TRAFFIC & TRANSPORT ENGINEERING

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28 July 2026

LSH West Trust Partnership
Unit 1 563 Newnham Road
Upper Mount Gravatt QLD 4122

Attention: Jones Shih

Dear Jones,

RE: 21-23 WESTERN AVENUE, CHERMSIDE
TRAFFIC ENGINEERING ASSESSMENT

INTRODUCTION

This report has been prepared by PTT, as requested by LSH West Trust Partnership, to assess the traffic engineering aspects of a proposed multiple-dwelling residential development, located at 21-23 Western Avenue, Chermside.

The aim of this assessment is to review the proposed development in terms of its site access arrangements, parking provision and design, servicing arrangements and pedestrian / cyclist facilities, with respect to the requirements of the Brisbane City Plan 2014.

EXISTING CONDITIONS

SUBJECT SITE

The subject site is formally described as Lots 16 and 17 on RP46834 and currently accommodates two residential dwellings. According to the Brisbane City Plan 2014, the site is zoned as High Density Residential. The site is bounded by Western Avenue to the west and by residential uses in all other directions. The surrounding area comprises predominantly residential, aged-care, healthcare and retail uses. Vehicular access to the subject site is currently provided via two crossovers on Western Avenue, as shown in Figure 1.

ROAD NETWORK

Western Avenue is an undivided two-way / two-lane road with on-street parking permitted on both sides. It has an unposted (ie urban default) speed limit of 50 km/h and is classified as a neighbourhood (ie minor) road according to the Brisbane City Plan 2014. It is accessed via priority-controlled T-intersections with Curwen Terrace and Hamilton Road to the north and south, respectively, with Western Avenue forming the minor approach at both intersections.

ACTIVE TRANSPORT

There is a pedestrian footpath on the eastern side of Western Avenue (ie along the subject site frontage) and on both sides of Hamilton Road. Isolated sections of footpath are also provided on the western side of Western Avenue and on both sides of Curwen Terrace, generally along the frontages of more recent constructed developments. There is a pedestrian centre median refuge on Hamilton Road about 70m east of the intersection with Western Avenue. According to the Brisbane City Plan 2014, Hamilton Road is classified as a secondary cycle route but no formal cycle facilities are currently provided.

PUBLIC TRANSPORT

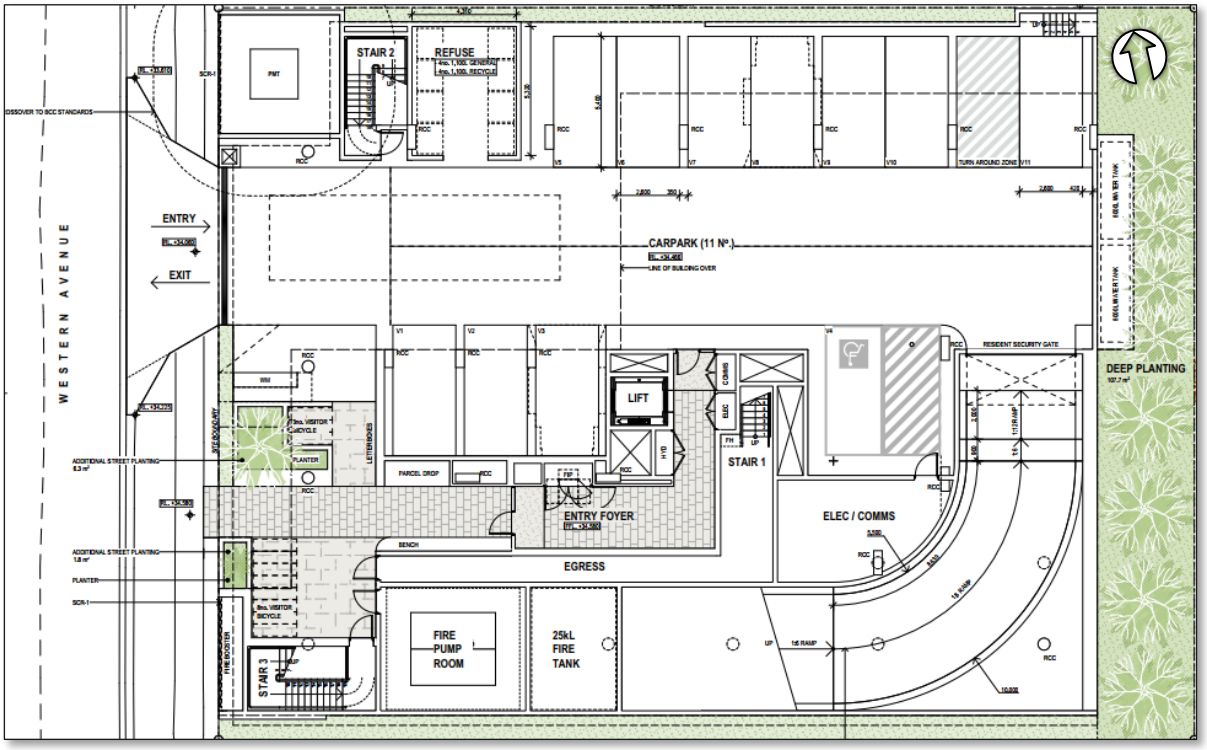
There are public bus stops on both sides of Hamilton Road adjacent to the intersection with Western Avenue, about 150m walking distance south of the subject site. The stops are serviced by Translink bus routes 325, 335, 340, 353 and 358, with most of these routes operating hourly between about 6:00am and 7:00pm on weekdays and weekends. Route 340 is a Bus Upgrade Zone (BUZ) service and operates every 15 minutes or less between about 6:00am and 11:00pm on weekdays and weekends. Accordingly, the site is well served by public transport.

