parking Impact Assessment of the Wahroonga Seniors Living / Aged Care Development - Stage 2 at 4-10 Neringah Avenue South, Wahroonga as depicted in **Annexure A**.

This Traffic and Parking Impact Assessment Report is submitted to the Department of Planning and Environment (DPE) in support of a State Significant Development Application (SSD-45121248) for the redevelopment of part of the site at 4-12 Neringah Avenue South, Wahroonga for the purposes of delivering additional community health services, seniors housing, as well as upgraded palliative care facilities that will contribute to the broader operation of 'Neringah Hospital.' The extent of the site is shown below.



*Outline of the site, with the portion of the site subject to the SCC shaded dark red (R4 zone)*

### **FIGURE 1: SITE EXTENT**

Specifically, this SSDA seeks approval for the following:

- Site preparation works comprising:
  - Demolition of the Neringah Hospital building, kiosk, and existing at-grade carparks;
  - Clearing of nominated vegetation on the proposed development areas;
  - Bulk earthworks including basement excavation; and
  - Remediation works where necessary across the site.



- Construction and use of an integrated seniors housing and health services facility across two buildings ranging from 4-5 storeys above ground, comprising:
  - 2 basement levels containing minimum of 130 car parking spaces and service dock;
  - 12 residential aged care facility beds (extension to existing Stage 1 provision);
  - 18 palliative care hospice beds (Schedule 3 health services facility);
  - Community healthcare services, including outpatient palliative care, centre for positive aging and Hammond at Home;
  - 57 seniors housing dwellings;
  - On-site administration, amenities, and ancillary operations spaces.
- Ground level and on-building landscaping works, including the provision of a through site pedestrian link connecting Archdale Park and Balcombe Park;
- Public domain works, specifically, regrading of part of the pedestrian walkway known as 'Archdale Walk' to provide accessible connection; and
- Extension and augmentation of infrastructure and services as required including new site signage

This report has been prepared to respond to the Secretary's Environmental Assessment Requirements (SEARs) for SSD-45121248 that were issued on 24 June 2022. A table referencing responses has been provided overleaf.

**TABLE 1: SEARS REQUIREMENTS**

SEARs Requirements	Addressed in Section
<ul style="list-style-type: none"> <li>Provide a transport and accessibility impact assessment, which includes: <ul style="list-style-type: none"> <li>An analysis of the existing transport network, including the road hierarchy and any pedestrian, bicycle or public transport infrastructure, current daily and peak hour vehicle movements, and exiting performance levels of nearby intersections.</li> </ul> </li> </ul>	<b>Section 2</b>
<ul style="list-style-type: none"> <li>Details of the proposed development, including pedestrian and vehicular access arrangements (including swept path analysis of the largest vehicle and height clearances, and an explanation of how residents will access facilities and services), parking arrangements and rates (including bicycle and end-of-trip facilities), drop-off/pick-up-zone(s) and bus bays (if applicable), and provisions for servicing and loading/unloading.</li> </ul>	<b>Section 1.1, Section 3</b>
<ul style="list-style-type: none"> <li>Analysis of the impacts of the proposed development (including justification for the methodology used), including predicted modal split, a forecast for additional daily and peak hour multimodal network flows as a result of the development (using industry standard modelling), identification of potential traffic impacts on road capacity, intersection performance and road safety (including pedestrian and cyclist conflict) and any cumulative impact from surrounding approved developments.</li> </ul>	<b>Section 4, Section 5</b>
<ul style="list-style-type: none"> <li>Measures to mitigate any traffic impacts, including details of any new or upgraded infrastructure to achieve acceptable performance and safety, and the timing, viability and mechanisms of delivery (including proposed arrangements with local councils or government agencies) of any infrastructure improvements in accordance with relevant standards.</li> </ul>	<b>N/A – No mitigation measures necessary, See Section 5.4</b>
<ul style="list-style-type: none"> <li>Proposals to promote sustainable travel choices for employees, residents, guests and visitors, such as connections into existing walking and cycling networks, minimising car parking provision, encouraging car share and public transport, providing adequate bicycle parking and high quality end-of-trip facilities, and implementing a Green Travel Plan.</li> </ul>	<b>Annexure D</b>
<ul style="list-style-type: none"> <li>Provide a Construction Traffic Management Plan detailing predicted construction vehicle movements, routes, access and parking arrangements, coordination with other construction occurring in the area, and how impacts on existing traffic, pedestrian and bicycle networks would be managed and mitigated.</li> </ul>	<b>Section 6</b>

## **1.1 Description and Scale of Development**

To expand on the scale provided above, the proposed development has the following characteristics relevant to traffic and parking impacts for the purposes of this assessment:

- Demolition of the existing Neringah Hospital;
- Construction of a residential Aged Care Facility and Seniors Living buildings including:
  - 18 x beds for Palliative Care;
  - 12 x beds for Residential (Aged) Care;
  - A maximum of 41 hospital staff on site with between 22 and 41 staff expected (includes maximum staff on-site due to the change of shift);
  - 14 community staff for village facilities including (but not limited to): maintenance, kitchen staff, hairdresser
  - 57 x Seniors Living dwellings consisting of:
    - 8 x one-bedroom units;
    - 47 x two-bedroom units, and;
    - 2 x three-bedroom units.
- Basement parking levels with vehicular access via a 7.4m wide two-way vehicle crossover located in the middle of the site's frontage to Neringah Avenue South, accommodating 130 car parking spaces plus a car wash bay, including:
  - 26 car parking spaces allocated for visitors on the lower ground level including two (2) accessible spaces;
  - 12 car parking spaces for seniors living residents;
  - 92 staff car parking spaces within basement levels 1 and 2 including two (2) accessible spaces;
  - One (1) car wash bay.
- A loading dock is proposed accommodating two (2) loading bays with one (1) bay to accommodate vehicles up to and including 6.4m length SRV's (including ambulances) and the other bay accommodating vehicles up to and including a 9.38m length laundry truck proposed to be used by the development. These bays are to be accessed via an existing driveway located near the northern boundary of the site on Neringah Avenue South. The loading dock will serve vehicles up to and including a 9.38m length laundry truck;
- Provision of a pedestrian link through the site connecting to Archdale Walk.



## **1.2 State Environmental Planning Policy (Transport and Infrastructure) 2021**

The proposed development does not qualify as a traffic generating development with relevant size and/or capacity under *Clause 2.121* of the *SEPP (Transport and Infrastructure) 2021*. Accordingly, formal referral to the Transport for NSW (TfNSW) is unnecessary and the application can be assessed by Ku-ring-gai Council officers accordingly.

## **1.3 Site Description**

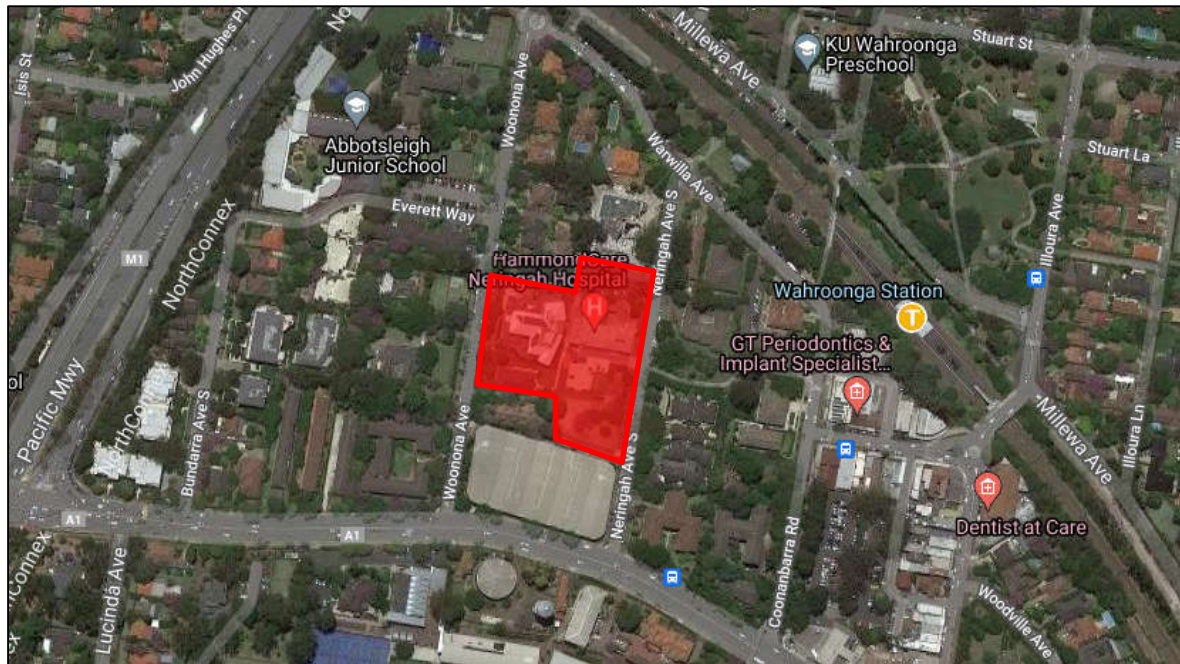
The subject site currently accommodates the existing HammondCare Wahroonga aged care facility consisting of 57 beds and the HammondCare Neringah Hospital. The existing HammondCare Wahroonga provides its own parking within a basement car park accessed from Woonona Avenue, whilst the HammondCare Neringah Hospital provides an at grade staff car park, accessed via a boom-gate and a separate at-grade visitor car park (including provision for emergency services) to the south of the hospital accessed from Neringah Avenue South.

The subject site is currently zoned *R2–Low Density Residential* and *R4-High Density Residential* under the *Ku-ring-gai Council Local Environmental Plan (LEP) 2015*. The site has frontages to Neringah Avenue South to the east and Woonona Avenue to the west of the site.

The site is generally surrounded by residential development and other development types with Wahroonga Train Station to the east of the site, Abbotsleigh Junior School to the west of the site, KU Wahroonga Preschool to the north of the site and Wahroonga Reservoir to the south of the site.

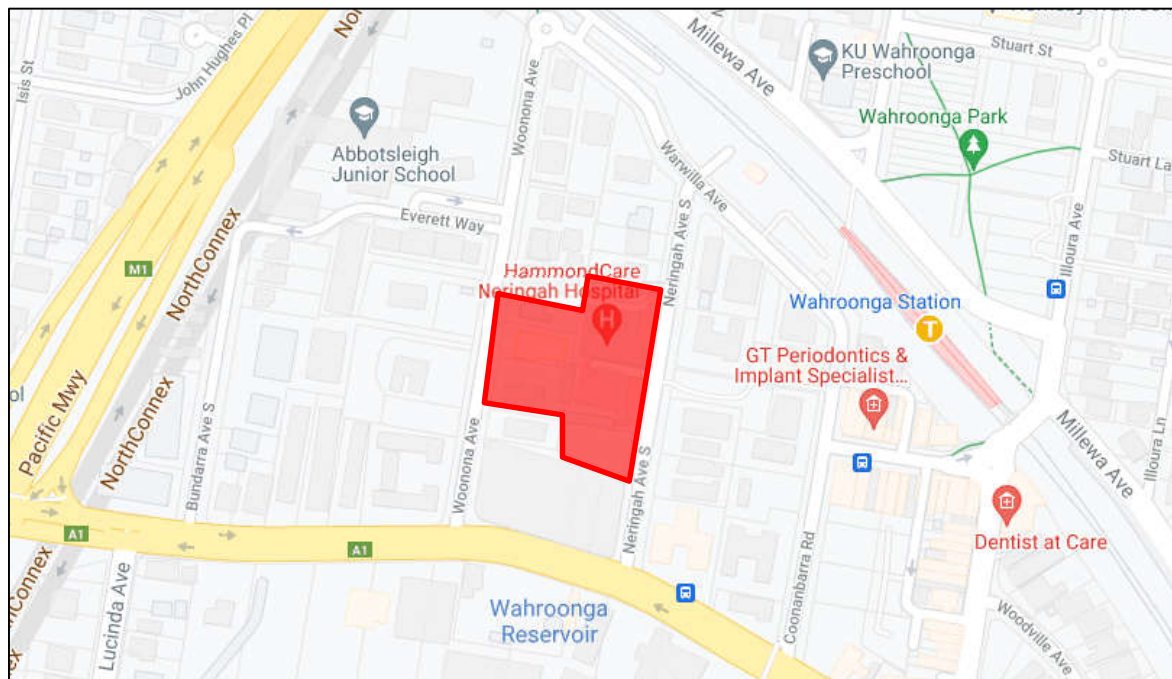
## **1.4 Site Context**

The location of the site is shown on an aerial photo and a street map in **Figure 2** and **Figure 3** respectively.



— Site Location

**FIGURE 2: SITE CONTEXT – AERIAL PHOTO**



— Site Location

**FIGURE 3: SITE CONTEXT – STREET MAP**

## **2 EXISTING TRAFFIC AND PARKING CONDITIONS**

### **2.1 *Road Hierarchy***

The road network servicing the site has characteristics as described in the following sub-sections.

#### **2.1.1 Neringah Avenue South**

- Unclassified LOCAL Road;
- Approximately 10m wide two-way carriageway (one lane in each direction) and kerbside parking;
- Signposted 50km/h speed limit;
- Sections of time restricted signposted “2-P, 830am-6pm, Mon-Fri, 830am-1230pm Sat” along the eastern side of the road and time restricted “2-P 8am-5pm, Mon-Fri” on the western side of the road. Unrestricted parking is available outside of time restricted parking areas;
- “No Parking” restrictions at the entrance to the Archdale Walk and within close proximity to the existing visitor site driveway from Neringah Avenue South.

#### **2.1.2 Pacific Highway**

- TfNSW Classified STATE Highway (No. 10);
- Approximately 20m wide dual carriageway within near vicinity of the site facilitating three lanes in each direction;
- Signposted 60km/h speed limit;
- 40km/h speed limit applies during school zone hours;
- ‘No Parking’ restrictions on the southern side of the road;
- ‘Clearway’ restrictions on the northern side of the road.

#### **2.1.3 Woonona Avenue**

- Unclassified LOCAL Road;
- Approximately 9m wide two-way carriageway (one lane in each direction) and kerbside parking;
- Default 50km/h speed limit;
- 40km/h speed limit applies during school zone hours;
- Unrestricted kerbside parking permitted along both sides of the road.

### **2.2 *Existing Traffic Management***

- STOP SIGN controlled intersection of Neringah Avenue South / Pacific Highway that is restricted to left-in / left-out movements only;
- Priority controlled intersection of Neringah Avenue South / Warwilla Avenue;



- Provision of raised pedestrian crossings along the southern leg and eastern leg of the intersection of Warwilla Avenue and Neringah Avenue South.

## 2.3 Existing Traffic Volumes

Intersection traffic surveys were conducted at the intersections of Neringah Avenue South / Warwilla Avenue and Neringah Avenue South / Pacific Highway from 7:00 AM to 9:30 AM and 2:30 PM to 6:00 PM on the Tuesday 1<sup>st</sup> June 2021 representing a typical operating weekday. The full survey results are shown in **Annexure B** for reference.

### 2.3.1 Existing Road Performance

The performance of the surrounding intersections under the existing traffic conditions has been assessed using SIDRA INTERSECTION 9.0, **Table 2** summarises the resultant intersection performance data, with full SIDRA results reproduced in **Annexure C**.

**TABLE 2: EXISTING INTERSECTION PERFORMANCES (SIDRA INTERSECTION 9.0)**

Intersection	Peak Hour	Degree of Saturation <sup>(1)</sup>	Average Delay <sup>(2)</sup> (sec/veh)	Level of Service <sup>(3)(4)</sup>	Control Type	Worst Movement
<b>EXISTING PERFORMANCE</b>						
Neringah Avenue South / Warwilla Avenue	AM	0.10	1.9 (Worst: 10.2)	<b>NA</b> (Worst: A)	Give Way	RT from Neringah Avenue South
	PM	0.08	2 (Worst: 9.1)	<b>NA</b> (Worst: A)		RT from Neringah Avenue South
Pacific Highway / Neringah Avenue	AM	0.54	0.4 (Worst: 20.6)	<b>NA</b> (Worst: B)	Stop	LT from Neringah Avenue
	PM	0.41	0.3 (Worst: 12)	<b>NA</b> (Worst: A)		LT from Neringah Avenue

**NOTES:**

(1) The Degree of Saturation is the ratio of demand to capacity for the most disadvantaged movement.

(2) The average delay is the delay experienced on average by all vehicles. The value in brackets represents the delay to the most disadvantaged movement.

(3) The Level of Service is a qualitative measure of performance describing operational conditions. There are six levels of service, designated from A to F, with A representing the best operational condition and level of service F the worst. The LoS of the intersection is shown in bold, and the LoS of the most disadvantaged movement is shown in brackets.

(4) No overall Level of Service is provided for Give Way and Stop controlled intersections as the low delays associated with the dominant movements skew the average delay of the intersection. The Level of Service of the worst approach is an indicator of the operation of the intersection, with a worse Level of Service corresponding to long delays and reduced safety outcomes for that approach.

As shown above, the two relevant intersections are currently performing at a high level of efficiency, with worst movement levels of service of “A” or “B” conditions in both the AM & PM peak hour periods. The level of service “A” and “B” performance is characterised by low approach delays and spare capacity.

## **2.4 Public Transport**

The subject site has access to existing bus stop (ID: 207625) located approximately 180m walking distance to the south of site on Pacific Highway. The bus stop services existing bus route N90 (Hornsby to City Town Hall via Chatswood (Night Service)), provided by State Transit.

Wahroonga Train Station is located approximately 290m walking distance to the north-east of the subject site, servicing the T1 North Shore & Western Line and T9 Northern Line. A train service is provided every 5 – 10 minutes in commuter peak periods and provides direct access between Berowra and Sydney CBD.

The location of the site subject to the surrounding public transport network is shown in **Figure 4** below.



## 2.5 Future Road and Infrastructure Upgrades

**Wahroonga Seniors Living / Aged Care Development - Stage 2**  
**4-10 Neringah Avenue South, Wahroonga**  
**220413.01FB - 11 November 2022**



### **3 PARKING ASSESSMENT**

#### **3.1 *State Environmental Planning Policy (Housing for Seniors or People with a Disability) 2004***

Reference is made to *Clauses 48, 49 and 50 of the former State Environmental Planning Policy (Housing for Seniors or People with a Disability) 2004* (SEPP (Housing for Seniors) 2004) which designates the following parking rates applicable to the proposed development:

##### ***48 Standards that cannot be used to refuse development consent for residential care facilities***

*A consent authority must not refuse consent to a development application made pursuant to this Chapter for the carrying out of development for the purpose of a residential care facility on any of the following grounds—*

*(d) **parking for residents and visitors:** if at least the following is provided—*

- (i) 1 parking space for each 10 beds in the residential care facility (or 1 parking space for each 15 beds if the facility provides care only for persons with dementia), and*
- (ii) 1 parking space for each 2 persons to be employed in connection with the development and on duty at any one time, and*
- (iii) 1 parking space suitable for an ambulance.*

##### ***50 Standards that cannot be used to refuse development consent for self-contained dwellings***

*(h) **parking:** if at least the following is provided—*

- (i) 0.5 car spaces for each bedroom where the development application is made by a person other than a social housing provider, or*
- (ii) 1 car space for each 5 dwellings where the development application is made by, or is made by a person jointly with, a social housing provider.*

The minimum parking provision requirements as per the above SEPP rates is summarised in **Table 3**, noting that the development is being made by a social housing provider.

**TABLE 3: SEPP MINIMUM PARKING REQUIREMENTS**

Type	Scale	Rate		Spaces Required
		Land Use	Rate	
Residential Care Facility	30 beds and 55 staff	Visitors	1 parking space for each 10 beds	3
		Staff	1 per 2 staff	28 (27.5)
		Ambulance	1 ambulance	1 ambulance
Self-Contained Dwellings	57 dwellings	Residential	1 per 5 dwellings	12 (11.4)
<b>Subtotal</b>	-	-	-	<b>43 + 1 ambulance</b>

As shown above, strict application of the SEPP requires a minimum provision of **43** car parking spaces plus one (1) ambulance. The proposed plans detail the provision of **130** car parking spaces, exceeding the SEPP requirements by 87 spaces.

The above assessment considers the car parking requirements based upon the former *SEPP (Housing for Seniors) 2004*. The following section provides an assessment against Council's DCP car parking requirements.

### **3.2 Council DCP Parking Requirement**

Reference is made to Ku-ring-gai Council's *Ku-ring-gai Development Control Plan 2022, Section C, Part 22 General Access and Parking, 22R.1 Car Parking Rates* which designates the following parking rates applicable to the proposed development:

#### **22R.1 CAR PARKING RATES**

##### **Seniors Housing**

*Provisions of Seniors Living Policy apply.*

*The following parking provision is recommended:*

**Resident funded development** 2 spaces per 3 self contained units plus 1 visitor space for every 5 units.

**Hostels, nursing and convalescent homes** 1 space per 10 beds for visitors, plus 1.5 spaces per 2 employees, plus 1 space for ambulance

*In the calculation of the parking spaces, overall requirement figures are to be rounded up to the nearest integer.*

Whilst the provisions of the Seniors Living Policy are stated to apply, the recommended parking provision based on the above rates in Ku-ring-gai Council's DCP is summarised in **Table 4**.

**TABLE 4: DCP PARKING RATES**

Land Use	Type	Scale	Rate		Parking Required
			Parking Use	Rate	
Self-contained dwellings	Resident-Funded	57 self-contained dwellings	Residents	2 per 3 units	38
			Visitors	1 visitor space per 5 units	12 (11.4)
Aged Care	Residential and Palliative care units	30 beds / units & 55 staff	Staff	1.5 spaces per 2 employees	42 (41.25)
			Visitors	1 space per 10 beds for visitors	3
			Ambulance	1 space for ambulance	1 ambulance space
<b>Total</b>	-	-	-	-	<b>95 + 1 ambulance</b>

As shown above, strict application of the DCP requires the provision of **95** car parking spaces plus an ambulance space. The proposed plans detail the provision of **130** car parking spaces and an ambulance space within the loading area, exceeding Council's recommended DCP provision by 35 spaces.

### 3.3 Accessible Parking

Ku-ring-gai Council's DCP does not specifically outline the requirement of disabled-accessible parking for seniors living developments. Accordingly, reference is made to the *Building Code of Australia (BCA) Table D3.5* which classifies accommodation for the aged as a Class 3(b) building and requires the provision of accessible parking at the rates of:

*Class 3(b) 1 space for every 100 car parking spaces or part thereof*

Application of the above rates requires the provision of two (2) accessible parking spaces. The proposed plans detail the provision of 16 accessible parking spaces, satisfying the minimum BCA requirements.

### 3.4 Bicycle & Motorcycle Parking Requirements

The Ku-ring-gai Council DCP 2022 does not require the provision of bicycle / motorcycle parking. The proposed development provides **14** bicycle parking spaces within the lower ground parking level. No motorcycle parking spaces have been provided, satisfying Council requirements.

### 3.5 Servicing & Loading

Reference is made to Ku-ring-gai Council's DCP which outlines the following with respect to waste collection for seniors living / aged care developments.

*9 On-site internal loading facilities are to be provided for all developments with loading and unloading requirements.*



*10 Loading docks are to be:*

- i) accessed via a rear lane or secondary streets where these are available, and accessible to heavy vehicles;*
- ii) conveniently located in such a way that minimises conflict with pedestrians and other traffic; and*
- iii) screened from the public street.*

The proposed plans detail a loading dock at the basement 1 level accessed via the northern driveway on Neringah Avenue South. The loading dock accommodates two (2) loading bays with one (1) bay to accommodate vehicles up to and including 6.4m length SRV's (including ambulances) and the other bay accommodating vehicles up to and including a 9.38m length laundry truck proposed to be used by the development. Other than the assessed 9.38m length laundry truck, the loading bays are to be restricted to vehicles up to and including 8.8m length MRV's. The loading bays are proposed to accommodate loading vehicles which will be restricted to a maximum headroom clearance of 3.5m. Swept path testing has been undertaken of vehicular access to the basement loading area, with results reproduced in **Annexure E**. The results indicate that the access driveway and loading area can successfully accommodate vehicles up to and including a 9.38m length laundry truck.

The loading area is located away from other pedestrian and vehicle accesses which minimise conflicts with those users. Additionally, the loading area is appropriately screened from the public street being located in a basement area.

### 3.6 *Sight Line Assessment*

During a visit to the site, it was noted that sight lines at the proposed two-way driveway and proposed loading driveway locations are potentially restricted due to the presence of shrubs and trees within the Council verge adjacent to the driveways. As a result, it is likely that some of these trees will be required to be removed or relocated to ensure sufficient sight lines can be achieved from the proposed driveways.

### 3.7 *Green Travel Plan*

To promote sustainable travel choices by staff, residents and visitors of the development, a Green Travel Plan has been developed and is provided in **Annexure D**. The Green Travel Plan (GTP) has been prepared to support the Development Application for the proposed seniors living / aged care development and outlines:

- The alternative transport options available to staff of and visitors to the development;
- Suggested initiatives to increase the use of alternative transport modes, thereby reducing private car travel;
- Sustainable transport targets and milestones and methods to measure and report on transport behaviour over time.

### 3.8 *Car Park Design & Compliance*

The car parking layout as depicted in **Annexure A**, has been assessed to achieve the relevant clauses and objectives of AS2890.1:2004, AS2890.2:2018 and AS2890.6:2009, subject to the insufficient information and required changes detailed in the following subsections. Any variances from the standards are addressed in the following subsections including required changes, if any. Swept path testing has been undertaken with results reproduced within **Annexure E** for reference.

The proposed car parking and vehicular access design achieves the following:

- 7.4m wide two-way driveway facilitating access to Neringah Avenue South;
- Minimum 6.0m width parking aisles;
- Compliant car parking basement ramp grades not exceeding 25% for private developments and no grade change greater than 12.5%;
- Minimum 5.4m long, 2.6m wide spaces for staff;
- Minimum 5.4m long, 2.6m wide spaces for visitors;
- Minimum 5.4m long, 2.4m wide accessible spaces with adjacent associated 5.4m long, 2.4m wide shared space;
- Minimum 1m width blind aisle extensions.

#### 3.8.1 Required Change – Loading Ramp Grades and Vertical Clearance

To assess the ability of loading vehicles to access the site, vertical clearance testing has been undertaken of an 8.8m length MRV with results provided in **Annexure E**. The results indicate that an MRV does not achieve compliant clearances along the proposed ramp

profile. However, preliminary investigations suggest that an acceptable ramp profile can be designed. The detailed design of this ramp can be required to occur during the Construction Certificate stage of the development.

### 3.8.2 Required Change – Loading Ramp Headroom Clearance

From the plans provided to date, there are no details regarding headroom obstructions along the loading ramp such that an assessment of compliance in this matter is not able to be completed. Additionally, further details regarding the power line heights near the loading driveway are required to ensure sufficient clearance is provided at this location. It is expected that there will be no headroom clearance issues due to the open nature of the loading ramp access. In any case, the detailed design of this ramp can be required to occur during the Construction Certificate stage of the development.

### 3.8.3 Required Change – Car Driveway Ramp Grades

To assess the ability of cars to access the appropriate parking areas, vertical clearance testing has been undertaken of an Australian 99<sup>th</sup> percentile light vehicle (B99) in accordance with *AS2890.1:2004* along the proposed driveway and ramp profile with results provided in **Annexure E**. The results indicate that a B99 scrapes its undercarriage along the proposed ramp profile. However, preliminary investigations suggest that an acceptable driveway and ramp profile can be designed. The detailed design of this driveway and ramp can be required to occur during the Construction Certificate stage of the development.

### 3.8.4 Required Change – Driveway Sight lines

During a visit to the site, it was noted that sight lines at the proposed two-way driveway and proposed loading driveway locations are potentially restricted due to the presence of shrubs and trees within the Council verge adjacent to the driveways. Accordingly, these shrubs and trees should be trimmed, relocated or removed where relevant to achieve suitable sight lines.

Whilst the plans have been assessed to comply with the relevant standards, subject to the required changes detailed above, it is usual and expected that a design certificate be required at the Construction Certificate stage to account for any changes following the development application.

## **4 PEDESTRIAN MANAGEMENT**

### **4.1 *Zebra Pedestrian Crossing Assessment***

As part of the assessment, consideration has been made to the provision of a pedestrian crossing across Neringah Avenue South to connect Archdale Walk on the eastern side of the road with the proposed green spine to be provided within the site.

Reference is made to the Transport for NSW (TfNSW) *Supplement to Australian Standard AS1742.10-2009, Manual of Uniform Traffic Control Devices – Part 10: Pedestrian control and protection Version 3.1*, which states the following warrants for the provision of zebra pedestrian crossings:

*Transport practice for numerical warrants for Pedestrian (Zebra) Crossings on arterial roads are:*

*i) Normal Warrant:*

*A pedestrian (Zebra) Crossing is warranted where:*

*In each of three separate one hour periods in a typical day*

*(a) The pedestrian flow per hour (P) crossing the road is greater than or equal to 30*

*AND*

*a) The vehicular flow per hour (V) through the site is greater than or equal to 500*

*AND*

*b) The product PV is greater than or equal to 60,000*

*ii) Reduced Warrant for sites used predominantly by children and by aged or impaired pedestrians:...*

*If at least 50% of pedestrians using the crossing are aged or impaired and for each three one hour periods in a typical day*

*(a)  $P \geq 30$*

*AND*

*(b)  $V \geq 200$*

*AND*

*(c)  $PV \geq 60,000$*

*a pedestrian (Zebra) Crossing may be installed.*



As per the completed traffic intersection surveys (detailed in **Section 2.3**), the peak traffic volume surveyed to occur along Neringah Avenue South was 109 vehicles. With added consideration that the proposed development is estimated to add some 28 vehicular trips to the road network, this peak hourly volume is expected to increase to some 137 peak hourly vehicles. Both the existing and proposed traffic volumes along Neringah Avenue South do not satisfy the warrant values of TfNSW's *Supplement to AS1742.10-2009* in any peak hourly period. Therefore, the provision of a pedestrian crossing is not warranted and is not recommended to be provided.

An alternative to a zebra pedestrian crossing is the provision of a pedestrian refuge.

#### **4.2 Pedestrian Refuge**

The relevant design guidelines for pedestrian refuges are detailed within *AS1742.10-2009, Manual of Uniform Traffic Control Devices – Part 10: Pedestrian control and protection Version 3.1*, the relevant *TfNSW Supplement*, and *Transport for NSW's TDT 2011/01a – Pedestrian Refuges (Supplement for narrowing or widening of roads at Pedestrian Refuges)*. Pedestrian refuges increase the ease with which pedestrians can cross a road, by providing an island area in the middle of the road, for pedestrians to wait.

One resultant impact of installing a pedestrian refuge within Neringah Avenue South near Archdale Walk is that it will reduce the quantity of available kerbside parking spaces in Neringah Avenue South. In addition to the kerbside area dedicated to the kerb ramp and/or kerb extension facilities associated with a pedestrian refuge there are also distances required to be signposted as “*No Stopping*” on either side of the kerb ramps. The typical refuge design is shown in **Annexure F** for reference.

As shown in **Annexure F**, approximately 25m of kerbside length (20m on the approach and 5m on the departure of the refuge) is required to be signposted as “*No Stopping*”. This will result in the loss of 50m of kerbside parking, approximately nine (9) car parking spaces based upon one space per 6m of kerbside length.

From a site visit undertaken, the on-street parking conditions are highly utilised and as such any removal of parking as a result of the provision of a pedestrian refuge facility is subject to the approval by Council's Local Traffic Committee.

The *RTA Guide to Traffic Generating Developments 2002* adopted by Transport for NSW (TfNSW) states the following with respect to the ability for aged pedestrians to safely cross the average street.

*In The Streets Where We Live, Landcom (1984), pedestrian safety and delay are further considered. This resulted in the definition of various behavioural thresholds, such as the observation that at 90 veh/hr children tend to stop playing in the street, and a 300 veh/hr limit is required for aged pedestrians to safely cross the average street.*

As the forecast two-way peak hour traffic within Neringah Avenue South is 137 vehicles, it is unnecessary to provide any formal crossing facility. An acceptable alternative to a pedestrian refuge would be to replicate the “*No Stopping*” signage along the pedestrian link along the site frontage, similar to the existing design shown in front of the Archdale Walk pram ramp.

## 5 TRAFFIC ASSESSMENT

The impact of the expected traffic generation levels associated with the subject proposal is discussed in the following sub-sections.

### 5.1 *Traffic Generation*

Traffic generation rates for the relevant land uses are provided in the *RTA Guide to Traffic Generating Developments (2002)* as adopted by Transport for NSW (TfNSW) and recent supplements and are as follows:

#### **RTA Guide**

##### **3.3.4 Housing for aged and disabled persons.**

*Evening peak hour vehicle trips = 0.1 - 0.2 per dwelling.*

#### **TDT 2013/04a**

##### **Housing for seniors**

*Weekday peak hour vehicle trips = 0.4 per dwelling*

*(Note that morning site peak hour does not generally coincide with the network peak hour)*

The resulting traffic generation is summarised in **Table 5**.

**TABLE 5: ESTIMATED TRAFFIC GENERATION**

Use	Scale	Generation Rate	Trips	PM Peak Hour Split
Self-contained dwellings	57 units	0.4 per dwelling	23 trips	18 in 5 out <sup>(1)</sup>
Residential aged care / Palliative care	30 units	0.15 per dwelling <sup>(2)</sup>	5 trips	1 in; 4 out <sup>(3)</sup>
<b>Total</b>	<b>-</b>	<b>-</b>	<b>28 trips</b>	<b>19 in; 9 out</b>

Notes:

- (1) Assumes 80% inbound & 20% outbound during PM peak;
- (2) Average of 0.1-0.2 per dwelling TfNSW Guide rate range;
- (3) Assumes 20% inbound & 80% outbound during PM peak.

As shown, the estimated traffic generation associated with the proposed development is in the order of **28** vehicle trips (19 IN, 9 OUT) for the PM peak period. The AM peak traffic generation has been assumed to be the same for conservative analysis, with the traffic distribution split (9 IN, 19 OUT). Note that this traffic generation is considered to be conservative as it does not incorporate the traffic generation of the existing site use.

There is understood to be no approved developments within close proximity of the site that would add additional traffic on the surrounding road network beyond that which was surveyed.

## 5.2 Expected Modal Split

To provide a reasonable split of expected staff and resident travel, the *NSW Bureau of Transport Statistics 2016 Journey to Work* data has been consulted for the suburbs of Waitara and Wahroonga. The data shows that on average 75% of employees who work in the area drive to and from work, with the detailed travel mode split from this data summarised in **Table 6**.

**TABLE 6: WAITARA & WAHROONGA WEST (SA2) EXISTING TRAVEL MODE SPLIT**

Mode of Transport	Usage Rate
Vehicle Driver	74.7%
Vehicle Passenger	5.7%
Train	10.4%
Bus	1.4%
Walk Only	6.0%
Bicycle	0.2%
Motorcycle / Scooter	0.4%
Other Modes	0.9%

It is noted that the Green Travel Plan included with this report, as provided in **Annexure D**, outlines: The alternative transport options available to residents, staff of and visitors to the development and suggested initiatives to increase the use of alternative transport modes, thereby reducing private car travel. As a result of the implementation of this Green Travel Plan, the modal split of residents, staff and visitors may change over time from the above modal split from the Journey to Work data.

In any case, it is considered that the traffic generation rates referred to in **Section 5.1** remain applicable to the proposed development.

## 5.3 Trip Assignment

The road network has been assessed and the following traffic assignment has been assumed for all traffic to and from the site:

- To the site:
  - 60% from Pacific Highway;
  - 40% from Warwilla Avenue (east of the site).
- From the site:
  - 60% to Warwilla Avenue (east of the site);
  - 40% to Pacific Highway.



#### **5.4 Traffic Impact**

The traffic generation outlined in **Section 5.1 & 5.3** above has been added to the existing traffic volumes recorded. SIDRA INTERSECTION 9.0 was used to assess the intersections performance. The purpose of this assessment is to compare the existing intersection operations to the future scenario under the increased traffic load. The results of this assessment are shown in **Table 7**.

**TABLE 7: INTERSECTION PERFORMANCE (SIDRA INTERSECTION 9.0)**

Intersection	Peak Hour	Degree of Saturation <sup>(1)</sup>	Average Delay <sup>(2)</sup> (sec/veh)	Level of Service <sup>(3)(4)</sup>	Control Type	Worst Movement
EXISTING PERFORMANCE						
Neringah Avenue South / Warwilla Avenue	AM	0.10	1.9 (Worst: 10.2)	NA (Worst: A)	Give Way	RT from Neringah Avenue South
	PM	0.08	2 (Worst: 9.1)	NA (Worst: A)		RT from Neringah Avenue South
Pacific Highway / Neringah Avenue	AM	0.54	0.4 (Worst: 20.6)	NA (Worst: B)	Stop	LT from Neringah Avenue
	PM	0.41	0.3 (Worst: 12)	NA (Worst: A)		LT from Neringah Avenue
FUTURE PERFORMANCE						
Neringah Avenue South / Warwilla Avenue	AM	0.13	2.1 (Worst: 10.3)	NA (Worst: A)	Give Way	RT from Neringah Avenue South
	PM	0.09	2.1 (Worst: 9.1)	NA (Worst: A)		RT from Neringah Avenue South
Pacific Highway / Neringah Avenue	AM	0.54	0.5 (Worst: 20.5)	NA (Worst: B)	Stop	LT from Neringah Avenue
	PM	0.41	0.3 (Worst: 11.9)	NA (Worst: A)		LT from Neringah Avenue

**NOTES:**

(1) The Degree of Saturation is the ratio of demand to capacity for the most disadvantaged movement.

(2) The average delay is the delay experienced on average by all vehicles. The value in brackets represents the delay to the most disadvantaged movement.

(3) The Level of Service is a qualitative measure of performance describing operational conditions. There are six levels of service, designated from A to F, with A representing the best operational condition and level of service F the worst. The LoS of the intersection is shown in bold, and the LoS of the most disadvantaged movement is shown in brackets.

(4) No overall Level of Service is provided for Give Way and Stop controlled intersections as the low delays associated with the dominant movements skew the average delay of the intersection. The Level of Service of the worst approach is an indicator of the operation of the intersection, with a worse Level of Service corresponding to long delays and reduced safety outcomes for that approach.

As shown, the intersections of Neringah Avenue South / Warwilla Avenue and Neringah Avenue South / Pacific Highway both retain the same worst movement Levels of Service under future conditions with minimal delays and additional capacity, indicating that there will be no adverse traffic impact on the road network as a result of the proposed development. As there are no adverse impacts expected to occur, no additional road infrastructure or impact mitigation measures are necessary.

## **6 CONSTRUCTION TRAFFIC MANAGEMENT PLAN**

Typically, after the development application stage a detailed Construction Traffic Management Plan is provided at the construction certificate stage prior to construction and as part of a consent condition, to be approved by NSW Department of Planning and Environment (DPE). Once a builder has been engaged, confirmation of the number of staff and construction vehicles can be provided and assessed (if required). Construction vehicular traffic is temporary in nature and is not expected to exceed the operating capacities of nearby intersections or be substantially greater than the assessed operation of the proposed development as detailed within this report.

Generally during construction, staff traffic will arrive to the site around 7:00am and depart the site around 5:00pm (or earlier), Monday to Saturday, with construction deliveries provided throughout the day. Considering the location and constraints of the site and surrounding environs, it is considered that some construction staff may be able to utilise any available parking within the basement of the existing HammondCare building located to the western end of the site. Otherwise, staff car parking will need to park on-street within the available unrestricted parking areas until such time as the proposed basement car parking area is available to utilise for staff car parking. The site manager is to promote the use of carpooling amongst staff and public transport usage to reduce the construction staff on-street car parking demand. It is highly unlikely that heavy construction traffic in conjunction with staff traffic will exceed the assessed 27 peak hour movements.

Considering the location and constraint of the site and surrounding environs, it is considered that some construction vehicle access may be able to be achieved via the existing and proposed driveway locations through reverse-in, forward out manoeuvres as there appears to be insufficient areas to accommodate the turning around of construction vehicles on site. However, as the construction progresses, some construction vehicles may require access via a proposed Works Zone from Neringah Avenue South. Once a builder is engaged, the methodology of the build will be detailed within a detailed Construction Traffic Management Plan (CTMP), to be approved by DPE.

Suitable hoarding will need to be installed along pedestrian paths to maintain pedestrian routes or provide detours where necessary. During operation of any Works Zone, it is likely the TfNSW accredited Traffic Controllers will be required to monitor and assist pedestrians with appropriate access around the site. Further, it is recommended that all construction vehicular traffic be restricted to occur outside of peak school drop-off and pick-up periods to minimise pedestrian impacts on pedestrian activity associated with the nearby school.

Based upon the above methodology there will be no impact to existing public transport facilities, namely bus and train facilities. Temporary loss of parking would occur along Neringah Avenue South due to the implementation of a Works Zone and there will be no major detours for pedestrians or cyclists.

In the event that a mobile crane / tower crane is required for the site, it is expected that this will be delivered to the site outside of peak operating hours of the surrounding road network such that it can be installed from Neringah Avenue South. The delivery and approval of any mobile crane / tower crane is subject to a separate application to Council.

Clarification on construction vehicle movements, staff numbers and methodology will need to be confirmed with the builder during the submission of a detailed construction traffic management plan during the construction certificate stage as part of a consent condition as mentioned previously.

All persons entering the site must report to the site office and be inducted into the site prior to entering the construction site as per standard OH&S requirements. The public can notify DPE of any incidents or complaints through DPE's "Report an Issue" process. DPE can then make direct contact with the Contractor responsible for the site under legislation. The Contractor will be required to maintain a register of all incidents and complaints, their status, actions and resolution.

The haulage route for construction vehicles will be assessed within the detailed Construction Traffic Management Plan. Pacific Highway is a TfNSW Classified State Highway and a 26m B-Double approved route such that it is likely that all construction traffic will utilise this road to travel to / from the surrounding road network.

Heavy vehicles exiting the site will pass over cattle grids installed within the site and tyres will be washed down to remove any excess sediment. Roads will be swept and cleared where spoil has been tracked out as required. Silt protection and / or bund walls will be installed along the perimeter fencing and to all stormwater drains and pits.

## 7 **CONCLUSION**

In view of the foregoing, the subject Wahroonga Seniors Living / Aged Care Development - Stage 2 proposal at 4-10 Neringah Avenue South, Wahroonga (as depicted in **Annexure A**) is fully supportable in terms of its traffic and parking impacts subject to the required changes detailed in **Section 3.8**. The following outcomes of this traffic and parking impact assessment are relevant to note:

- The proposal requires the provision of **43 to 95** car parking spaces and one (1) ambulance space, in accordance with the relevant controls applicable to the development, including Council's DCP requirements and *SEPP (Housing for Seniors) 2004*.
- Council's DCP does not require the provision of bicycle and motorcycle parking facilities.
- The proposed plans have been assessed against the relevant sections of *AS2890.1*, *AS2890.2* and *AS2890.6* and have been found to satisfy the objectives of each standard, subject to the required changes and insufficient information detailed in **Section 3.8**. The required changes can be required to be made during the detailed design that will occur at the Construction Certificate stage of the development.
- During a visit to the site, it was noted that sight lines at the proposed driveway locations are potentially restricted due to the presence of shrubs within the Council verge adjacent to the driveway. As a result, it is likely that some of these trees will be required to be removed or relocated to ensure sufficient sight lines can be achieved from the proposed driveways.
- All waste collection, deliveries and emergency services (ambulance) will utilise the loading area in the basement area accessed via the single lane loading driveway.
- As part of the assessment, consideration was made to the provision of a zebra pedestrian crossing to provide connection to the Archdale Walk on the eastern side of Neringah Avenue South. The vehicular volumes along Neringah Avenue South do not satisfy the warrant values of TfNSW's *Supplement to AS1742.10-2009* for a pedestrian crossing in any peak hourly period such that the provision of a pedestrian crossing at the proposed location is not warranted.
- An alternative to a zebra pedestrian crossing is a pedestrian refuge, although is not considered mandatory and is subject to approval by Council's Local traffic Committee.
- The traffic generation of the proposed development has been estimated to be some **28** trips. The impacts of the traffic generation have been modelled using SIDRA INTERSECTION 9.0, indicating that there will be no detrimental impact to the performance of the intersections or on residential amenity surrounding the site as a result of the generated traffic.