Figure 1: SITE LOCALITY

PROPOSED DEVELOPMENT

The proposal involves a multiple-dwelling development comprising 42 units (28 two-bedroom and 14 three-bedroom units). The proposed ground level layout is shown in Figure 2, with plans of development attached.

Figure 2: PROPOSED SITE LAYOUT



ACCESS

LOCATION

Vehicular access to the site is proposed via an all-movements crossover on Western Avenue. Both existing crossovers are to be removed. Brisbane City Council's (Council) Transport, Access, Parking and Servicing (TAPS) Policy requires that crossovers on minor roads be located a minimum of 3.0m from adjacent crossovers and 10m from adjacent intersections (with minor roads). The proposed crossover is located approximately 12m from the nearest adjacent crossover and well clear of intersections. Accordingly, the proposed crossover location with Council's TAPS Policy requirements.

DESIGN

The largest service vehicle expected on-site under the proposal is a 10.2m long refuse collection vehicle (RCV), as discussed below. To facilitate RCV site access to / from a minor road, Council's TAPS Policy requires that a 6.5m wide Type B2 crossover be provided. A crossover of this size / design would also be sufficient to facilitate simultaneous two-way entry / exit for light vehicles in accordance with the TAPS Policy.

The proposed crossover is designed as a 6.5m wide Type B2 crossover in accordance with Council Standard Drawing BSD-2021 and, as such, complies with Council's TAPS Policy requirements for design.

SIGHT DISTANCE

On a 50 km/h road (ie Western Avenue), Council's TAPS Policy specifies a desirable sight distance of 90m and a minimum sight distance of 50m. On-site observations indicate the proposed crossover location achieves approximately 45m sight distance to the north (ie to the intersection with Curwen Terrace) and in excess of 100m to the south. The reduced sight distance to the north is considered adequate, when considering that vehicles turning into Western Avenue would be travelling at low speeds.

PARKING

REQUIREMENT

The subject site is defined as a "key location" according to Council's TAPS Policy. This is because:

- it is located within 400m walking distance of a mixed-use zone
- it is located within 400m walking distance of a public bus stop(s) with a maximum service headway of 20 minutes on weekdays and 30 minutes on weekends, between 7:00am and 7:00pm (ie the bus stops on Hamilton Road 150m south of the site, serviced by Translink's Route 340 BUZ service, as identified above)

Accordingly, the minimum car parking requirement of the proposed development has been determined based on the parking provision rates outlined in Council's TAPS Policy, for multiple dwelling uses in a "key location". As shown in Table 1, a minimum of 67 car parking spaces (comprising 56 resident and 11 visitor spaces) are required to support the proposal.

Table 1: MINIMUM CAR PARKING REQUIREMENT

USER	SCALE	PARKING RATE	REQUIREMENT
Resident (2-bedroom unit)	28 units	1.2 spaces per unit	33.6
Resident (3-bedroom unit)	14 units	1.6 spaces per unit	22.4
Visitors	42 units	0.25 spaces per unit	11
Total			67 spaces

PROVISION

The proposed development provides a total of 67 on-site car parking spaces, comprising 11 visitor spaces on ground level and 56 resident spaces across two basement levels. Accordingly, the proposed parking provision complies with Council's TAPS Policy requirements.

PERSONS WITH DISABILITIES (PWD) PARKING

Council's TAPS Policy requires that multiple-dwelling developments comprising more than 10 units designate at least one visitor space for PWD parking. The proposal provides one PWD visitor parking space, which complies with this requirement.

DESIGN

The proposed car parking areas are designed consistent with the requirements of Council's TAPS Policy, in terms of minimum parking space and aisle dimensions, and are typified by:

- regular car parking spaces dimensioned 2.6m wide by 5.4m long (or 10.8m long if tandem)
- small car spaces dimensioned 2.3m wide by 5.4m long
- PWD parking space dimensioned 2.4m wide by 5.4m long, with an adjacent 2.4m wide shared area
- parking aisles dimensioned a minimum 6.2m wide
- an additional 0.3m clearance to adjacent walls, to allow for opening of car doors
- a minimum 2.3m vertical clearance in all parking spaces (or 2.5m clearance in the PWD space)

Some performance-based solutions are sought in relation to other aspects of the car parking design, as identified below. As demonstrated, these performance-based solutions are not expected to compromise the safety or operation of the parking areas.

Column Positions

All columns along the sides of car parking spaces are positioned clear of the design parking clearance envelope prescribed by AS2890.1[1], to allow for manoeuvring and opening of car doors. The relevant dimensions of this clearance envelope slightly differ (by 5cm) to those of the clearance envelope specified in Council's TAPS Policy. However, both clearance envelopes are expected to achieve equivalent safe and functional outcomes and this marginal difference is not expected to have a material impact. Accordingly, the proposed column locations are considered adequate.