**ANNEXURE A: PROPOSED PLANS  
(4 SHEETS)**



Number	Name
B2.01	LIFT LOBBY
B2.03	STORE
B2.04	SPARE
B2.05	STORAGE
B2.06	PUMP ROOM
B2.07	COMMS
B2.08	MECH PLANT
B2.09	STORE
B2.10	STORE
B2.11	EXHAUST FAN ROOM
B2.12	LIFT LOBBY
B2.13	DB
L.01	LIFT 01
L.02	LIFT 02
L.03	LIFT 03
L.04	LIFT 04
MR	MECH RISER
S.02	STAIR 02
S.03	STAIR 03
S.04	STAIR 04

- 12 x

SENIORS LIVING

AS 2890.6 COMPLIANT CAR SPACES
- 26 x

VISITOR CAR SPACES

AS 2890.6 COMPLIANT
- 92 x

HAMMOND CARE/STAFF CAR SPACES
- 1 x

CAR WASH BAY
- TOTAL 130 CAR SPACES

16 CAR SPACES

AS 2890.6 COMPLIANT

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CLIENT:

HammondCare

Champion Life

PROJECT: 01368

WAHROONGA STAGE 2

4-12 NERINGAH AVE S,

WAHROONGA NSW 2076

DRAWING TITLE:

FLOOR PLAN - BASEMENT 2

DATE: OCT 2022

CHECKED: BF

DRAWN: RW, JC, SB

SCALE: 1 : 200 @ A1

DRAWING: DG-03-01

REVISION: P8

10/11/2022 5:19:12 PM

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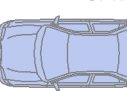


Number	Name
B1.02	STORAGE
B1.03	BIN STORE - APT
B1.04	LIFT LOBBY
B1.05	LIFT LOBBY
B1.06	MSSB
B1.07	BACK OF HOUSE
B1.08	STORAGE
B1.10	CENTRAL UPS ROOM
B1.11	BOH LOBBY
B1.14	STAFF ROOM
B1.15	ACC WC
B1.16	AMB WC
B1.17	AMB WC
B1.18	COMMERCIAL KITCHEN
B1.19	COLD ROOM
B1.20	COLD ROOM
B1.21	SA FAN ROOM
B1.23	SPRINKLER PUMP ROOM
B1.24	LOADING DOCK
B1.25	BIN STORE
B1.26	PALL CARE STORE
B1.27	RESI CARE STORE
B1.28	MAINT. WSHOP
B1.29	BACKUP GENERATOR
B1.30	EXHAUST FAN ROOM
B1.31	RESI CARE STORE
B1.32	PALL CARE STORE
B1.33	BOH LOBBY
B1.34	CLEAN STORE
B1.35	STORE
CHUTE	CHUTES
DB	DB
HR	HYD RISER
L.05	BOH LIFT
L.06	BOH LIFT
MR	MECH RISER
S.01	STAIR 01

- 12 x

SENIORS LIVING

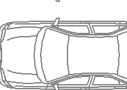
AS 2890.6 COMPLIANT CAR SPACES


- 26 x

VISITOR CAR SPACES


- 92 x

HAMMOND CARE/STAFF CAR SPACES


- 1 x

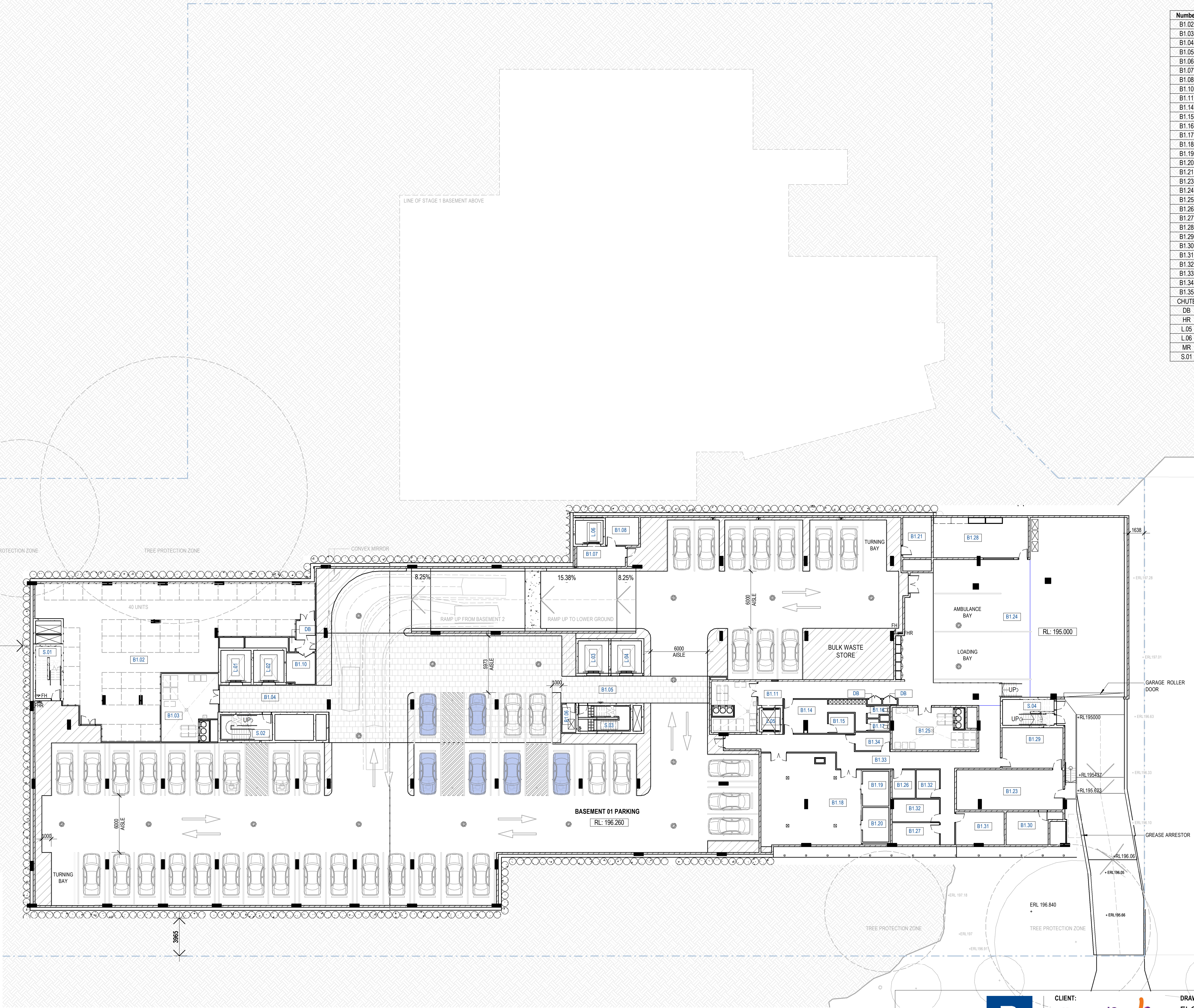
CAR WASH BAY


- TOTAL 130 CAR SPACES

AS 2890.6 COMPLIANT

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PROJECT: 01368

WAHROONGA STAGE 2

4-12 NERINGAH AVE S,

WAHROONGA NSW 2076

DRAWING TITLE:

FLOOR PLAN - BASEMENT 1

DATE: OCT 2022

CHECKED: BF

DRAWN: RW, JC

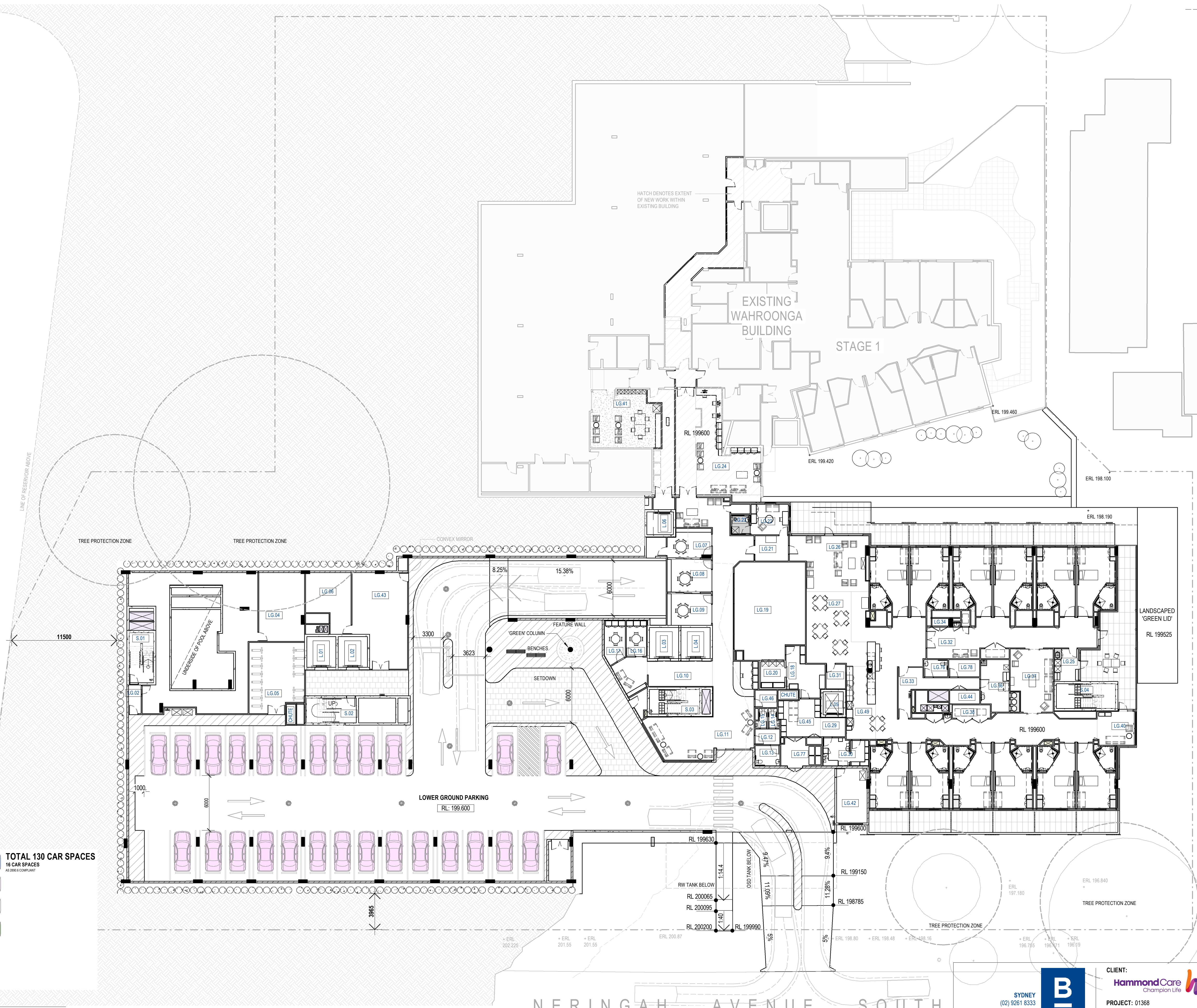
SCALE: 1 : 200 @ A1

REVISION:

DG-03-02 P11



Number	Name
DB	DB
HR	HYD RISER
LG.01	BOH STORE
LG.02	STAFF ROOM
LG.03	SITTING
LG.04	POOL PLANT
LG.05	BIKE STORE
LG.06	MAIN COMMS ROOM
LG.07	FUNCTION ROOM
LG.08	FUNCTION ROOM
LG.09	FUNCTION ROOM
LG.10	LIFT LOBBY
LG.11	RECEPTION & WAITING
LG.12	AIRLOCK
LG.13	ACC WC
LG.14	AMB
LG.15	AMB
LG.16	FAMILY RM
LG.17	MTG
LG.18	DEBOXING
LG.19	SHOP
LG.20	COLD ROOM
LG.21	VEST.
LG.22	PARLOUR
LG.23	PARL. WC
LG.24	LIBRARY
LG.25	LAUNDRY
LG.26	LOUNGE
LG.27	DINING
LG.29	BOH CORRIDOR
LG.30	PANTRY
LG.31	DIN WC
LG.32	CORRIDOR
LG.33	BOH
LG.34	LINEN
LG.36	DIRTY
LG.37	TV RM
LG.38	LIFTER BAY
LG.39	LINEN
LG.40	SITTING
LG.41	STAFF ROOM
LG.42	FAN ROOM
LG.43	MAIN SWITCH ROOM
LG.44	COMMS
LG.45	CLEAN STORE
LG.46	STORE
LG.47	STORE
LG.48	STORE
LG.49	KITCHEN
LG.50	BEDROOM
LG.51	BEDROOM
LG.52	BEDROOM
LG.53	BEDROOM
LG.54	BEDROOM
LG.55	BEDROOM
LG.56	BEDROOM
LG.57	BEDROOM
LG.58	BEDROOM
LG.59	BEDROOM
LG.60	BEDROOM
LG.61	BEDROOM
LG.62	ENSUITE
LG.63	ENSUITE
LG.64	ENSUITE
LG.65	ENSUITE
LG.66	ENSUITE
LG.67	ENSUITE
LG.68	ENSUITE
LG.69	ENSUITE
LG.70	ENSUITE
LG.71	ENSUITE
LG.72	ENSUITE
LG.73	ENSUITE
LG.74	STORE
LG.75	LIFTER BAY
LG.76	STAFF WC
LG.77	BIN STORE
LG.78	STORE
LG.79	LIFTER BAY
MR	



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Champion Life  
PROJECT: 01368  
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4-12 NERINGAH AVE S,  
WAHROONGA NSW 2076

DRAWING TITLE:  
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GROUND**  
DATE: OCT 2022 SCALE: 1:200 @ A1  
CHECKED: BF DRAWING: REVISION:  
DRAWN: RW, JC DG-03-03 P10





1:200

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CLIENT:

PROJECT: 01358  
WAHROONGA STAGE 2  
4-12 NERINGAH AVE S,  
WAHROONGA NSW 2076

DRAWING TITLE:  
CONSTRUCTION DETAILS -  
BUILDING SECTIONS - SHEET 1

DATE: 03/14/22 CHECKED: Checker

SCALE: 1 : 200

REVISION: DRAWING: AR-DG-30-01

27/10/2022 3:03:35 PM





**ANNEXURE B: TRAFFIC SURVEY DATA  
(2 SHEETS)**

# TRANS TRAFFIC SURVEY

## TURNING MOVEMENT SURVEY

trafficsurvey.com.au



### Intersection of Warwilla Ave and Laneway, Wahroonga

GPS -33.716554, 151.115211

Date: Tue 01/06/21  
Weather: Fine  
Suburban: Wahroonga  
Customer: McLaren

North: Laneway  
East: Warwilla Ave  
South: Neringah Ave S  
West: Warwilla Ave

Survey AM: 7:00 AM-9:30 AM  
Period PM: 2:30 PM-6:00 PM  
Traffic AM: 7:30 AM-8:30 AM  
Peak PM: 2:45 PM-3:45 PM

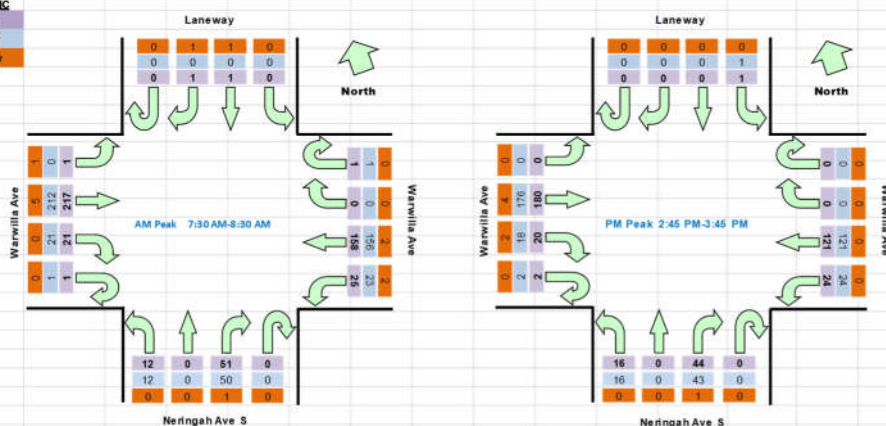
#### All Vehicles

Time		North Approach Laneway				East Approach Warwilla Ave				South Approach Neringah Ave S				West Approach Warwilla Ave				Hourly	Total
Period Start	Period End	U	R	SB	L	U	R	WB	L	U	R	NB	L	U	R	EB	L	Hour	Peak
7:00	7:15	0	0	0	0	0	0	19	4	0	10	0	0	1	1	4	0	353	
7:15	7:30	0	1	0	0	0	0	26	1	0	11	1	0	1	3	21	0	467	
7:30	7:45	0	0	0	0	0	0	49	7	0	15	0	1	0	4	28	0	489	Peak
7:45	8:00	0	0	0	0	1	0	46	9	0	13	0	4	1	5	66	0	425	
8:00	8:15	0	1	1	0	0	0	45	2	0	12	0	3	0	10	78	1	330	
8:15	8:30	0	0	0	0	0	0	18	7	0	11	0	4	0	2	45	0	216	
8:30	8:45	0	0	0	1	0	0	10	5	0	9	0	0	0	1	13	1	151	
8:45	9:00	0	0	1	1	1	0	10	5	0	13	1	1	0	1	16	0		
9:00	9:15	0	0	0	0	0	0	13	4	0	15	0	0	0	1	6	0		
9:15	9:30	0	0	0	0	1	0	5	3	0	6	0	1	0	0	6	0		
14:30	14:45	0	0	0	0	0	0	29	3	0	8	0	0	1	1	12	0	384	
14:45	15:00	0	0	0	1	0	0	30	7	0	10	0	5	1	1	22	0	408	Peak
15:00	15:15	0	0	0	0	0	0	43	5	0	7	0	5	0	7	40	0	384	
15:15	15:30	0	0	0	0	0	0	37	5	0	15	0	3	0	5	81	0	316	
15:30	15:45	0	0	0	0	0	0	11	7	0	12	0	3	1	7	37	0	225	
15:45	16:00	0	0	0	0	2	1	16	8	0	9	0	1	0	2	14	0	203	
16:00	16:15	0	1	0	0	0	1	6	3	0	11	0	0	0	1	16	0	225	
16:15	16:30	0	1	0	0	0	0	12	4	0	16	0	0	0	1	21	0	250	
16:30	16:45	0	0	0	0	1	1	17	3	0	14	0	0	0	0	20	0	242	
16:45	17:00	0	0	0	0	0	0	19	6	0	17	0	1	0	0	32	0	249	
17:00	17:15	0	2	0	0	1	1	12	6	0	12	0	0	0	1	29	0	225	
17:15	17:30	0	0	0	0	0	2	8	3	0	12	0	1	0	0	21	0		
17:30	17:45	0	0	0	0	0	0	17	4	0	14	0	1	0	1	26	0		
17:45	18:00	0	0	0	0	1	0	17	2	0	12	0	1	0	0	18	0		

Peak Time		North Approach Laneway				East Approach Warwilla Ave				South Approach Neringah Ave S				West Approach Warwilla Ave				Peak
Period Start	Period End	U	R	SB	L	U	R	WB	L	U	R	NB	L	U	R	EB	L	total
7:30	8:30	0	1	1	0	1	0	158	25	0	51	0	12	1	21	217	1	489
14:45	15:45	0	0	0	1	0	0	121	24	0	44	0	16	2	20	180	0	408

Note: Site sketch is for illustrating traffic flows. Direction is indicative only, drawing is not to scale and not an exact streets configuration.

Graphic  
Total  
Light  
Heavy



# TRANS TRAFFIC SURVEY

## TURNING MOVEMENT SURVEY

trafficsurvey.com.au



### Intersection of Pacific Hwy and Neringah Ave S, Wahroona

GPS -33.719037, 151.114683

Date:	Tue 01/06/21
Weather:	Fine
Suburban:	Wahroonga
Customer:	McLaren

North:	Neringah Ave S
East:	Pacific Hwy
South:	N/A
West:	Pacific Hwy

Survey	AM:	7:00 AM-9:30 AM
Period	PM:	2:30 PM-6:00 PM
Traffic	AM:	7:15 AM-8:15 AM
Peak	PM:	4:15 PM-5:15 PM

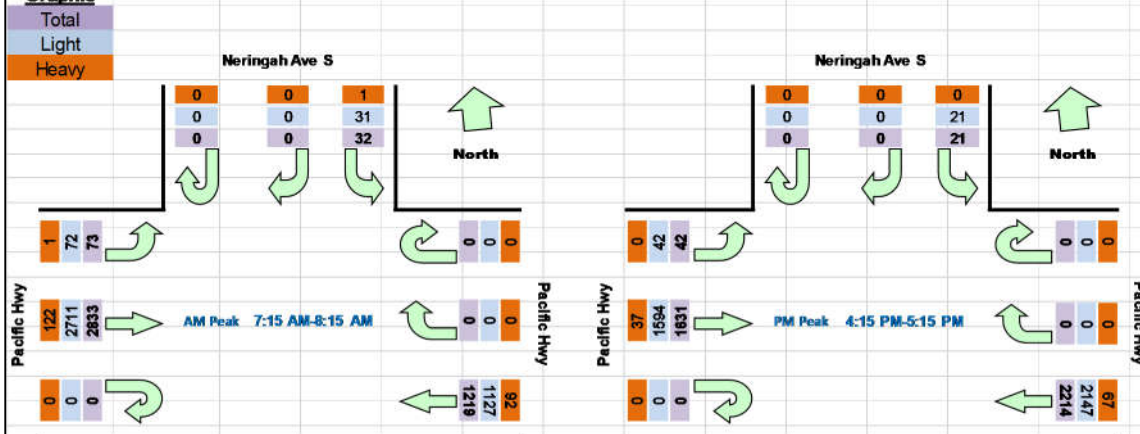
#### All Vehicles

Time		North Approach Neringah Ave			East Approach Pacific Hwy			West Approach Pacific Hwy			Hourly Total	
Period Start	Period End	U	R	L	U	R	WB	U	EB	L	Hour	Peak
7:00	7:15	0	0	2	0	0	265	0	733	9	4131	
7:15	7:30	0	0	5	0	0	322	0	806	18	4157	Peak
7:30	7:45	0	0	6	0	0	290	0	697	15	4000	
7:45	8:00	0	0	8	0	0	275	0	657	23	3917	
8:00	8:15	0	0	13	0	0	332	0	673	17	3682	
8:15	8:30	0	0	10	0	0	319	0	651	14	3378	
8:30	8:45	0	0	1	0	0	313	0	603	8	3136	
8:45	9:00	0	0	5	0	0	235	0	472	16		
9:00	9:15	0	0	2	0	0	236	0	478	15		
9:15	9:30	0	0	2	0	0	265	0	480	5		
14:30	14:45	0	0	2	0	0	431	0	436	7	3458	
14:45	15:00	0	0	4	0	0	407	0	385	10	3496	
15:00	15:15	0	0	9	0	0	425	0	380	10	3586	
15:15	15:30	0	0	10	0	0	499	0	430	13	3719	
15:30	15:45	0	0	12	0	0	489	0	405	8	3783	
15:45	16:00	0	0	6	0	0	540	0	342	8	3817	
16:00	16:15	0	0	5	0	0	556	0	388	8	3894	
16:15	16:30	0	0	2	0	0	560	0	444	10	3908	Peak
16:30	16:45	0	0	6	0	0	554	0	376	12	3804	
16:45	17:00	0	0	8	0	0	557	0	397	11	3819	
17:00	17:15	0	0	5	0	0	543	0	414	9	3713	
17:15	17:30	0	0	4	0	0	474	0	422	12		
17:30	17:45	0	0	2	0	0	550	0	398	13		
17:45	18:00	0	0	2	0	0	502	0	353	10		

Peak Time		North Approach Neringah Ave			East Approach Pacific Hwy			West Approach Pacific Hwy			Peak total
Period Start	Period End	U	R	L	U	R	WB	U	EB	L	
7:15	8:15	0	0	32	0	0	1219	0	2833	73	4157
16:15	17:15	0	0	21	0	0	2214	0	1631	42	3908

Note: Site sketch is for illustrating traffic flows. Direction is indicative only, drawing is not to scale and not an exact streets configuration.

#### Graphic





**ANNEXURE C: SIDRA RESULTS  
(8 SHEETS)**

# MOVEMENT SUMMARY

▼ Site: 101v [EX AM - Neringah Avenue South / Warwilla Avenue (Site Folder: General)]

Intersection of Neringah Avenue South and Warwilla Avenue  
Existing Conditions  
AM Peak Periods  
Site Category: (None)  
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV ] veh/h	[ Total veh/h	HV ] %				[ Veh. veh	Dist ] m				
South: Neringah Avenue South (S)														
1	L2	13	0	14	0.0	0.013	5.8	LOS A	0.0	0.3	0.15	0.54	0.15	53.2
2	T1	1	0	1	0.0	0.013	8.1	LOS A	0.0	0.3	0.15	0.54	0.15	53.7
3	R2	51	1	54	2.0	0.104	10.2	LOS A	0.4	2.8	0.54	0.75	0.54	50.1
Approach		65	1	68	1.5	0.104	9.3	LOS A	0.4	2.8	0.45	0.71	0.45	50.8
East: Warwilla Avenue (E)														
4	L2	25	2	26	8.0	0.051	5.6	LOS A	0.0	0.0	0.00	0.16	0.00	56.7
5	T1	158	2	166	1.3	0.051	0.0	LOS A	0.0	0.1	0.01	0.07	0.01	59.3
6	R2	1	0	1	0.0	0.051	6.5	LOS A	0.0	0.1	0.01	0.01	0.01	58.3
Approach		184	4	194	2.2	0.051	0.8	NA	0.0	0.1	0.00	0.08	0.00	59.0
North: Work Site Driveway (N)														
7	L2	1	0	1	0.0	0.002	6.0	LOS A	0.0	0.1	0.31	0.52	0.31	52.5
8	T1	1	0	1	0.0	0.002	8.1	LOS A	0.0	0.1	0.34	0.53	0.34	52.7
9	R2	1	0	1	0.0	0.002	9.5	LOS A	0.0	0.1	0.51	0.59	0.51	50.8
Approach		3	0	3	0.0	0.002	7.9	LOS A	0.0	0.1	0.39	0.55	0.39	52.0
West: Warwilla Road (W)														
10	L2	1	0	1	0.0	0.069	5.6	LOS A	0.0	0.0	0.00	0.00	0.00	58.3
11	T1	217	5	228	2.3	0.069	0.1	LOS A	0.2	1.2	0.05	0.05	0.05	59.3
12	R2	21	0	22	0.0	0.069	6.3	LOS A	0.2	1.2	0.13	0.11	0.13	56.9
Approach		239	5	252	2.1	0.069	0.7	NA	0.2	1.2	0.06	0.05	0.06	59.1
All Vehicles		491	10	517	2.0	0.104	1.9	NA	0.4	2.8	0.09	0.15	0.09	57.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).  
Vehicle movement LOS values are based on average delay per movement.  
Minor Road Approach LOS values are based on average delay for all vehicle movements.  
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.  
Delay Model: SIDRA Standard (Geometric Delay is included).  
Queue Model: SIDRA Standard.  
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).  
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.



# MOVEMENT SUMMARY

▼ Site: 101v [EX PM - Neringah Avenue South / Warwilla Avenue (Site Folder: General)]

Intersection of Neringah Avenue South and Warwilla Avenue  
Existing Conditions  
PM Peak Period  
Site Category: (None)  
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV ] veh/h	[ Total veh/h	HV ] %				[ Veh. veh	Dist ] m				
South: Neringah Avenue South (S)														
1	L2	16	0	17	0.0	0.015	5.7	LOS A	0.1	0.4	0.12	0.54	0.12	53.3
2	T1	1	0	1	0.0	0.015	7.3	LOS A	0.1	0.4	0.12	0.54	0.12	53.7
3	R2	44	1	46	2.3	0.080	9.1	LOS A	0.3	2.2	0.49	0.69	0.49	50.9
Approach		61	1	64	1.6	0.080	8.1	LOS A	0.3	2.2	0.39	0.65	0.39	51.6
East: Warwilla Avenue (E)														
4	L2	24	0	25	0.0	0.040	5.5	LOS A	0.0	0.0	0.00	0.20	0.00	56.7
5	T1	121	0	127	0.0	0.040	0.0	LOS A	0.0	0.1	0.01	0.08	0.01	59.2
6	R2	1	0	1	0.0	0.040	6.3	LOS A	0.0	0.1	0.01	0.01	0.01	58.2
Approach		146	0	154	0.0	0.040	1.0	NA	0.0	0.1	0.01	0.10	0.01	58.8
North: Work Site Driveway (N)														
7	L2	1	0	1	0.0	0.002	5.9	LOS A	0.0	0.1	0.27	0.51	0.27	52.9
8	T1	1	0	1	0.0	0.002	7.3	LOS A	0.0	0.1	0.31	0.52	0.31	53.0
9	R2	1	0	1	0.0	0.002	8.6	LOS A	0.0	0.1	0.47	0.57	0.47	51.5
Approach		3	0	3	0.0	0.002	7.3	LOS A	0.0	0.1	0.35	0.53	0.35	52.5
West: Warwilla Road (W)														
10	L2	1	0	1	0.0	0.059	5.6	LOS A	0.0	0.0	0.00	0.01	0.00	58.3
11	T1	180	4	189	2.2	0.059	0.1	LOS A	0.2	1.2	0.05	0.05	0.05	59.3
12	R2	20	2	21	10.0	0.059	6.3	LOS A	0.2	1.2	0.13	0.12	0.13	56.3
Approach		201	6	212	3.0	0.059	0.7	NA	0.2	1.2	0.06	0.06	0.06	59.0
All Vehicles		411	7	433	1.7	0.080	2.0	NA	0.3	2.2	0.09	0.17	0.09	57.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).  
Vehicle movement LOS values are based on average delay per movement.  
Minor Road Approach LOS values are based on average delay for all vehicle movements.  
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.  
Delay Model: SIDRA Standard (Geometric Delay is included).  
Queue Model: SIDRA Standard.  
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).  
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

# MOVEMENT SUMMARY

 **Site: 101 [EX AM - Neringah Avenue South / Pacific Highway**  
**(Site Folder: General)]**

Intersection of Neringah Avenue South and Pacific Highway  
 Site Category: (None)  
 Stop (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV ] veh/h	[ Total veh/h	HV ] %				[ Veh. veh	Dist ] m				
East: Pacific Highway (E)														
5	T1	1219	92	1283	7.5	0.230	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		1219	92	1283	7.5	0.230	0.1	NA	0.0	0.0	0.00	0.00	0.00	59.9
North: Neringah Avenue (N)														
7	L2	32	1	34	3.1	0.127	20.6	LOS B	0.4	2.9	0.80	1.00	0.80	44.8
Approach		32	1	34	3.1	0.127	20.6	LOS B	0.4	2.9	0.80	1.00	0.80	44.8
West: Pacific Highway (W)														
10	L2	73	1	77	1.4	0.538	5.8	LOS A	0.0	0.0	0.00	0.04	0.00	57.5
11	T1	2833	122	2982	4.3	0.538	0.2	LOS A	0.0	0.0	0.00	0.01	0.00	59.4
Approach		2906	123	3059	4.2	0.538	0.4	NA	0.0	0.0	0.00	0.01	0.00	59.3
All Vehicles		4157	216	4376	5.2	0.538	0.4	NA	0.4	2.9	0.01	0.02	0.01	59.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Project: \\192.168.1.107\mte storage\Jobs\2021\210429\MTE SIDRA\21 06 10.sip9

# MOVEMENT SUMMARY

 **Site: 101 [EX PM - Neringah Avenue South / Pacific Highway**  
**(Site Folder: General)]**

Intersection of Neringah Avenue South and Pacific Highway  
Existing Conditions  
PM Peak Period  
Site Category: (None)  
Stop (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV ] veh/h	[ Total veh/h	HV ] %				[ Veh. veh	Dist ] m				
East: Pacific Highway (E)														
5	T1	2214	67	2331	3.0	0.406	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.7
Approach		2214	67	2331	3.0	0.406	0.1	NA	0.0	0.0	0.00	0.00	0.00	59.7
North: Neringah Avenue (N)														
7	L2	32	1	34	3.1	0.057	12.0	LOS A	0.2	1.4	0.53	0.95	0.53	49.7
Approach		32	1	34	3.1	0.057	12.0	LOS A	0.2	1.4	0.53	0.95	0.53	49.7
West: Pacific Highway (W)														
10	L2	42	0	44	0.0	0.306	5.6	LOS A	0.0	0.0	0.00	0.05	0.00	57.8
11	T1	1631	37	1717	2.3	0.306	0.1	LOS A	0.0	0.0	0.00	0.01	0.00	59.7
Approach		1673	37	1761	2.2	0.306	0.2	NA	0.0	0.0	0.00	0.01	0.00	59.6
All Vehicles		3919	105	4125	2.7	0.406	0.3	NA	0.2	1.4	0.00	0.01	0.00	59.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).  
Vehicle movement LOS values are based on average delay per movement.  
Minor Road Approach LOS values are based on average delay for all vehicle movements.  
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.  
Delay Model: SIDRA Standard (Geometric Delay is included).  
Queue Model: SIDRA Standard.  
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).  
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

# MOVEMENT SUMMARY

▼ Site: 101v [FU AM - Neringah Avenue South / Warwilla Avenue (Site Folder: General)]

Intersection of Neringah Avenue South and Warwilla Avenue  
 Future Conditions  
 AM Peak Period  
 Site Category: (None)  
 Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV ] veh/h	[ Total veh/h	HV ] %				[ Veh. veh	Dist ] m				
South: Neringah Avenue South (S)														
1	L2	13	0	14	0.0	0.013	5.8	LOS A	0.0	0.3	0.15	0.54	0.15	53.2
2	T1	1	0	1	0.0	0.013	8.1	LOS A	0.0	0.3	0.15	0.54	0.15	53.7
3	R2	63	1	66	1.6	0.129	10.3	LOS A	0.5	3.5	0.55	0.76	0.55	50.1
Approach		77	1	81	1.3	0.129	9.5	LOS A	0.5	3.5	0.47	0.72	0.47	50.6
East: Warwilla Avenue (E)														
4	L2	28	2	29	7.1	0.052	5.6	LOS A	0.0	0.0	0.00	0.18	0.00	56.6
5	T1	158	2	166	1.3	0.052	0.0	LOS A	0.0	0.1	0.01	0.08	0.01	59.3
6	R2	1	0	1	0.0	0.052	6.5	LOS A	0.0	0.1	0.01	0.01	0.01	58.3
Approach		187	4	197	2.1	0.052	0.9	NA	0.0	0.1	0.00	0.09	0.00	58.9
North: Work Site Driveway (N)														
7	L2	1	0	1	0.0	0.002	6.0	LOS A	0.0	0.1	0.31	0.52	0.31	52.5
8	T1	1	0	1	0.0	0.002	8.1	LOS A	0.0	0.1	0.34	0.53	0.34	52.7
9	R2	1	0	1	0.0	0.002	9.5	LOS A	0.0	0.1	0.51	0.59	0.51	50.8
Approach		3	0	3	0.0	0.002	7.9	LOS A	0.0	0.1	0.39	0.55	0.39	52.0
West: Warwilla Road (W)														
10	L2	1	0	1	0.0	0.069	5.6	LOS A	0.0	0.0	0.00	0.00	0.00	58.3
11	T1	217	5	228	2.3	0.069	0.1	LOS A	0.2	1.2	0.06	0.05	0.06	59.3
12	R2	21	0	22	0.0	0.069	6.3	LOS A	0.2	1.2	0.13	0.11	0.13	56.9
Approach		239	5	252	2.1	0.069	0.7	NA	0.2	1.2	0.06	0.05	0.06	59.1
All Vehicles		506	10	533	2.0	0.129	2.1	NA	0.5	3.5	0.10	0.17	0.10	57.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).  
 Vehicle movement LOS values are based on average delay per movement.  
 Minor Road Approach LOS values are based on average delay for all vehicle movements.  
 NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.  
 Delay Model: SIDRA Standard (Geometric Delay is included).  
 Queue Model: SIDRA Standard.  
 Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).  
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

# MOVEMENT SUMMARY

▼ Site: 101v [FU PM - Neringah Avenue South / Warwilla Avenue (Site Folder: General)]

Intersection of Neringah Avenue South and Warwilla Avenue  
 Future Conditions  
 PM Peak Period  
 Site Category: (None)  
 Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV ] veh/h	[ Total veh/h	HV ] %				[ Veh. veh	Dist ] m				
South: Neringah Avenue South (S)														
1	L2	16	0	17	0.0	0.015	5.7	LOS A	0.1	0.4	0.11	0.54	0.11	53.3
2	T1	1	0	1	0.0	0.015	7.4	LOS A	0.1	0.4	0.11	0.54	0.11	53.8
3	R2	49	1	52	2.0	0.089	9.1	LOS A	0.3	2.4	0.49	0.70	0.49	50.9
Approach		66	1	69	1.5	0.089	8.3	LOS A	0.3	2.4	0.39	0.66	0.39	51.5
East: Warwilla Avenue (E)														
4	L2	32	0	34	0.0	0.042	5.6	LOS A	0.0	0.0	0.00	0.25	0.00	56.3
5	T1	121	0	127	0.0	0.042	0.0	LOS A	0.0	0.1	0.01	0.10	0.01	59.1
6	R2	1	0	1	0.0	0.042	6.3	LOS A	0.0	0.1	0.01	0.01	0.01	58.2
Approach		154	0	162	0.0	0.042	1.2	NA	0.0	0.1	0.00	0.13	0.00	58.5
North: Work Site Driveway (N)														
7	L2	1	0	1	0.0	0.002	5.9	LOS A	0.0	0.1	0.27	0.52	0.27	52.8
8	T1	1	0	1	0.0	0.002	7.4	LOS A	0.0	0.1	0.31	0.53	0.31	53.0
9	R2	1	0	1	0.0	0.002	8.6	LOS A	0.0	0.1	0.47	0.57	0.47	51.5
Approach		3	0	3	0.0	0.002	7.3	LOS A	0.0	0.1	0.35	0.54	0.35	52.4
West: Warwilla Road (W)														
10	L2	1	0	1	0.0	0.059	5.6	LOS A	0.0	0.0	0.00	0.01	0.00	58.3
11	T1	180	4	189	2.2	0.059	0.1	LOS A	0.2	1.2	0.05	0.05	0.05	59.3
12	R2	20	2	21	10.0	0.059	6.3	LOS A	0.2	1.2	0.13	0.12	0.13	56.3
Approach		201	6	212	3.0	0.059	0.8	NA	0.2	1.2	0.06	0.06	0.06	59.0
All Vehicles		424	7	446	1.7	0.089	2.1	NA	0.3	2.4	0.10	0.18	0.10	57.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).  
 Vehicle movement LOS values are based on average delay per movement.  
 Minor Road Approach LOS values are based on average delay for all vehicle movements.  
 NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.  
 Delay Model: SIDRA Standard (Geometric Delay is included).  
 Queue Model: SIDRA Standard.  
 Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).  
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

# MOVEMENT SUMMARY

 **Site: 101 [FU AM - Neringah Avenue South / Pacific Highway**  
**(Site Folder: General)]**

Intersection of Neringah Avenue South and Pacific Highway  
Future Conditions  
AM Peak Period  
Site Category: (None)  
Stop (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV ] veh/h	[ Total veh/h	HV ] %				[ Veh. veh	Dist ] m				
East: Pacific Highway (E)														
5	T1	1219	92	1283	7.5	0.230	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		1219	92	1283	7.5	0.230	0.1	NA	0.0	0.0	0.00	0.00	0.00	59.9
North: Neringah Avenue (N)														
7	L2	40	1	42	2.5	0.156	20.5	LOS B	0.5	3.5	0.80	1.00	0.80	44.9
Approach		40	1	42	2.5	0.156	20.5	LOS B	0.5	3.5	0.80	1.00	0.80	44.9
West: Pacific Highway (W)														
10	L2	78	1	82	1.3	0.539	5.8	LOS A	0.0	0.0	0.00	0.05	0.00	57.5
11	T1	2833	122	2982	4.3	0.539	0.2	LOS A	0.0	0.0	0.00	0.02	0.00	59.4
Approach		2911	123	3064	4.2	0.539	0.4	NA	0.0	0.0	0.00	0.02	0.00	59.3
All Vehicles		4170	216	4389	5.2	0.539	0.5	NA	0.5	3.5	0.01	0.02	0.01	59.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).  
Vehicle movement LOS values are based on average delay per movement.  
Minor Road Approach LOS values are based on average delay for all vehicle movements.  
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.  
Delay Model: SIDRA Standard (Geometric Delay is included).  
Queue Model: SIDRA Standard.  
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).  
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.



# MOVEMENT SUMMARY

 **Site: 101 [FU PM - Neringah Avenue South / Pacific Highway**  
**(Site Folder: General)]**

Intersection of Neringah Avenue South and Pacific Highway  
Future Conditions  
PM Peak Period  
Site Category: (None)  
Stop (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV ] veh/h	[ Total veh/h	HV ] %				[ Veh. veh	Dist ] m				
East: Pacific Highway (E)														
5	T1	2214	67	2331	3.0	0.406	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.7
Approach		2214	67	2331	3.0	0.406	0.1	NA	0.0	0.0	0.00	0.00	0.00	59.7
North: Neringah Avenue (N)														
7	L2	35	1	37	2.9	0.061	11.9	LOS A	0.2	1.5	0.52	0.95	0.52	49.8
Approach		35	1	37	2.9	0.061	11.9	LOS A	0.2	1.5	0.52	0.95	0.52	49.8
West: Pacific Highway (W)														
10	L2	54	0	57	0.0	0.308	5.6	LOS A	0.0	0.0	0.00	0.06	0.00	57.7
11	T1	1631	37	1717	2.3	0.308	0.1	LOS A	0.0	0.0	0.00	0.02	0.00	59.7
Approach		1685	37	1774	2.2	0.308	0.3	NA	0.0	0.0	0.00	0.02	0.00	59.6
All Vehicles		3934	105	4141	2.7	0.406	0.3	NA	0.2	1.5	0.00	0.02	0.00	59.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).  
Vehicle movement LOS values are based on average delay per movement.  
Minor Road Approach LOS values are based on average delay for all vehicle movements.  
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.  
Delay Model: SIDRA Standard (Geometric Delay is included).  
Queue Model: SIDRA Standard.  
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).  
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.



**ANNEXURE D: GREEN TRAVEL PLAN  
(20 SHEETS)**

**GREEN TRAVEL PLAN**  
**FOR THE**  
**PROPOSED WAHROONGA SENIORS LIVING / AGED CARE**  
**DEVELOPMENT**  
**AT**  
**4-10 NERINGAH AVENUE SOUTH, WAHROONGA**

**Prepared By:**



**Assessed and Approved by:**



[www.mclarentraffic.com.au](http://www.mclarentraffic.com.au)

## 1 Introduction

McLaren Traffic Engineering (MTE) was commissioned by HammondCare to provide a Green Travel Plan (GTP) for the proposed Wahroonga Seniors Living / Aged Care Development at 4-10 Neringah Avenue South, Wahroonga.