End of Aisle Treatments

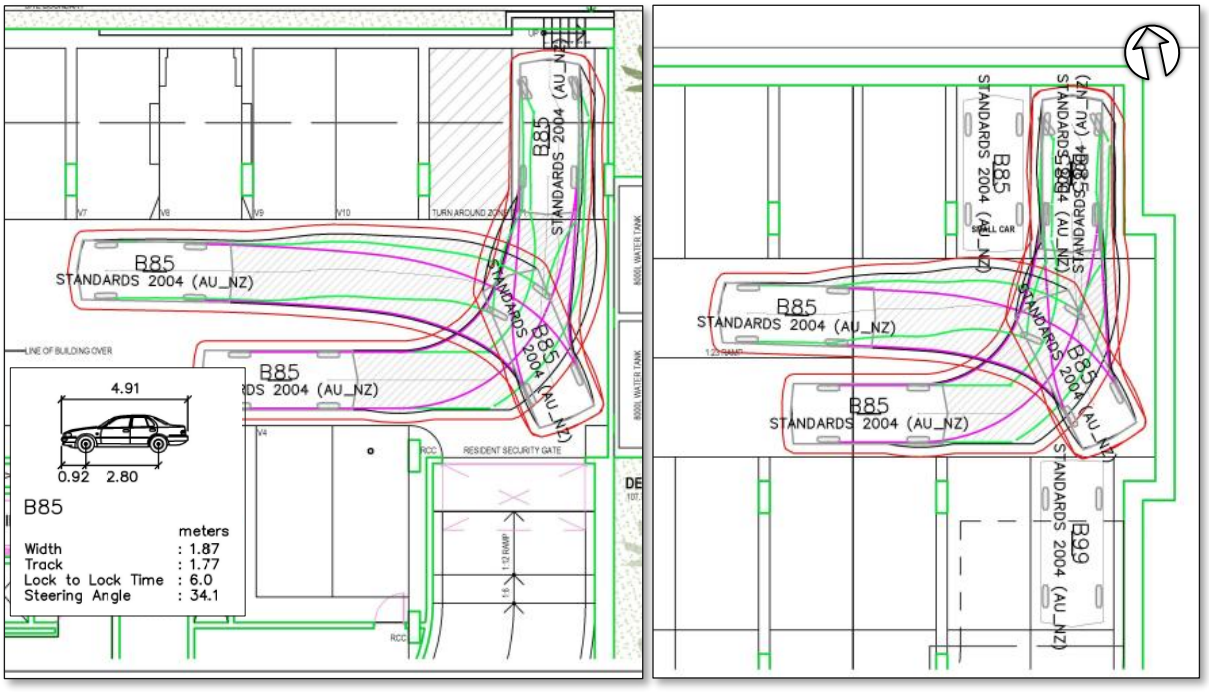
To facilitate manoeuvring to / from the last parking space in blind aisles, Council's TAPS Policy identifies end of aisle treatments comprising either a 2.0m long aisle extension beyond the last space, or an 8.0m wide aisle behind the last space. The proposed end of aisle treatments are designed as follows:

- a 7.5m wide aisle behind the last visitor parking space, with a dedicated turnaround bay provided
- a 1.3m long aisle extension beyond the last resident parking space

As demonstrated by the swept path analyses shown in Figure 3 and attached in PTT Drawing Number 26-396-001, these treatments are sufficient to facilitate a medium passenger vehicle (ie B85) manoeuvring to / from the last parking spaces with a single reverse movement. Therefore, the proposed end of aisle treatments are considered adequate.

[1] Australian Standards AS2890.1:2004 Parking Facilities Part 1: Off-Street Car Parking

Figure 3: MANOEUVRING AT ENDS OF AISLES



RAMP OPERATIONS

Design

Vehicle access to / from the basement parking levels is proposed via two-way / one-lane ramps. As outlined below, the proposal is expected to generate approximately 23 one-way vehicle trips during the peak hours, which is well below the typical capacity limits of short two-way / one-lane ramps.

The proposed ramps have maximum grades of 1:6 (ie 16.7%) in accordance with Council's TAPS Policy requirements, with 2.0m long 1:12 (ie 8.3%) grade transitions at each end to prevent scraping. The ramps are dimensioned 4.5m wide between kerbs (with an additional 0.3m clearance provided to walls) and, as demonstrated by the swept path analyses attached in PTT drawing number 26-396-002, are sufficient to accommodate manoeuvring by large passenger vehicles (ie B99s).

Traffic Management

It is proposed that the two-way / one-lane operations on the ramp be controlled using signal lights. We have been advised that common practice for one-lane ramps in residential parking facilities is to provide a default green signal for downhill travel (ie to prioritise vehicles entering the site) and a default red signal for uphill travel. When a vehicle is detected approaching the bottom of the ramp to travel uphill, the downhill signal changes to red, with the uphill signal then changing to green after a programmed delay (to allow any downhill vehicles already on the ramp to clear). Both signals then revert back to their default displays after a further programmed delay (to allow the uphill travelling vehicle to clear the ramps).

This arrangement is expected to be sufficient to achieve safe and efficient operations at the development. Based on our review, the following traffic management measures are expected to be required:

- signal lights at the top and bottom of each ramp, with associated signage (ie instructing drivers to wait on a red signal)
- pavement markings to designate suitable waiting areas at the top and bottom of each ramp, for vehicles to stand while waiting for an opposing vehicle to clear the ramp
- vehicle detectors at the bottom of each ramp to detect uphill travelling vehicles
- convex mirrors installed part-way along each ramp, to maintain safe ramp operations in the infrequent event that the detector and lighting system is temporarily non-functional (for instance, during a power outage)

These measures are indicated in Figures 4 and 5 (and attached in PTT drawing number 26-396-003).