This Green Travel Plan is developed to address an appropriate requirement within the *Secretary's Environmental Assessment Requirements* (SEARs) for SSD-45121248 that were issued on 24 June 2022, which is stated as follows:

*Proposals to promote sustainable travel choices for employees, residents, guests and visitors, such as connections into existing walking and cycling networks, minimising car parking provision, encouraging car share and public transport, providing adequate bicycle parking and high quality end-of-trip facilities, and implementing a Green Travel Plan.*

The Green Travel Plan addresses the above requirements and develops strategies to encourage the use of sustainable transport options

This Green Travel Plan (GTP) has been prepared to support the Development Application for the proposed seniors living / aged care development and outlines:

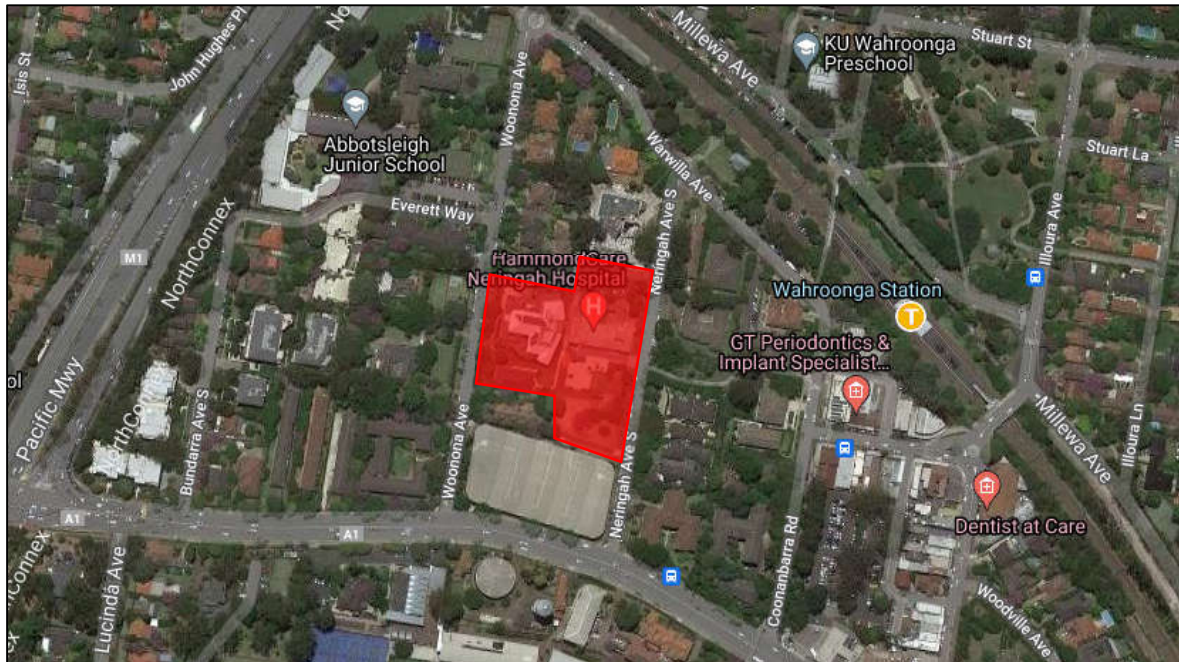
- The alternative transport options available to staff of and visitors to the development;
- Suggested initiatives to increase the use of alternative transport modes, thereby reducing private car travel;
- Sustainable transport targets and milestones and methods to measure and report on transport behaviour over time.

### 1.1 **Development Characteristics and Approvals**

The proposed Seniors Living and Aged Care development to which this GTP applies has the following characteristics:

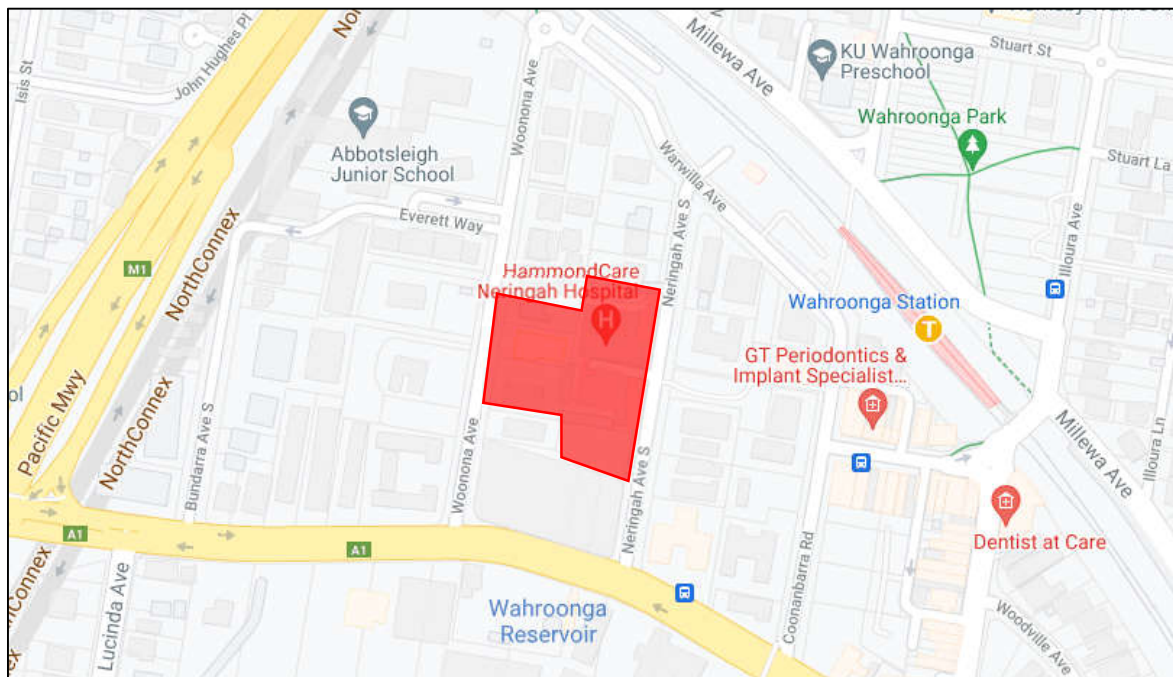
- Residential Aged Care Facility and Seniors Living buildings including:
  - 18 x beds for Palliative Care;
  - 12 x beds for Residential (Aged) Care;
  - A maximum of 41 hospital staff on site with between 22 and 41 staff expected (includes maximum staff on-site due to the change of shift);
  - 14 community staff for village facilities including (but not limited to): maintenance, kitchen staff, hairdresser
  - 57 x Seniors Living dwellings consisting of:
    - 8 x one-bedroom units;
    - 47 x two-bedroom units, and;
    - 2 x three-bedroom units.

The proposed development is located on a site bounded by Woonona Avenue to the west and Neringah Avenue South to the east. Wahroonga Train Station is located approximately 290m walking distance to the northeast. The location of the site is shown in **Figure 1** and **Figure 2** respectively.



— Site Location

**FIGURE 1: SITE CONTEXT – AERIAL PHOTO**



— Site Location

**FIGURE 2: SITE CONTEXT – STREET MAP**

## 1.2 References

A number of sources have been consulted to inform the preparation of this report including:

- NSW Premier's Council for Active Living's Workplace Travel Plan Guidelines – Final Report (April 2010)
- NSW State Government Long Term Transport Master Plan;
- Transport for NSW Future Transport Strategy 2056
- NSW Journey to Work Data from the NSW Bureau of Transport Statistics;
- ABS Census Data;
- Public Transport or Private Vehicle: Factors That Impact on Mode Choice, Grace Corpuz (Transport Data Centre, New South Wales Ministry of Transport);
- Kur-Ring-Gai Council's *Ku-ring-gai Bike Plan* dated 23 November 2012;
- Kur-Ring-Gai Council's *Cycling Ku-Ring-Gai Map*;
- *Traffic and Parking Impact Assessment* completed by *McLaren Traffic Engineering* which accompanies this Green Travel Plan.



## 2 Objectives

Alternative modes of transport including walking, cycling and public transport quantifiably promote positive transport and health outcomes. The NSW State Government *Long Term Transport Master Plan* emphasises the importance of alternative transport options in the growth of Greater Metropolitan Sydney. Further to this, the NSW State Government's *Future Transport Strategy 2056* emphasises the importance of encouraging active travel (walking and cycling) and the use of public transport.

Additionally, the *NSW Premier's Council for Active Living Workplace Travel Plan Guidance – Final Report (April 2010)* provides examples of travel plans appropriate for different size and types of employers outlining that for:

### **20-250 employees**

#### *Mainly office-based employees*

*Likely to be beneficial to form alliances with other organizations in the locality also developing a WTP [Workplace Travel Plan].*

*Could focus on key cost saving opportunities such as business travel, and reducing fleet expenses.*

#### *Employees mainly working unsociable hours / shifts*

*May initially seem to be limited opportunities to encourage people onto non-car forms of transport.*

*Consider focusing on making access to public transport safer & easier*

*May also be opportunities to promoting car sharing (for those on matching shifts), but will need 'emergency rides home' support.*

It is in line with this guidance for businesses of between 20 – 250 employees that this Green Travel Plan has been constructed. This Green Travel Plan is developed to assist in identifying a range of low-cost initiatives and promotions which will directly benefit employees and the business. This plan will help advise employees and guests of sustainable and alternative transport options, with the overall objective to shift travel from private cars to active or public transport options, with the following positive implications:

- Reduced parking demand;
- Reduced traffic congestion and trip duration;
- High benefit to cost (BCR) ratio;
- Positive health outcomes from walking and cycling;
- Improved air quality and reduced per-capita emissions.

### **3 Implementation**

#### **3.1 Management and Authority**

The distribution of and implementation of the measures detailed in this Green Travel Plan is the responsibility of the management body of the proposed seniors living / aged care development. It is the responsibility of the HammondCare management to include alternative transport methods and initiatives in the HammondCare website as well as their regular communications to staff of the Aged Care development.

Accordingly, authority is provided to the development's management to implement measures, review the plan and undertake further relevant and appropriate actions.

#### **3.2 Distribution and Implementation**

The seniors living / aged care management will be responsible to inform staff, residents and visitors about any initiatives that they choose to implement via any community website related to the development, any newsletters and any message boards accessible to staff, residents and visitors of the development. All new staff members and residents to the development should be made aware of and provided a copy of this Green Travel Plan as part of their induction process. Additionally, management should provide regular reminders and encouragement to utilise alternative transport modes.

## **4 Existing Alternate Transport Facilities**

### **4.1 Public Transport – Train Services**

Wahroonga Train Station is located approximately 290m walking distance to the north-east of the subject site, servicing the T1 North Shore & Western Line and T9 Northern Line. A train service is provided every 5 – 10 minutes in commuter peak periods and provides direct access between Berowra and Sydney CBD.

The train service has the following characteristics:

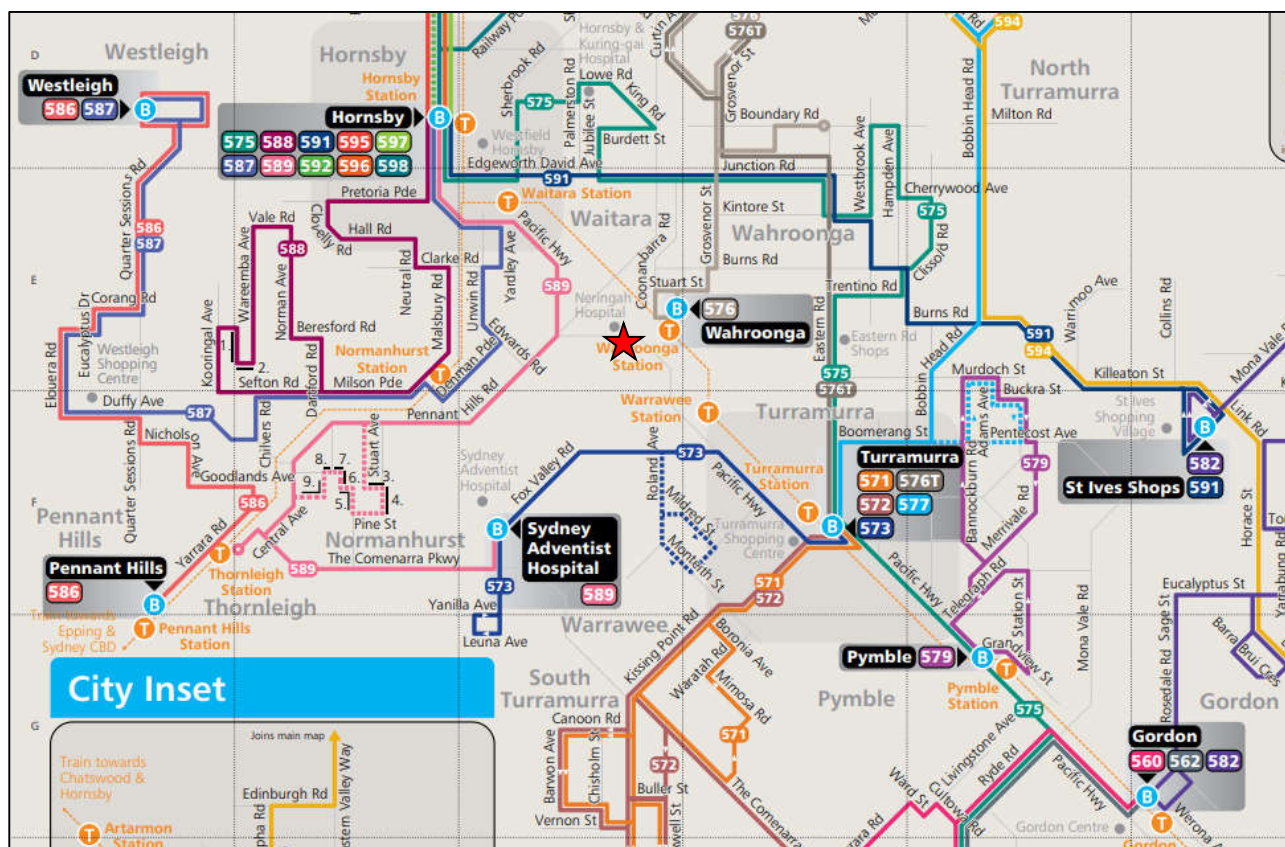
- Arriving / Departing at Wahroonga Station:
  - One (1) service every 3-6 minutes from the city during the weekday AM peak period;
  - One (1) service every 5-15 minutes from the north during the weekday AM peak period;
  - One (1) service every 3-12 minutes to the city during the weekday PM peak period;
  - One (1) service every 9-15 minutes to the north during the weekday PM peak period;
  - Provides a total of 16 services towards the Sydney CBD and 15 services to the north between 7:00am and 9:00am on weekdays;
  - Provides a total of 17 services towards the Sydney CBD and 11 services to the north between 4:00pm and 6:00pm on weekdays.

### **4.2 Public Transport - Bus Services**

The subject site has access to existing bus stop (ID: 207625) located approximately 180m walking distance to the south of site on Pacific Highway. The bus stop services existing bus route N90 (Hornsby to City Town Hall via Chatswood (Night Service)), provided by Busways North West.

The subject site also has access to existing bus stop (ID: 2076144) located approximately 400m walking distance to the east of the site on Illoura Avenue. The bus stop services existing bus route 576 (Wahroonga to North Wahroonga Loop Service), provided by Transdev NSW.

The site location subject to the surrounding public transport network is shown in **Figure 3** below.



★ Site Location

**FIGURE 3: PUBLIC TRANSPORT NETWORK MAP**

Table 1 outlines the frequency of the local bus services provided by *State Transit* which are located close to the site.

**TABLE 1: BUS ROUTE FREQUENCY**

Route	Destination	Frequency		
		8 – 9 AM peak hour	Off-Peak	5 – 6 PM peak hour <sup>(2)</sup>
N90	Hornsby to City Town Hall via Chatswood (Night Service)	N/A	60 mins <sup>(1)</sup>	N/A
576	Wahroonga to North Wahroonga (Loop Service)	10-30 mins	20-40 mins <sup>(2)</sup>	15-30 mins

Notes:

- (1) N90 service only operates from 11:40PM to 5:20AM such that the frequency during this time is described in the "Off-Peak" column.
- (2) The Off-Peak period for Route 576 has been taken as 3:30pm to 4:30pm.

As shown above the N90 Bus Route provides a bus service which is limited to hourly services during late night / early morning hours between 11:40PM and 5:20AM. The 576 bus route provides a service that is generally limited to the peak hours with AM services between 6:40AM and 9:00AM and PM services between 3:30PM and 8:00PM. The frequency of the services during the peak hours may be desirable to some users.

### 4.3 Active Transport - Walking

Pedestrian walking facilities are abundantly provided within close proximity to the site. Specific details of the walking facilities are provided below:

- Neringah Avenue South:
  - Formalised pedestrian footpath provided along both sides of the street;
- Pacific Highway:
  - Formalised pedestrian footpath provided along both sides of the street;
- Woonona Avenue:
  - Formalised pedestrian footpath provided along both sides of the street;
- Archidale Walk:
  - Pedestrian only walkway, linking Neringah Avenue to Coonanbarra Road. This provides a pedestrian link between the subject site and both the Wahroonga local centre and subsequently Wahroonga Train Station.

Accordingly, there are numerous existing pedestrian walking facilities that have been provided by the council within close proximity of the site. Employees and visitors may utilise these facilities to reduce the number of vehicles driven locally.

### 4.4 Active Transport – Cycling

The subject site has some informal bicycle facilities close to the site in the form of “Useful Unmarked Routes” in accordance with the *Cycling Ku-Ring-Gai Map* along nearby roads. These informal routes are described as:

*“mainly quieter streets that generally avoid major hills and busy roads and intersections. These are not official cycle routes but have been suggested by other cyclists.”*

Cycle paths encourage individuals to utilise bicycles as a mode to travel, reducing motor vehicle congestion and overall motor vehicle usage. The location and nature of the cycle facilities within close proximity of the site are detailed below:

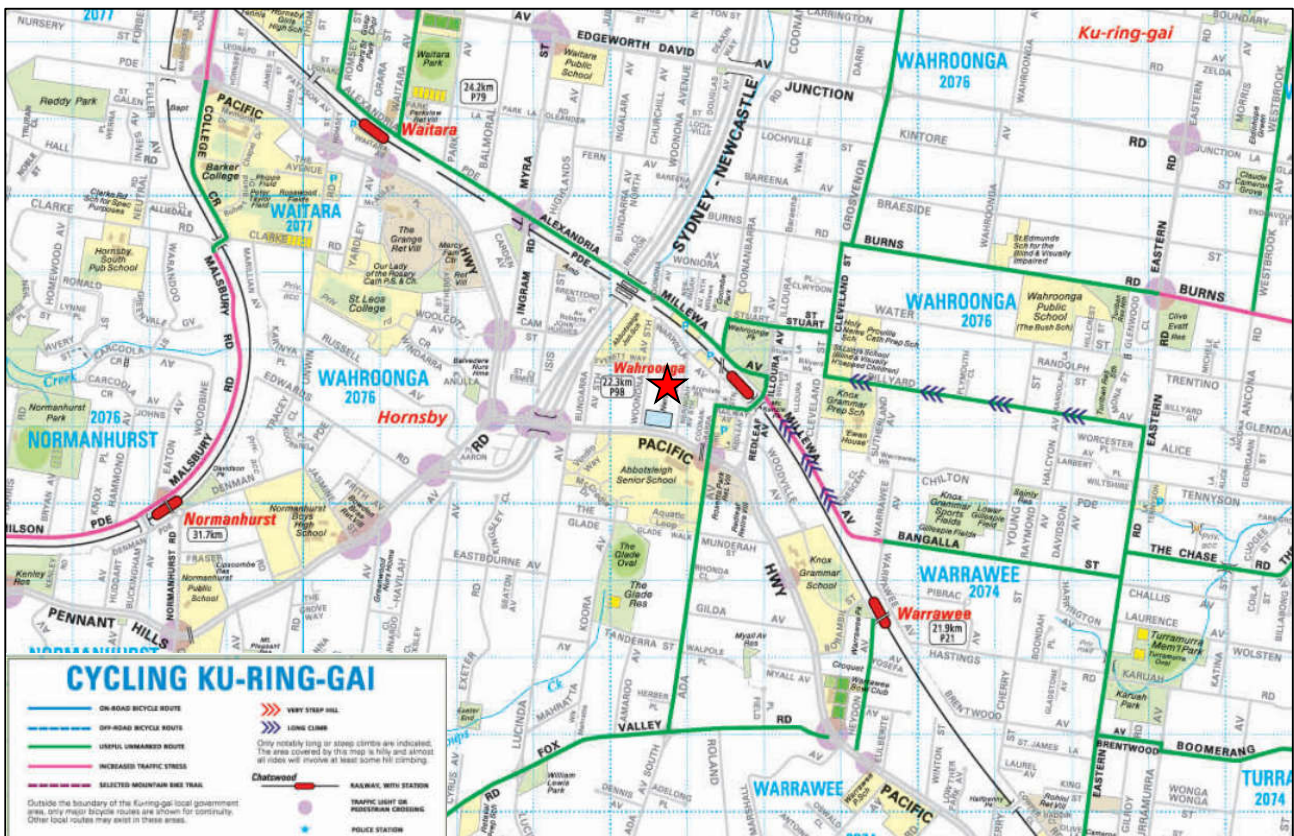
- Coonanbarra Road and Railway Avenue
  - Identified as a “Useful Unmarked Route” within the *Cycling Ku-Ring-Gai Map*.
  - Identified within the 2012 *Ku-ring-gai Bike Plan* as an “On Road (Proposed)” route in the proposed bicycle network. However, it does not appear that this has been implemented.
  - Bicycle parking racks located on Coonanbarra Road.
- Millewa Avenue
  - Identified as a “Useful Unmarked Route” within the *Cycling Ku-Ring-Gai Map*.
  - Identified within the 2012 *Ku-ring-gai Bike Plan* as an “On Road (Proposed)” route in the proposed bicycle network. However, it does not appear that this has been implemented.



The *Ku-ring-gai Bike Plan* identifies multiple strategies to increase cycling infrastructure throughout the Ku-ring-gai Council area.