Figure 4: RECOMMENDED TRAFFIC MANAGEMENT MEASURES – GROUND LEVEL

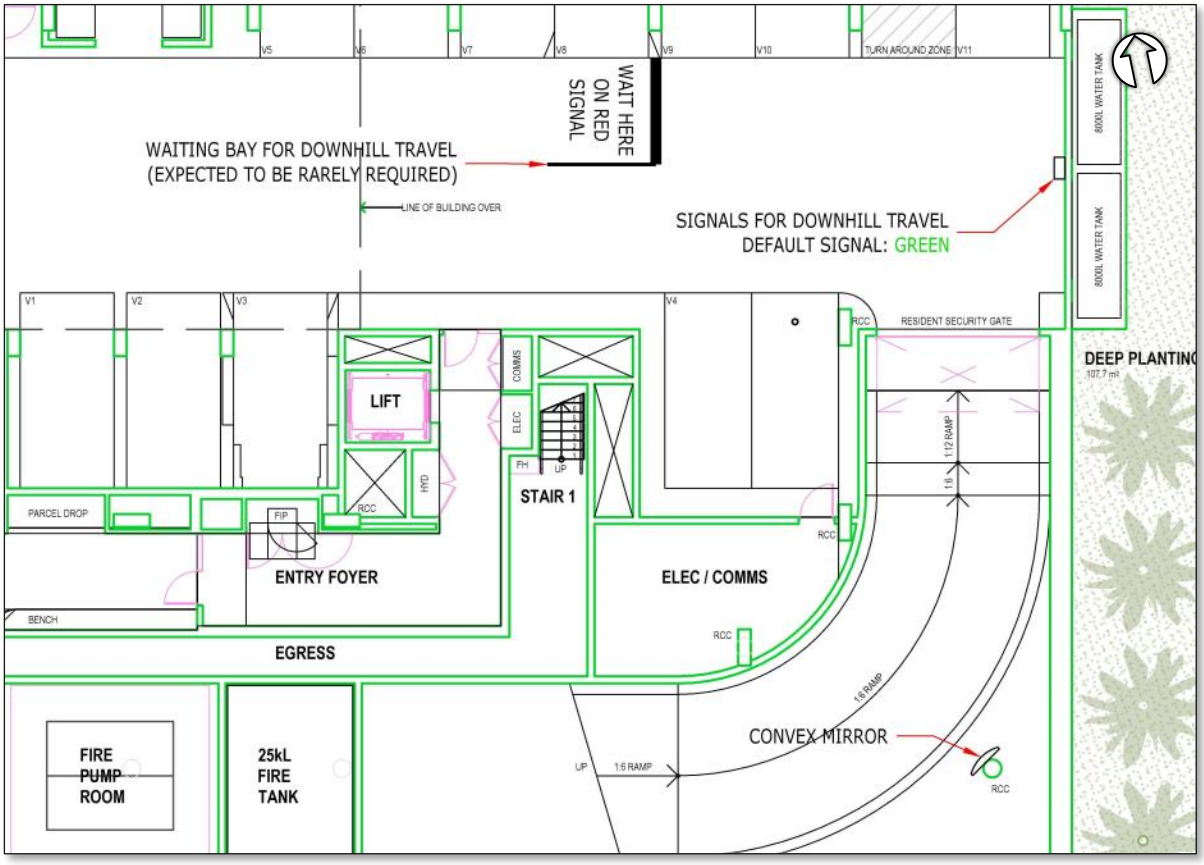
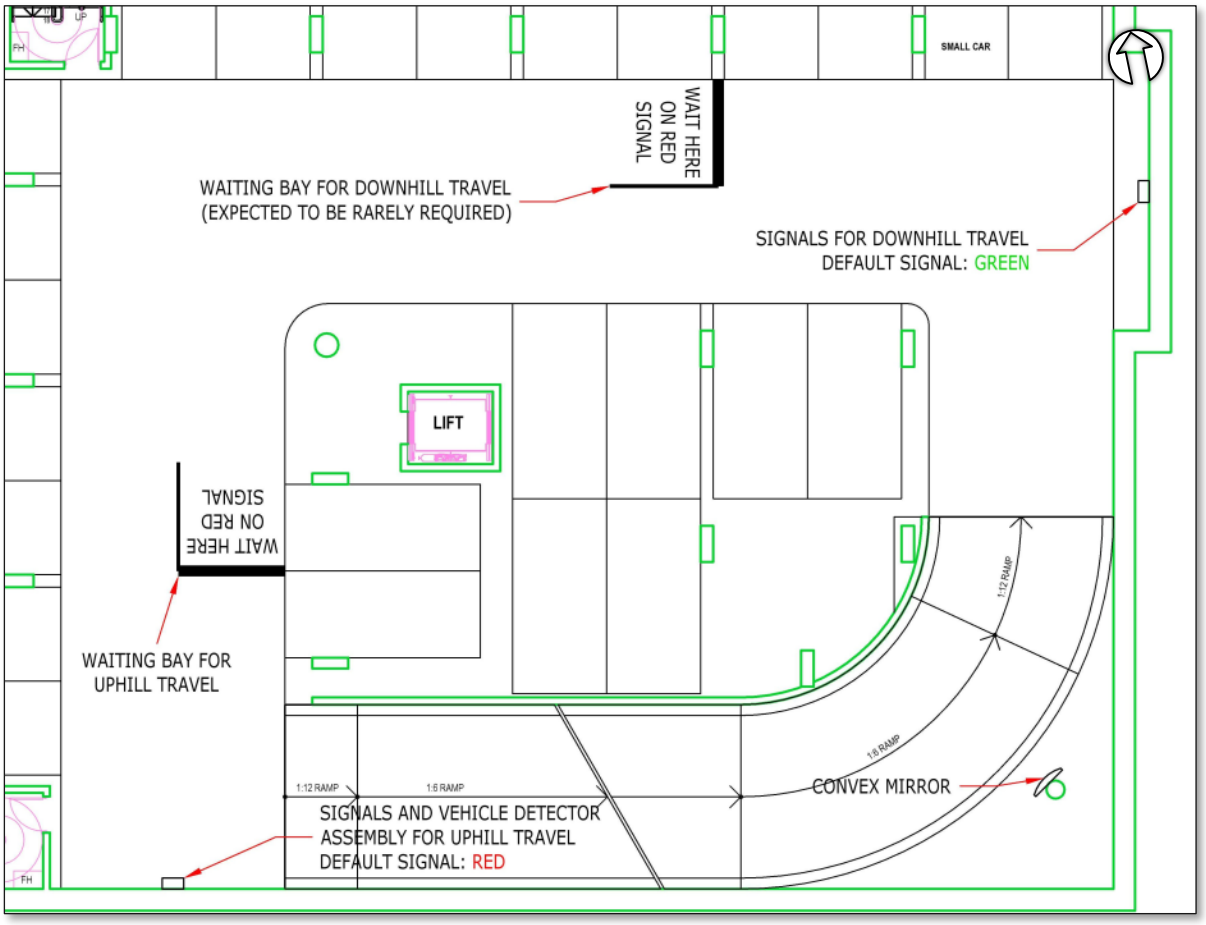