The Ku-ring-gai Development Control Plan does not specify a requirement for the provision of bicycle parking for the proposed development. Regardless, the proposed development provides **15** bicycle parking spaces within the lower ground parking level to encourage staff, residents and visitors to utilise alternative modes of transport.

The location of the site relative to the surrounding cycling routes is depicted in **Figure 4**, with a copy of the *Cycling Ku-Ring-Gai Map* provided in **Appendix A**.



★ Site Location

**FIGURE 4: SITE CONTEXT – CYCLING ROUTES**



## 5 Alternative Transport Strategy

### 5.1 Timeframe

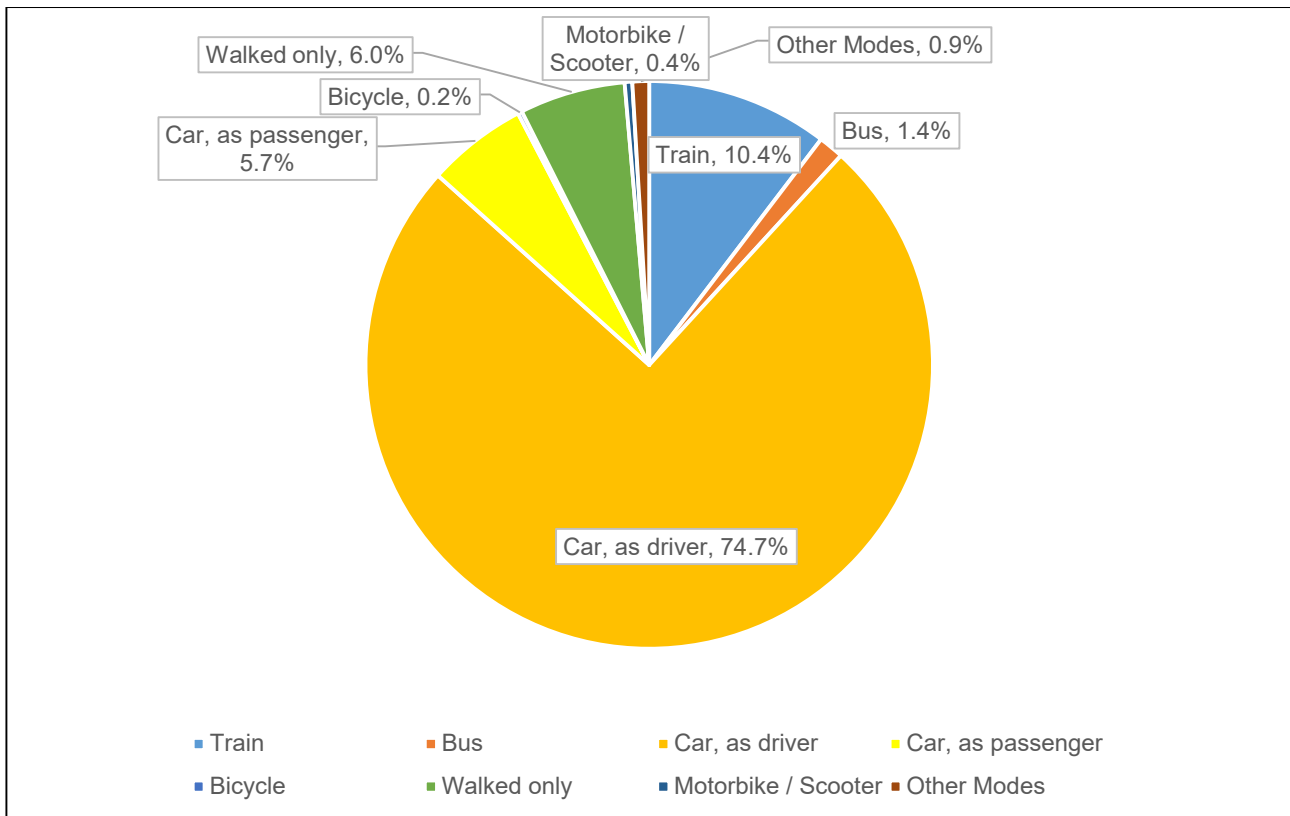
This Green Travel Plan will apply from the issue of the Occupation Certificate for the seniors living / aged care components of the development.

### 5.2 Existing Transport Use

To assist in setting the targets and milestones for transport use, the NSW Bureau of Transport Statistics 2016 Journey to Work data has been consulted for the suburbs of Waitara and Wahroonga. The data shows that on average 75% of employees who work in the area drive to and from work, with the detailed travel mode split summarised in **Table 2** and illustrated in **Figure 5**.

**TABLE 2: WAITARA & WAHROONGA WEST (SA2) EXISTING TRAVEL MODE SPLIT**

Mode of Transport	Usage Rate
Vehicle Driver	74.7%
Vehicle Passenger	5.7%
Train	10.4%
Bus	1.4%
Walk Only	6.0%
Bicycle	0.2%
Motorcycle / Scooter	0.4%
Other Modes	0.9%



**FIGURE 5: SUMMARY OF ABS CENSUS 2016 TRAVEL MODE SPLIT**

### 5.3 Targets and Milestones

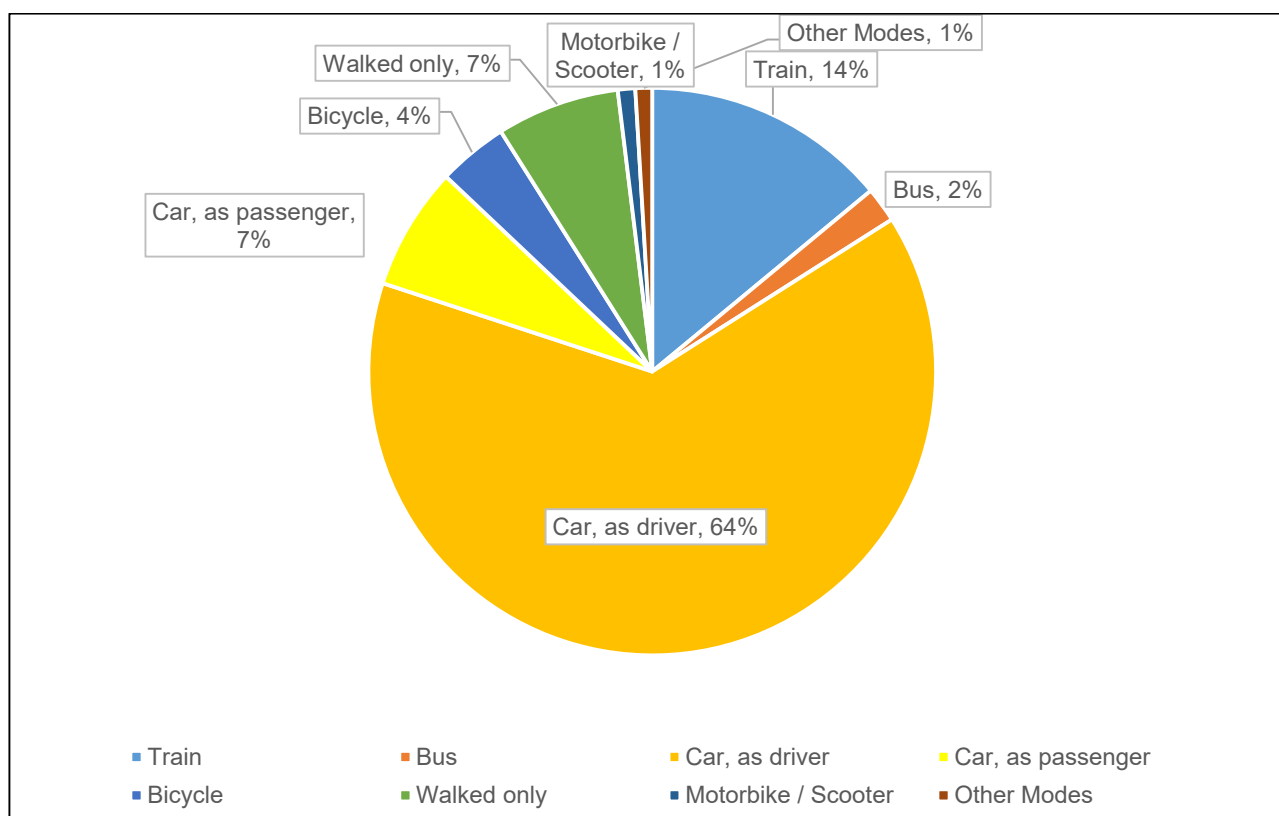
Through the implementation of actions described in **Section 6**, continuous increases in alternative transport use are anticipated for the duration of this Green Travel Plan's effectiveness, with the overall target a 1% year-on-year growth in the use of public or active transport options from that of the current Journey to Work data. The 1% year-on-year increase is assumed to occur generally in proportion to the current alternative modes of transport, resulting in a target 10% shift over ten years. The resulting 1, 3, 5 and 10-year goals for the travel mode split for staff is depicted in **Table 3**, with the 10-year goal also illustrated in **Figure 6**.

**TABLE 3: TARGETED TRANSPORT MODE SPLIT**

Mode of Transport	Usage Rate				
	Existing <sup>(1)</sup>	1yr	3yr	5yr	10yr
<b>Vehicle Driver</b>	74.7%	73%	71%	69%	64%
<b>Vehicle Passenger</b>	5.7%	6%	6%	6%	7%
<b>Train</b>	10.4%	11%	12%	13%	14%
<b>Bus</b>	1.4%	2%	2%	2%	2%
<b>Walk Only</b>	6%	6%	6%	6%	7%
<b>Bicycle</b>	0.2%	0.5%	1%	2%	4%
<b>Motorbike / Scooter</b>	0.4%	0.5%	1%	1%	1%
<b>Other Modes</b>	0.9%	1%	1%	1%	1%

Note:

- (1) As the development is not yet constructed, the "Existing" mode of transportation has been developed using the NSW Bureau of Transport Statistics 2016 Journey to Work data. Following the first surveys undertaken for the development, the existing travel mode percentages should be updated to reflect the surveyed percentages.



**FIGURE 6: TARGETED TRANSPORT MODE SPLIT (10 YEAR)**

## **5.4 Measurement and Reporting**

### **5.4.1 Frequency**

Travel mode surveys are to be undertaken annually for the first three years of the occupation of the development, and from time to time thereafter.

### **5.4.2 Method**

The seniors living / aged care staff will conduct surveys digitally once per year for a three-year period and then from time to time when the Green Travel Plan is updated. The surveys will also include a feedback field such that staff can suggest schemes or initiatives for the seniors living / aged care development and upper management to adopt to encourage alternative transport use.

Residents and visitors to the seniors living / aged care development will be surveyed either digitally or via printed surveys at the same times as the staff.

### **5.4.3 Reporting**

Following the completion of surveys, the results will be compiled into a report for review and further initiatives suggested if a shortfall is identified in any target travel mode. Following the surveys completed in the first year, the existing and targeted transport mode splits should be further reviewed and revised if necessary to more accurately reflect the transport mode choices of the staff and visitors to the site.

## 6 Projects and Programs

The following actions form the basis for implementation of the Green Travel Plan.

Collectively, these actions have been designed to help achieve the targets and milestones set out in **Section 5**. It should be noted, that these actions are not necessarily a compulsory task but rather a potential option that should be investigated and implemented as appropriate for the future occupants of the site.

### 6.1 Initiatives to Specifically Reduce Private Car Use

The following initiatives are suggested to lower private car usage by providing for facilities or programs with the aim to allow for greater flexibility in the choice of travel mode to and from the site. The strategies that can be implemented with this goal in mind are not limited to the following actions as shown in **Table 4**, but these are the basis for further reduction in private car reliance.

**TABLE 4: POSSIBLE INITIATIVES TO REDUCE PRIVATE CAR USAGE**

Action	Cost	Target Group	Date
Subsidise public transport travel for staff of the site	Moderate	Staff	Ongoing
Provide large lockers or storage areas for the storing work uniforms and equipment	Moderate	Staff	Ongoing
Identify priority users of car park e.g. people with disabilities, shift workers, carpoolers	Nil	Staff and Residents	From date of implementation
Introduce or increase charges for car parking and use money raised for TravelSmart initiatives	Nil	Staff and Visitors	From date of implementation

### 6.2 Public Transport Initiatives

The following actions are focused on encouraging staff and visitors to partake in public transport when travelling to and from the site. The strategies to be implemented are not limited to the following actions as shown in **Table 5**, but these are the basis for further development of public transport options.

**TABLE 5: POSSIBLE PUBLIC TRANSPORT INITIATIVES**

Action	Cost	Target Group	Date
Develop a map showing public transport routes to / from the site	Minimal	Staff, Residents and Visitors	Ongoing
Put up a notice board with leaflets and maps showing the main public transport routes to and from the site	Minimal	Staff, Residents and Visitors	From date of implementation
Prepare a Transport Access Guide (TAG) for the site	Nil	Staff, Residents and Visitors	From date of implementation
Encourage public transport for all residents and staff	Nil	Staff and Residents	From date of implementation
Ensure public transport tickets are available at the workplace for staff work-related travel during the day	Nil	Staff	From date of implementation
Flexible start and finish times to facilitate the catching of scheduled bus and train services	Nil	Staff	From date of implementation

### 6.3 Walking and Cycling Initiatives

#### 6.3.1 Walking

The following actions are focused on encouraging staff, residents and visitors to partake in walking when travelling to and from the site. The strategies to be implemented are not limited to the following actions as shown in **Table 6**, but these are the basis for further development of active transport options.

**TABLE 6: POSSIBLE WALKING INITIATIVES**

Action	Cost	Target Group	Date
Identify employees living near work that may be interested in walking to work	Nil	Staff	Ongoing
Produce a map showing safe walking routes to and from your site with times, not distances, to local facilities, such as shops and public transport	Minimal	Staff, Residents and Visitors	From date of occupation
Provide showers and changing room facilities	As per construction	Staff and Visitors	From date of occupation
Take part in 'National Walk to Work Day'	Nil	Staff	Annually
Have some 'TravelSmart Get to Work' days encouraging staff to come by alternative transport	Nil	Staff	Annually
Encourage staff to walk as a method of exercise	Nil	Staff	Ongoing

#### 6.3.2 Cycling

The following actions are focused on encouraging staff, residents and visitors to partake in cycling when travelling to and from the site. The strategies to be implemented are not limited



to the actions as shown in **Table 7**, but these are the basis for further development of active transport options.

**TABLE 7: POSSIBLE CYCLING INITIATIVES**

Action	Cost	Target Group	Date
Organise an after-work ride. It does not have to be long or strenuous and could end somewhere for dinner or drinks. This idea is to encourage people who might be reluctant to cycle to give it a go.	Nil	Staff	Quarterly
Provide sufficient bicycle parking to meet peak needs	Minimal	Staff, Residents and Visitors	From date of implementation
Have good, secure bicycle parking in an easily accessible location	Minimal	Staff, Residents and Visitors	From date of implementation
Provide bicycle parking for visitors	Minimal	Visitors	From date of implementation
Provide showers, changing rooms and lockers.	As per construction	Staff and Visitors	From date of implementation
Circulate maps of cycle paths in the vicinity	Nil	Staff, Residents and Visitors	Ongoing
Participate in annual events such as 'Ride to Work Day'	Nil	Staff	Annually
Arrange information sessions outlining cycling safety and health benefits.	Minimal	Staff	Annually

## 6.4 Sustainable Transport Initiatives - Carpooling

The following actions are focused on encouraging staff to partake in carpooling and limiting the number of cars used to travel when travelling to and from the site. The strategies to be implemented are not limited to the following actions as shown in **Table 8**, but these are the basis for further development of alternative transport.

**TABLE 8: POSSIBLE CARPOOLING INITIATIVES**

Action	Cost	Target Group	Date
Set up a carpooling database	Nil	Staff	From date of implementation
Encourage use of carpooling apps	Nil	Staff	From date of implementation
Subsidise costs of carpooling trips	Minimal	Staff and Residents	From date of implementation
Subsidise the cost of fuel for carpooling staff	Minimal	Staff	From date of implementation
Staff management to ensure favourable parking spaces are available to those who carpool	Nil	Staff	From date of implementation

## 6.5 Use of Incentives

Many of the alternative transport initiatives described above require the willing participation of employees, residents and visitors and would not otherwise be effective. The incentivisation of alternative transport options could increase the number of residents and employees using alternative transport options.

A review of the *NSW Household Travel Survey* by *Grace Corpuz* identified a number of factors that affected the usage of alternative travel options, identifying the following factors as most influential on alternative transport use (in order of importance):

- Parking capacity and arrangements (destination factor);
- Where a vehicle is not available or accessible (origin factor);
- Where it is cheaper (origin & destination factor);
- Travel time (origin & destination factor);
- Convenience (origin & destination factor);
- Accessibility (origin & destination factor).

In addition to the above, the direct advertisement of and incentives for alternative transport use is suggested as a part of increasing alternative transport utilisation. Future development of this Green Travel Plan should take into consideration the factors listed above.



**APPENDIX A: KU-RING-GAI CYCLING MAP  
(1 SHEET)**





### CYCLING KU-RING-GAI

**ON-ROAD BICYCLE ROUTE**  
OFF-ROAD BICYCLE ROUTE  
INCREASED TRAFFIC STRESS  
HEAVY TRAFFIC STRESS  
ROADS WITH STATIONARY TRAFFIC  
ROADS WITH STATIONARY TRAFFIC  
ROADS WITH STATIONARY TRAFFIC

**Legend:**  
ON-ROAD BICYCLE ROUTE  
OFF-ROAD BICYCLE ROUTE  
INCREASED TRAFFIC STRESS  
HEAVY TRAFFIC STRESS  
ROADS WITH STATIONARY TRAFFIC  
ROADS WITH STATIONARY TRAFFIC  
ROADS WITH STATIONARY TRAFFIC

**Scale:**  
0 200 400 600 800 1000  
0 200 400 600 800 1000  
0 200 400 600 800 1000

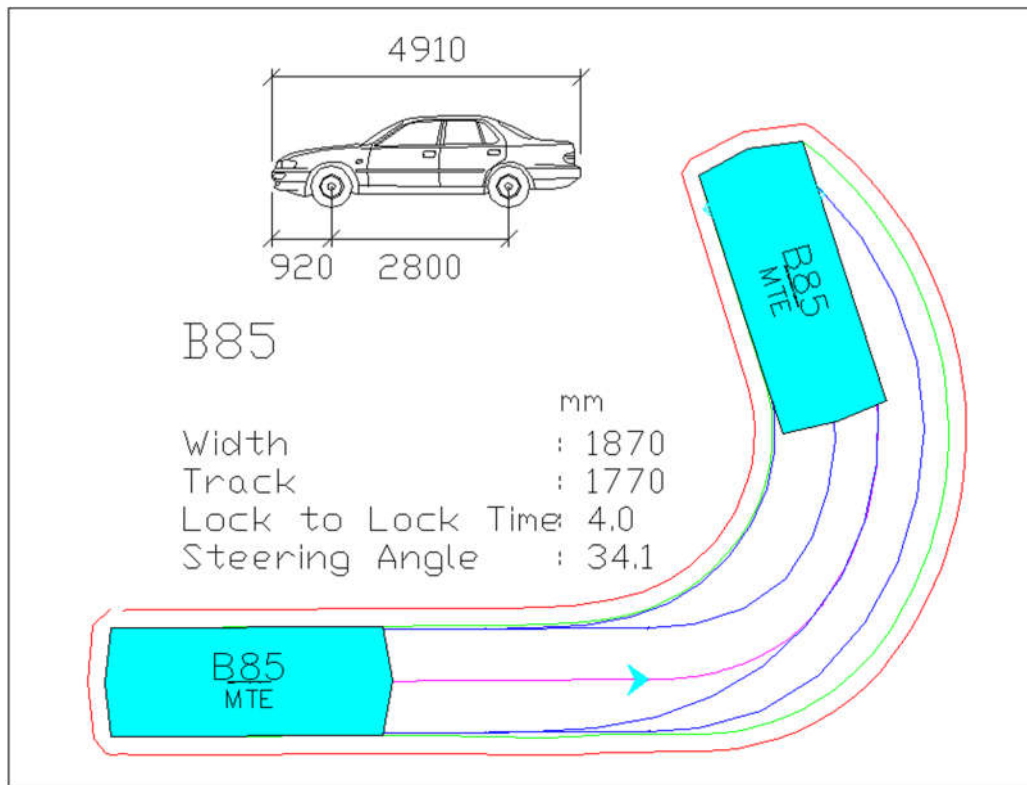
**North Arrow:**  
N

**Version:**  
Version 18.07.16

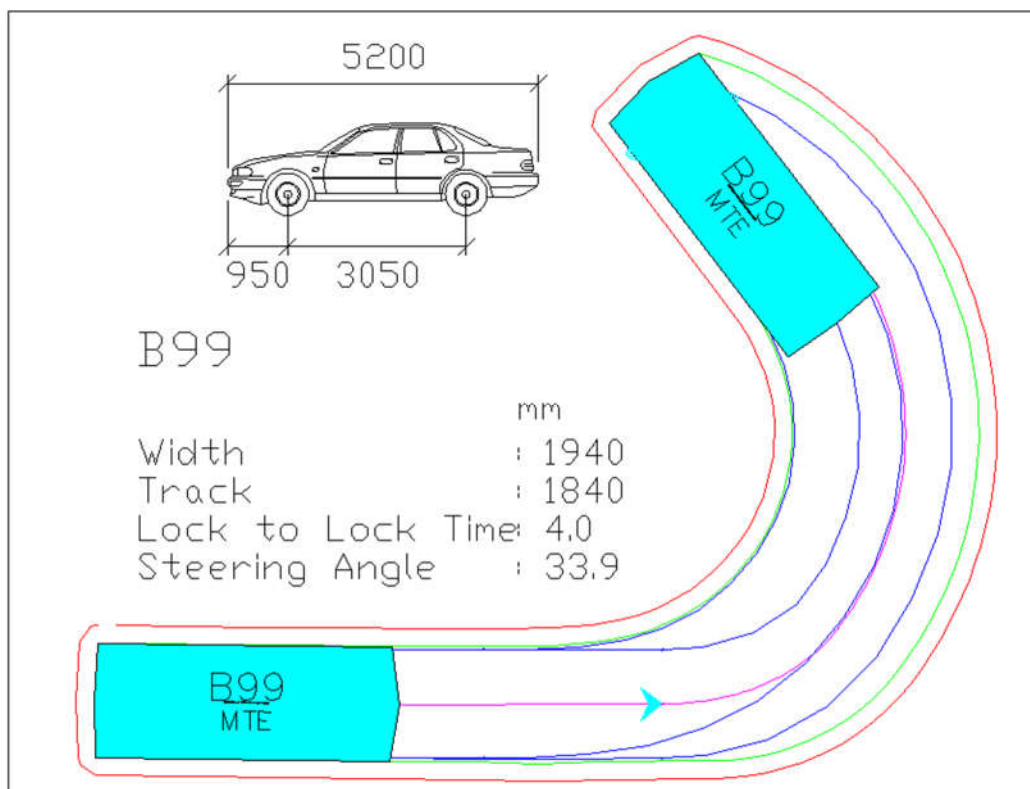




**ANNEXURE E: SWEPT PATH TESTING  
(12 SHEETS)**



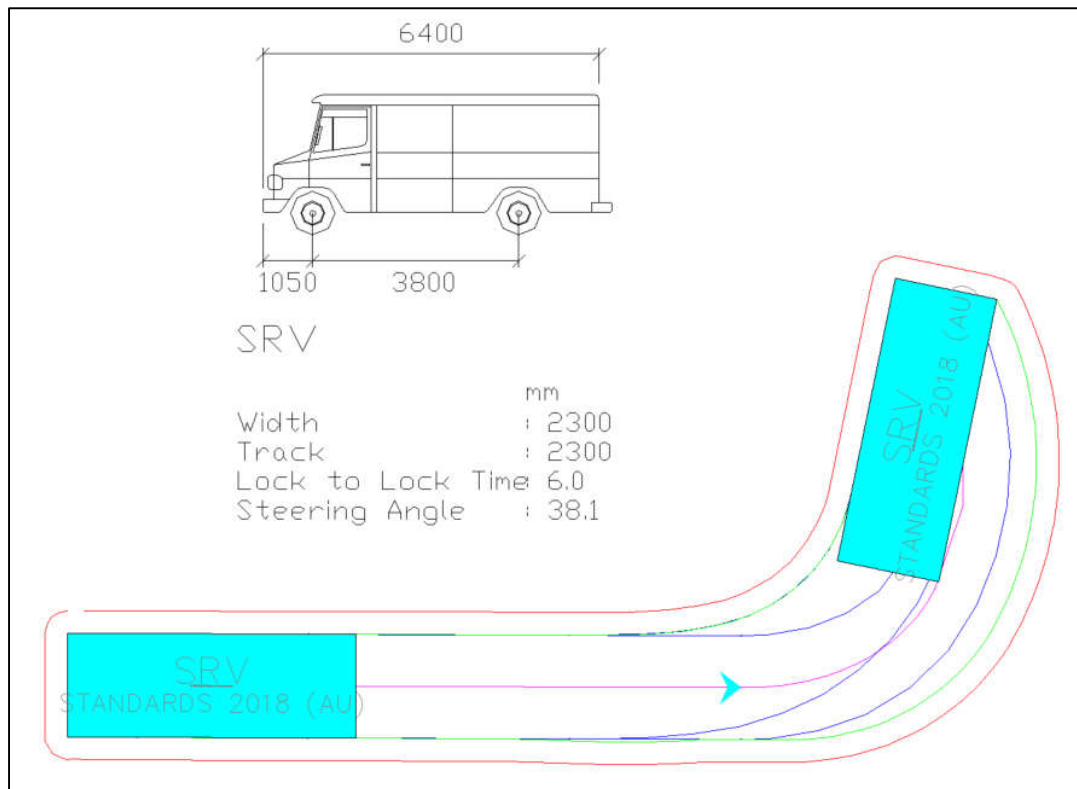
**AUSTRALIAN STANDARD 85<sup>TH</sup> PERCENTILE SIZE VEHICLE (B85)**



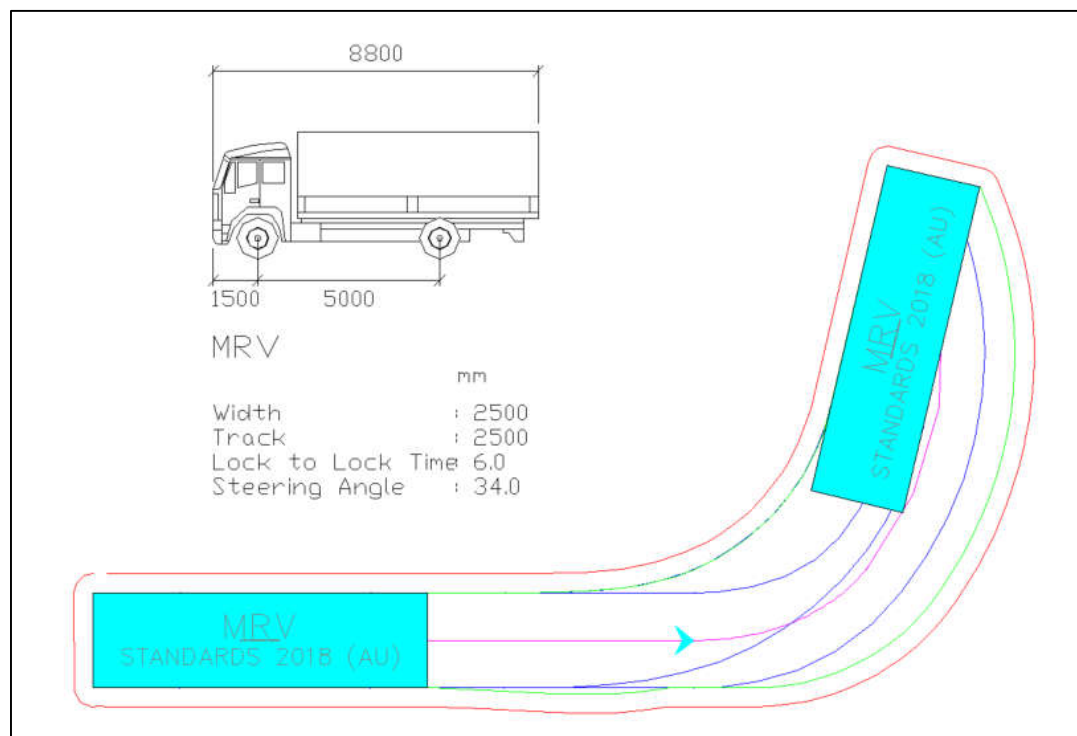
**AUSTRALIAN STANDARD 99.8<sup>TH</sup> PERCENTILE SIZE VEHICLE (B99)**

Blue – Tyre Path  
 Green – Vehicle Body  
 Red – 300mm Clearance



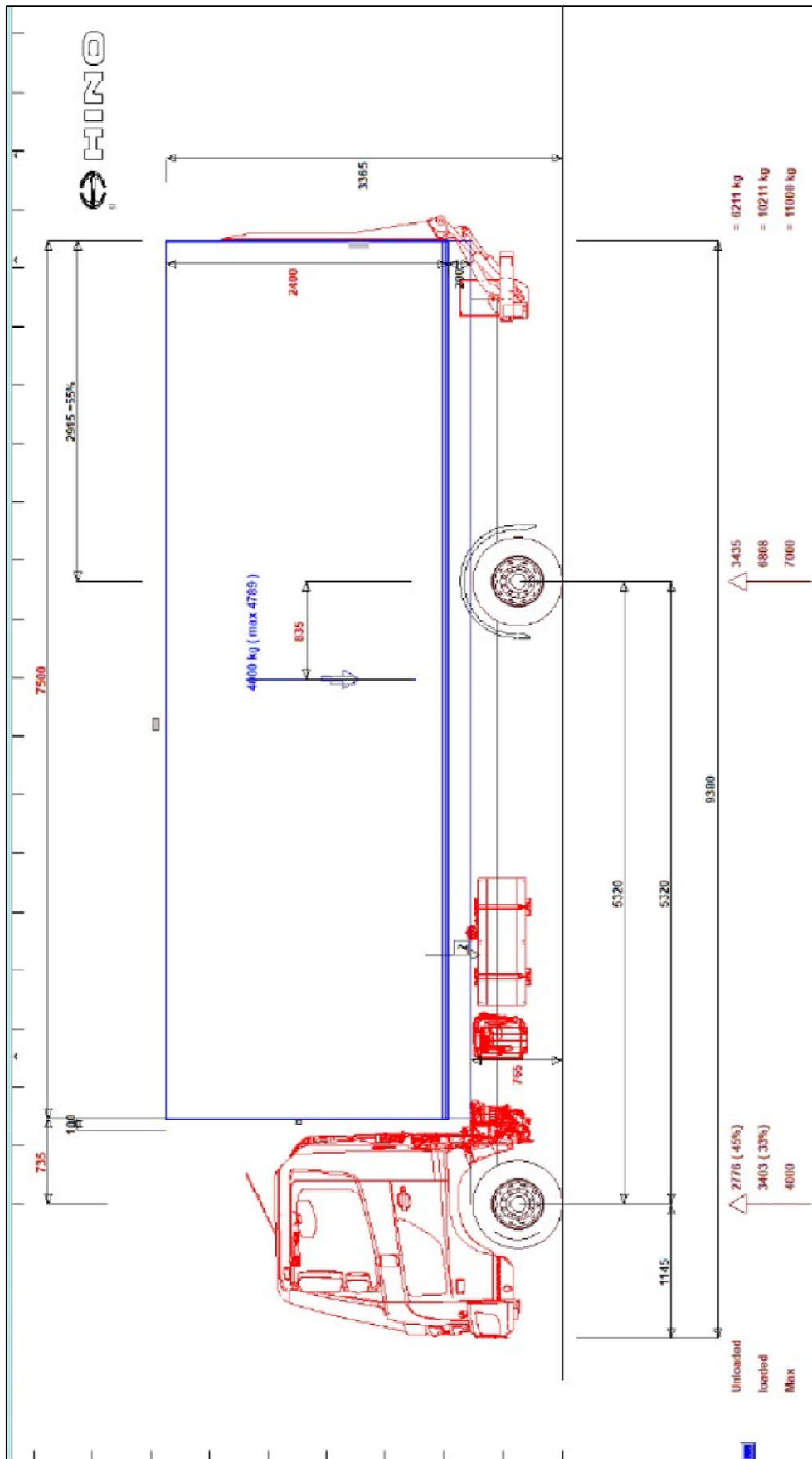


**AUSTRALIAN STANDARD SMALL RIGID VEHICLE (SRV)**

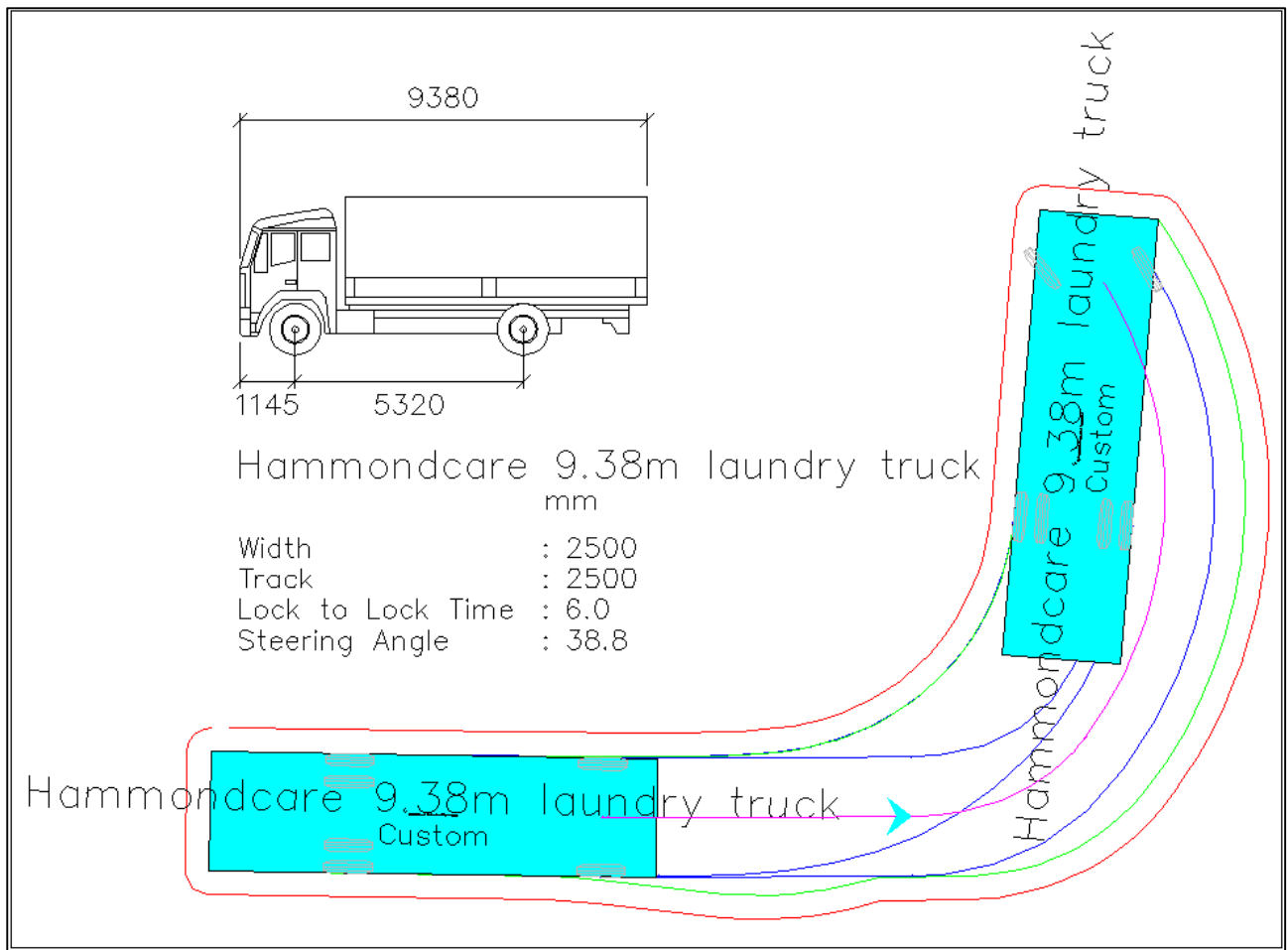


**AUSTRALIAN STANDARD MEDIUM RIGID VEHICLE (MRV)**

Blue – Tyre Path  
 Green – Vehicle Body  
 Red – 500mm Clearance



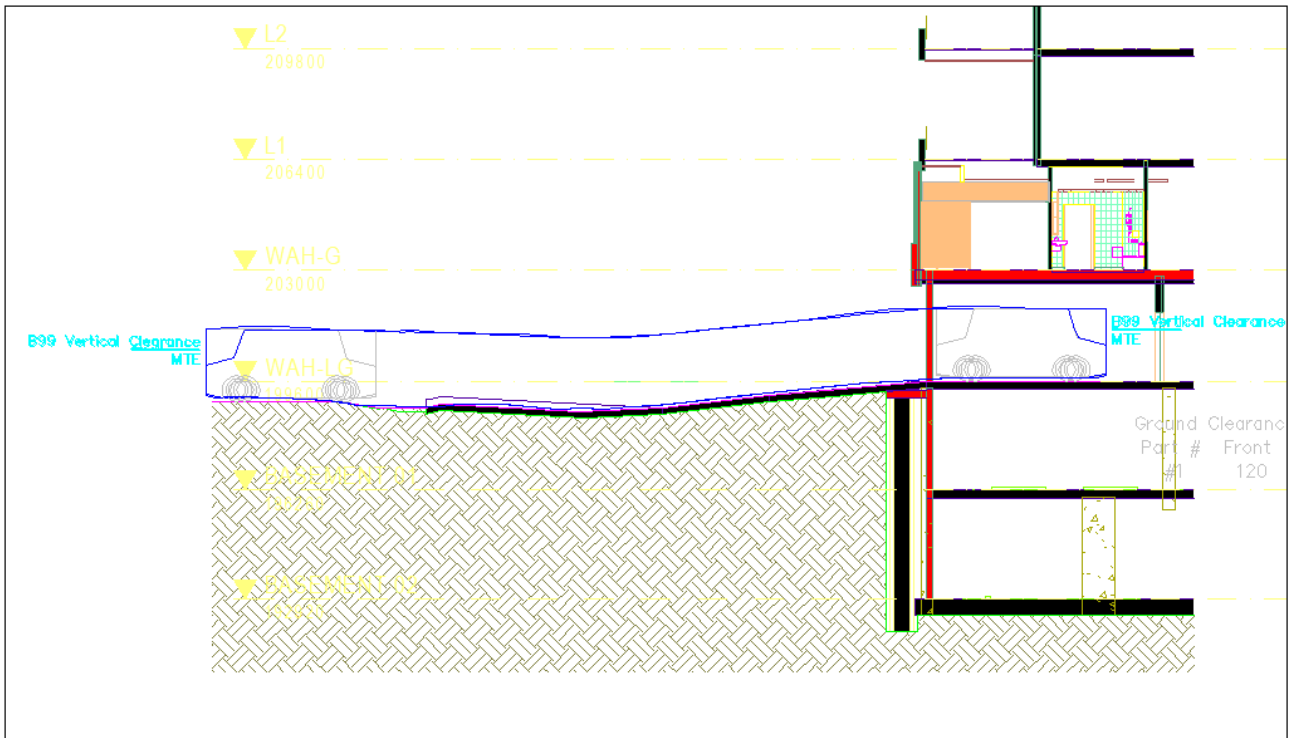
Laundry Truck Details provided by Client



**9.38M LAUNDRY TRUCK CUSTOM VEHICLE BUILT USING PROVIDED DETAILS**  
(based upon an MRV)

Blue – Tyre Path  
Green – Vehicle Body  
Red – 500mm Clearance

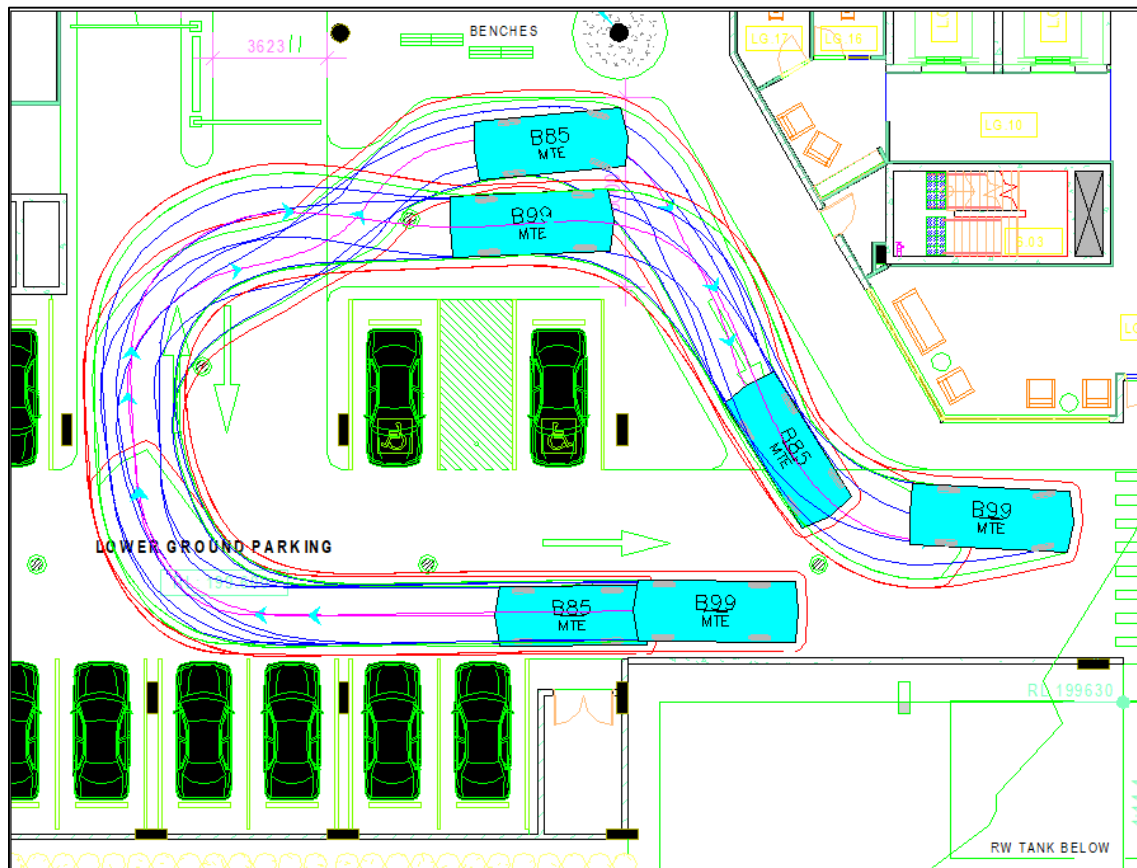
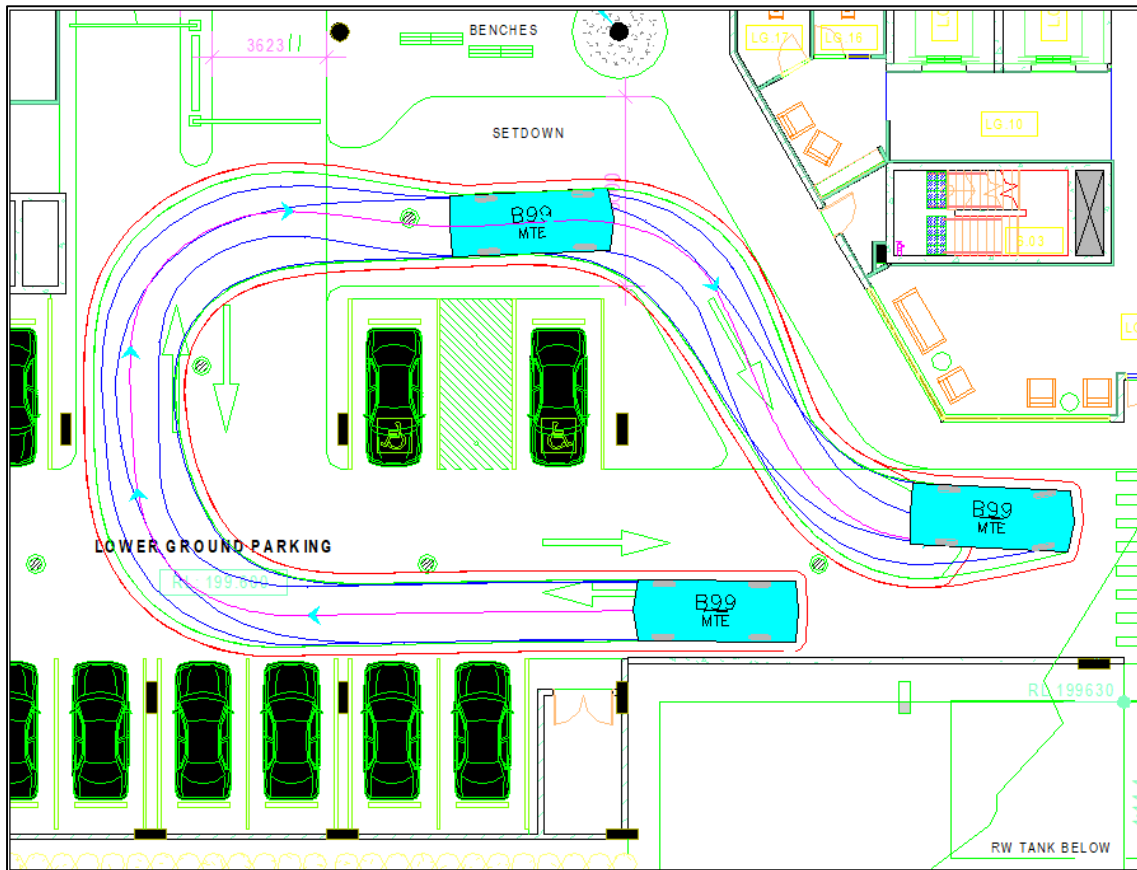