Figure 5: RECOMMENDED TRAFFIC MANAGEMENT MEASURES – BASEMENT LEVELS



QUEUING

Section 4.8(8) of Council's TAPS Policy recommends that vehicle queuing space be provided at site accesses based on the car park capacity, service rate and frontage road classification, in order to allow a free influx of traffic which will not adversely affect traffic or pedestrian flows on the frontage road. The 95th percentile queue at the proposed site access is considered an adequate measure of an acceptable queue.

The predicted 95th percentile queue at the site access has been calculated based on 16 vehicles entering the site during the critical peak hour (as calculated in Table 3), using the queuing theory outlined in PTT's Queuing Practice Note, attached. The results of the analysis indicate a 95th percentile queue of 0.1 vehicles (ie 0.6m) at the site access.

The proposed layout provides 7.2m (ie about 1.2 vehicles) of queuing space, measured between the site boundary and the first on-site parking space, which is sufficient to accommodate the predicted 95th percentile queue. Accordingly, the proposed queuing provision is considered adequate.

SERVICING

DESIGN SERVICE VEHICLES

The design service vehicles specified in Council's TAPS Policy for multiple-dwelling use are a 12.5m long Large Rigid Vehicle (LRV) and 10.2m long Refuse Collection Vehicle (RCV).

The largest commercial vehicle typically required to service multiple-dwelling developments (aside from an RCV) is a furniture removal truck. PTT has previously consulted furniture removal companies servicing Brisbane to understand the types of furniture removal trucks that are available and the size of truck typically required to service multiple-dwelling units. Based on this, we understand that the furniture removal demands of multiple-dwelling units are typically able to be satisfied by vehicles up to an 8.8m long Medium Rigid Vehicle (MRV) in size.

Therefore, the proposed development has been designed to accommodate service vehicles up to an RCV and MRV in size on-site. The proposal is not expected to generate significant demand for servicing by an LRV.