## B99 Vertical Clearance Testing

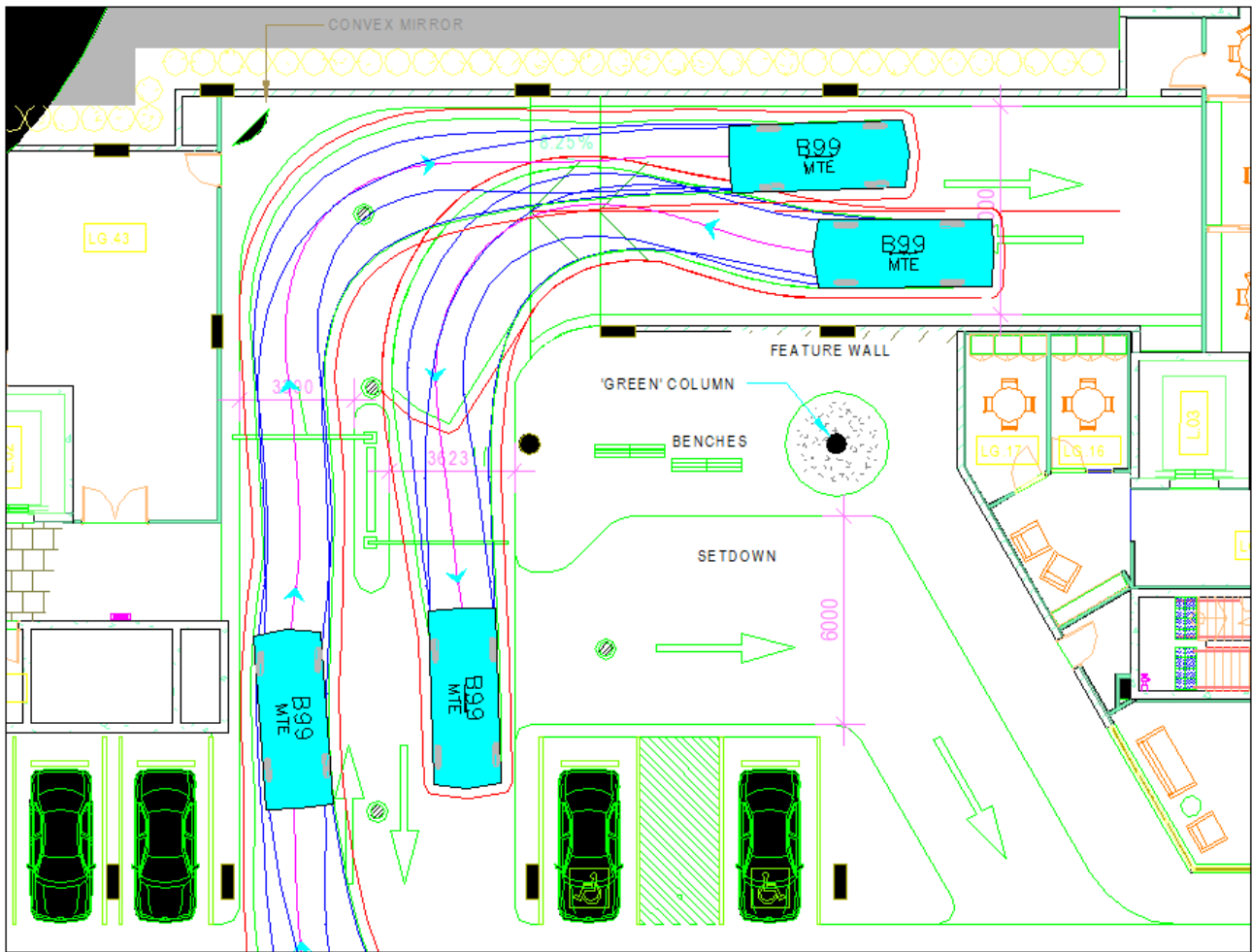
Unsuccessful

Undercarriage scraping occurs near the kerb. This can be modified during detailed design of the CC stage



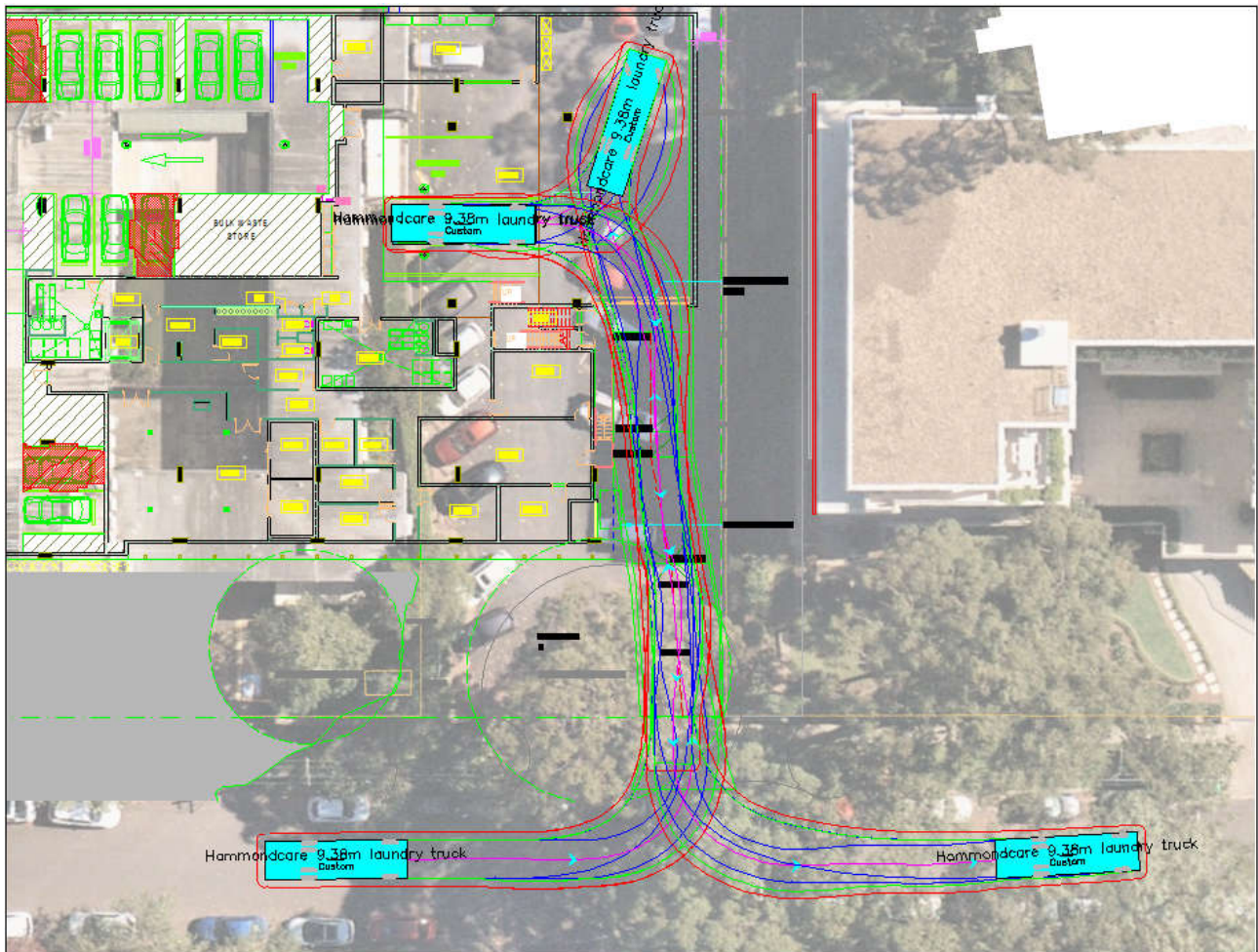
**B99 Circulation of drop off area with two way passing of B85 in set down area**  
Successful





### B99 Basement and boom gate access

Successful

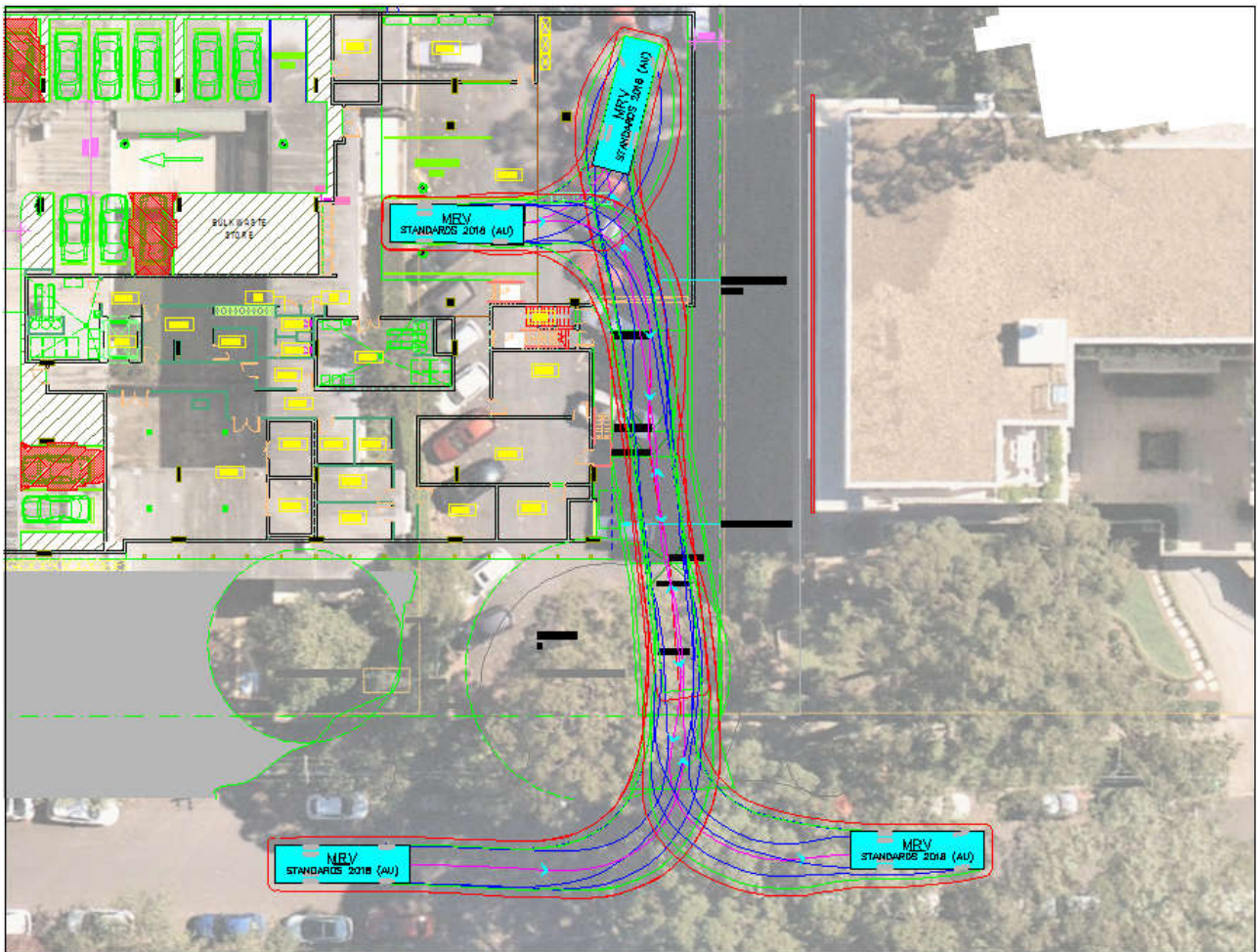


### 9.38m Laundry Truck Driveway Swept Paths

Laundry Truck Left Turn Entry / Laundry Truck Left Turn Exit

Bay Access: 2 Manoeuvres Reverse IN / 1 Manoeuvre Forward OUT

Successful



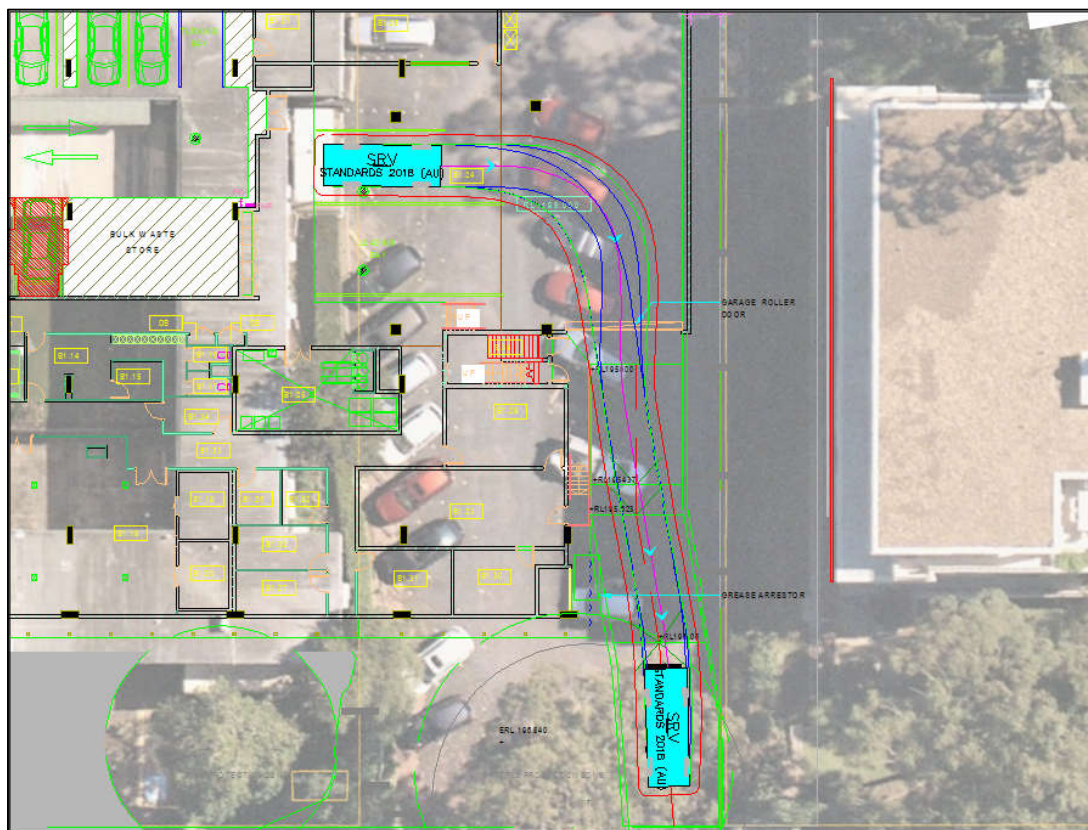
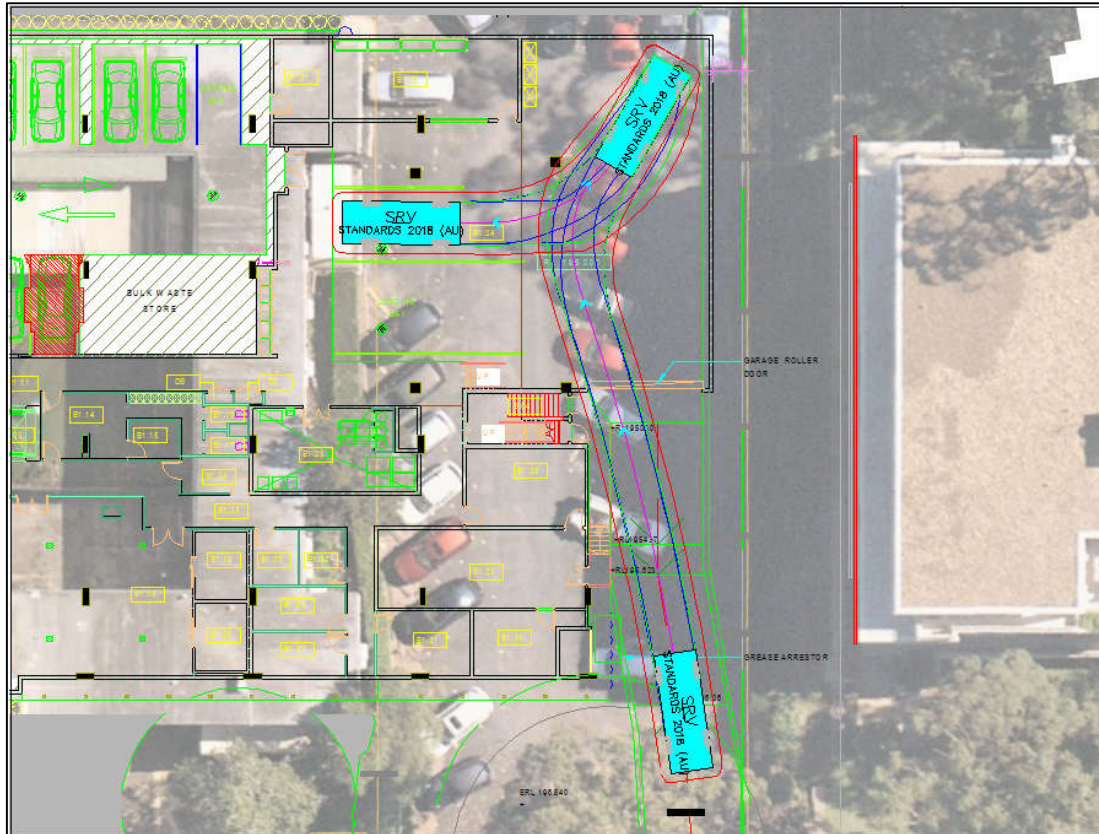
### MRV Driveway Swept Paths

MRV Left Turn Entry / MRV Left Turn Exit

Bay Access: 2 Manoeuvres Reverse IN / 1 Manoeuvre Forward OUT

Successful

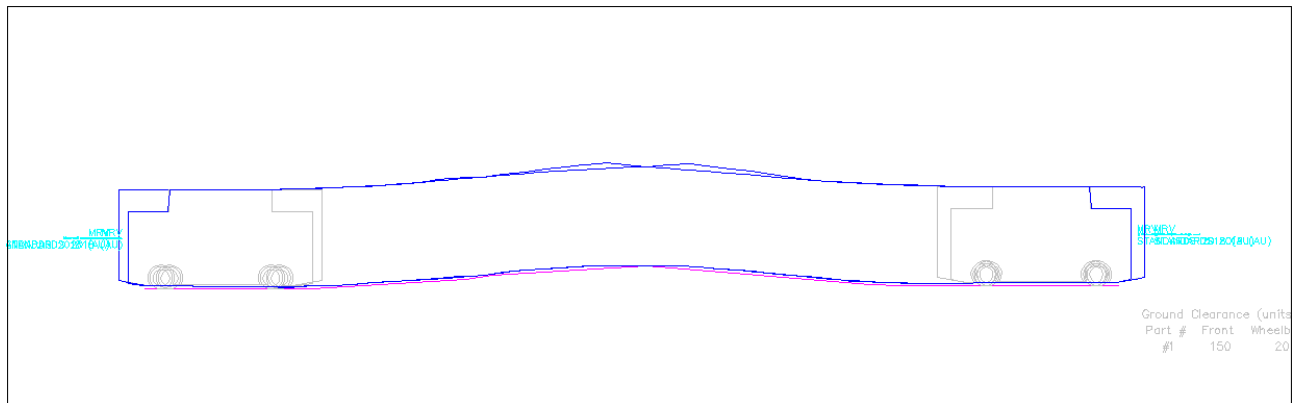




### SRV Loading Bay Swept Paths

2 Manoeuvres Reverse IN / 1 Manoeuvre Forward OUT

Successful



## MRV Vertical Clearance Testing

Unsuccessful

Inadequate clearances occur near the crest of the ramp. This can be modified during detailed design of the CC stage



**ANNEXURE F: AS1742.10 TYPICAL PEDESTRIAN  
REFUGE  
(1 SHEET)**