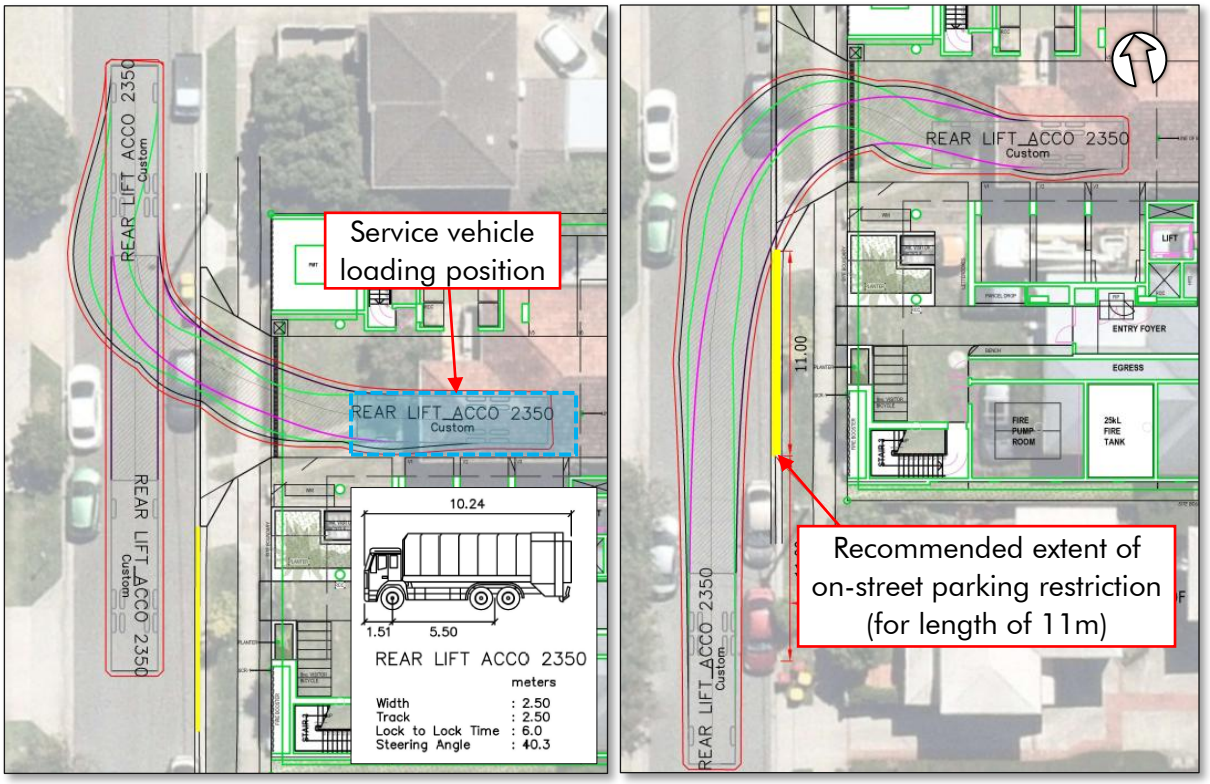
LOADING AND MANOEUVRING

Council's TAPS Policy permits developments accessed via minor roads (ie Western Avenue) to accommodate service vehicles reversing into the site and exiting in forward gear. Provision is required for service vehicles to stand wholly contained within the site boundary, clear of queuing areas and without blocking access to more than 50% of car parking spaces. A minimum 4.5m vertical clearance is required by Council's TAPS Policy to accommodate both design service vehicles.

Consistent with Council's TAPS Policy requirements, service vehicles are proposed to be accommodated in the on-site parking aisle on ground level, as indicated in Figure 6. While standing in this position, service vehicles would be located clear of the design queue area and would temporarily obstruct access to about four visitor parking spaces (ie less than 50% of the total provision). The plans provide a minimum 4.8m vertical clearance in this area, which is sufficient to accommodate an MRV and RCV in accordance with Council requirements.

Swept path analyses of RCV and MRV access and manoeuvring have been undertaken, as attached in PTT drawing numbers 26-396-004 and 26-396-005, and shown in Figure 6 (for the larger vehicle). As shown, due to the narrow carriageway on Western Avenue, it is recommended that a yellow edge line be installed to restrict on-street parking on the southern side of the proposed site access crossover for a length of approximately 11m, to allow service vehicles to egress the site. When taking into account the removal of redundant crossovers, there would be a net reduction of one on-street parking space under the proposal, which is unlikely to have a significant adverse impact on the availability of on-street parking.

Figure 6: RCV ACCESS AND EGRESS



ACTIVE TRANSPORT

PEDESTRIAN FACILITIES

A dedicated pedestrian site access and footpath is proposed to the south of the vehicle crossover, as shown in Figure 7. This is expected to facilitate safe and convenient pedestrian access to / from the site.

The development plans make provision for a 2.0m wide by 2.5m deep sight splay triangle on the southern (ie exit) side of the proposed crossover, clear of walls and other obstructions to visibility. The sight splay is expected to provide adequate visibility between vehicles exiting the site and pedestrians in the verge, in accordance with AS2890.1 requirements.

CYCLISTS

The bicycle parking requirement of the proposed development has been determined based on the bicycle parking provision rates provided in Council's TAPS Policy. A minimum of 53 bicycle spaces (comprising 42 resident and 11 visitor spaces) are required to support the proposal, as shown in Table 2.

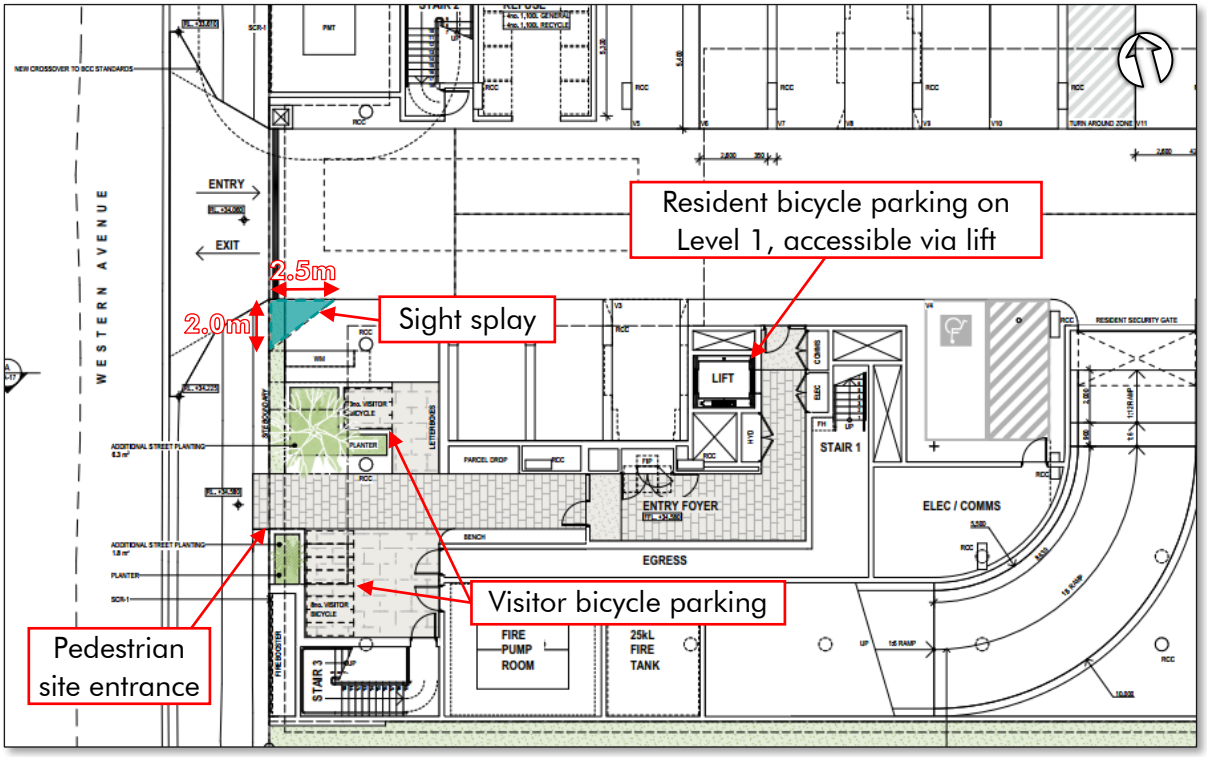
Table 2: MINIMUM BICYCLE PARKING REQUIREMENT

USER	SCALE	BICYCLE PARKING RATE	REQUIREMENT
Resident	42 units	1 space per unit	42 spaces
Visitors	42 units	1 space per four units	11 spaces
Total			53 spaces

A total of 11 visitor bicycle parking spaces are proposed on ground level, adjacent to the pedestrian site entrance, as shown in Figure 7. The spaces are dimensioned 1.8m long by 0.5m wide and are accessible via a minimum 1.5m wide pathway, which is consistent with AS2890.3[2] requirements (as referenced in Council's TAPS Policy). All resident bicycle parking is to be accommodated in storage cages on Level 1 of the building, which is accessible via lift. The storage cages (one per unit) are of sufficient size to accommodate a 1.8m long by 0.5m wide design bicycle parking envelope and are accessible via minimum 1.5m wide aisles. The development plans indicate internal lift dimensions of approximately 2.0m by 1.4m, which is sufficient to accommodate bicycles and their riders.

Accordingly, the proposed bicycle parking arrangements comply with Council's TAPS Policy and AS2890.3 requirements.

Figure 7: PROPOSED PEDESTRIAN AND CYCLIST FACILITIES



TRAFFIC OPERATIONS

TRAFFIC GENERATION

The likely peak hour traffic generation of the proposed development has been determined based on the trip generation rates provided in the RTA Guide to Traffic Generating Developments. In:out splits of 20:80 and 70:30 have been adopted for the weekday morning and evening peak hours, respectively. As shown in Table 3, the proposed development is expected to generate 23 trips (five in and 18 out) during the weekday morning peak hour and 23 trips (16 in and seven out) during the evening peak hour.

[2] Australian Standards AS2890.3:2015 Parking Facilities Part 3: Bicycle Parking

Table 3: PREDICTED PEAK HOUR TRAFFIC GENERATION

PEAK HOUR & USE	SCALE	TRIP GENERATION RATE	TRIPS (VPH)	IN:OUT
Weekday Morning				
Two-bedroom unit	28 units	0.4 – 0.5 trips per unit	14	3 : 11
Three-bedroom unit	14 units	0.5 – 0.65 trips per unit	9	2 : 7
Total	42 units		23	5 : 18
Weekday Evening				
Two-bedroom unit	28 units	0.4 – 0.5 trips per unit	14	10 : 4
Three-bedroom unit	14 units	0.5 – 0.65 trips per unit	9	6 : 3
Total	42 units		23	16 : 7

TRAFFIC IMPACT

Given the forecast low traffic generation of the proposal, the addition of development traffic is not expected to have a significant adverse impact on the operation of the surrounding road network. Detailed assessment of this impact (ie intersection analysis) is not considered required.

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

The proposed development has been evaluated in terms of its site access arrangements, parking provision and design, servicing arrangements, pedestrian / cycle facilities and likely traffic impact. The main points to note are:

- the proposal involves a multiple-dwelling development comprising 42 units
- access is proposed via a 6.5m wide Type B2 crossover on Western Avenue, which complies with Council's TAPS Policy requirements for location and design
- the proposed parking provision of 56 resident and 11 visitor spaces (total 67 spaces) complies with Council's TAPS Policy requirements and the design of these facilities is considered adequate
- provision is made for on-site servicing by an RCV and MRV, which is expected to adequately cater for the servicing demands of the site
- the proposed pedestrian facilities are expected to facilitate safe and convenient pedestrian access to and from the site
- sufficient bicycle parking is proposed on-site, in accordance with Council's TAPS Policy and AS2890.3 requirements
- the proposed development is expected to generate 23 one-way vehicle trips in each peak hour, which is not expected to have a significant adverse impact on the operation of the surrounding road network

RECOMMENDATIONS

Based on the above, it is recommended that:

- a series of traffic management measures be implemented to achieve safe and efficient operation of the two-way / one-lane ramps which are proposed to provide access to the resident basement parking levels, as indicated in Figures 4 and 5 (and attached in PTT drawing number 26-396-003)
- a yellow edge line be installed on Western Avenue to restrict on-street parking on the southern side of the proposed site access for a length of approximately 11m, as shown in Figure 6 (and attached in PTT drawing numbers 26-396-004 and 26-396-005)
-

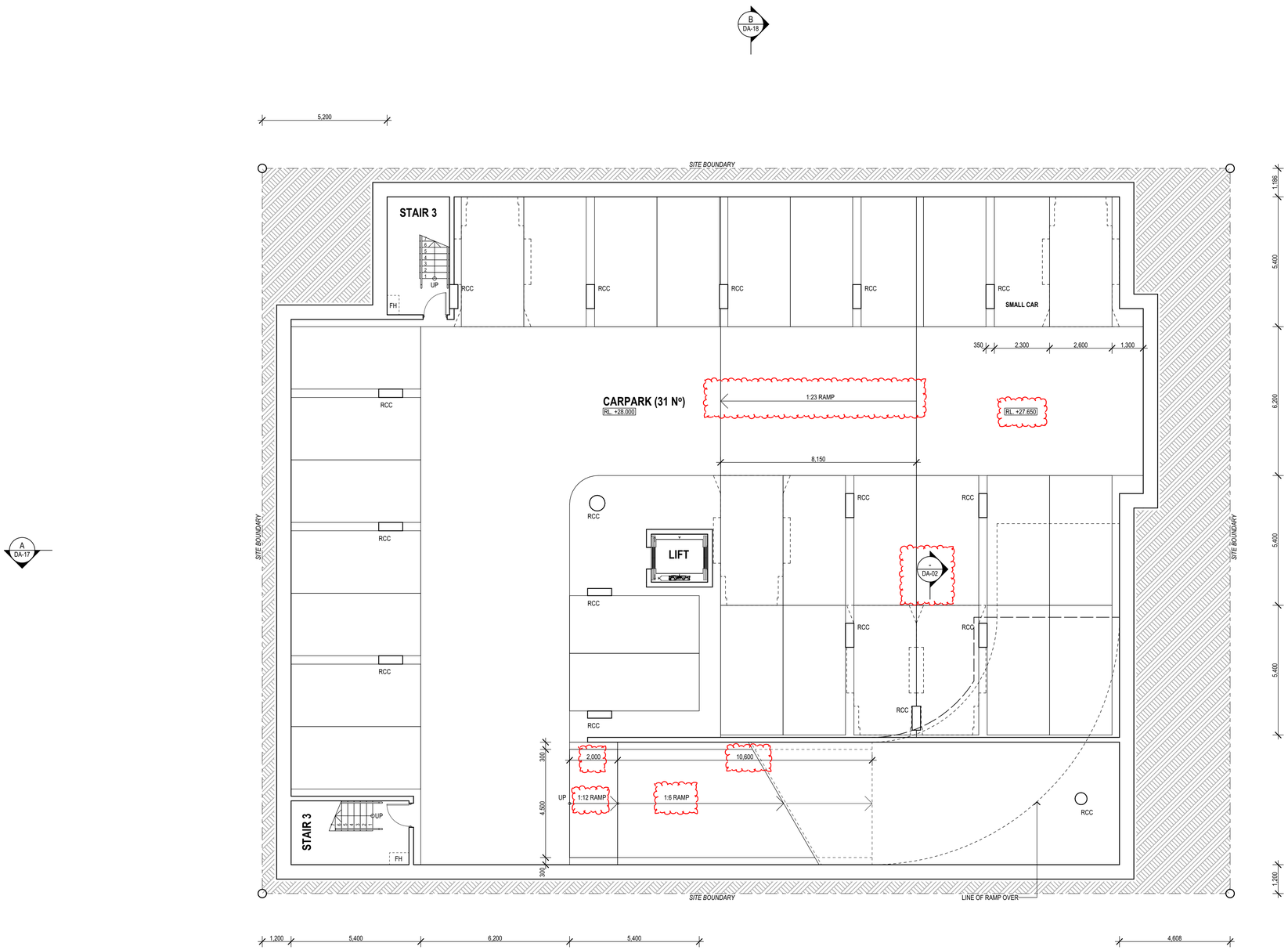
If you have any questions regarding the issues discussed above, please do not hesitate to contact us.

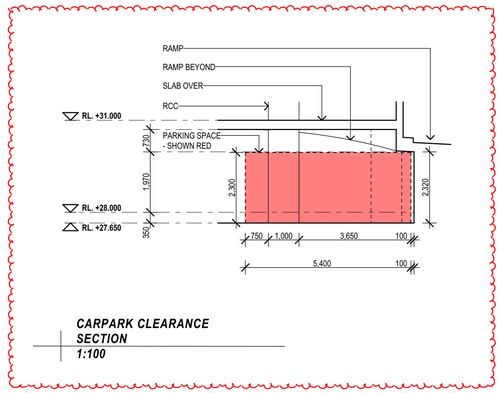
Yours sincerely,

James Gannon
Director (RPEQ 22233)

LEGEND

AC	AIR CONDITIONING UNIT
ACC	ACCESSABLE
BAL	BALCONY
BAL-#	BALUSTRADE-TYPE
BRK	BRICK
CUP'D	CUPBOARD
COMMS	COMMUNICATIONS RISER
CT	COOK TOP
DP	DOWN PIPE
DW	DISHWASHER
EG	EAVES GUTTER
ELEC	ELECTRCIAL RISER
ENS	ENSUITE
FFL	FINISHED FLOOR LEVEL
FH	FIRE HYDRANT
HYD	HYRDRAULIC RISER
MRS	METAL ROOF SHEETING
NGL	NATURAL GROUND LINE
OV	OVEN
P	PANTRY
RL	RELATIVE LEVEL
REN	RENDER
RCC	REINFORCED CONCRETE COLUMN
SCR-#	SCREEN-TYPE
WIR	WALK IN ROBE
WH	WINDOW HOOD
REF	REFRIDGETATROR
ROBE	WARDROBE
SHR	SHOWER
WC	WATER CLOSET
PCP	PREFABRICATED CONCRETE PANEL
VB	VANITY BASIN





CARPARK CLEARANCE SECTION
1:100

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Diligent

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SCALE 1:100@A3

ISSUE	DATE	BY	DESCRIPTION	CHKD
01	10.07.2026	JM	DRAFT DA	LG

UNCONTROLLED

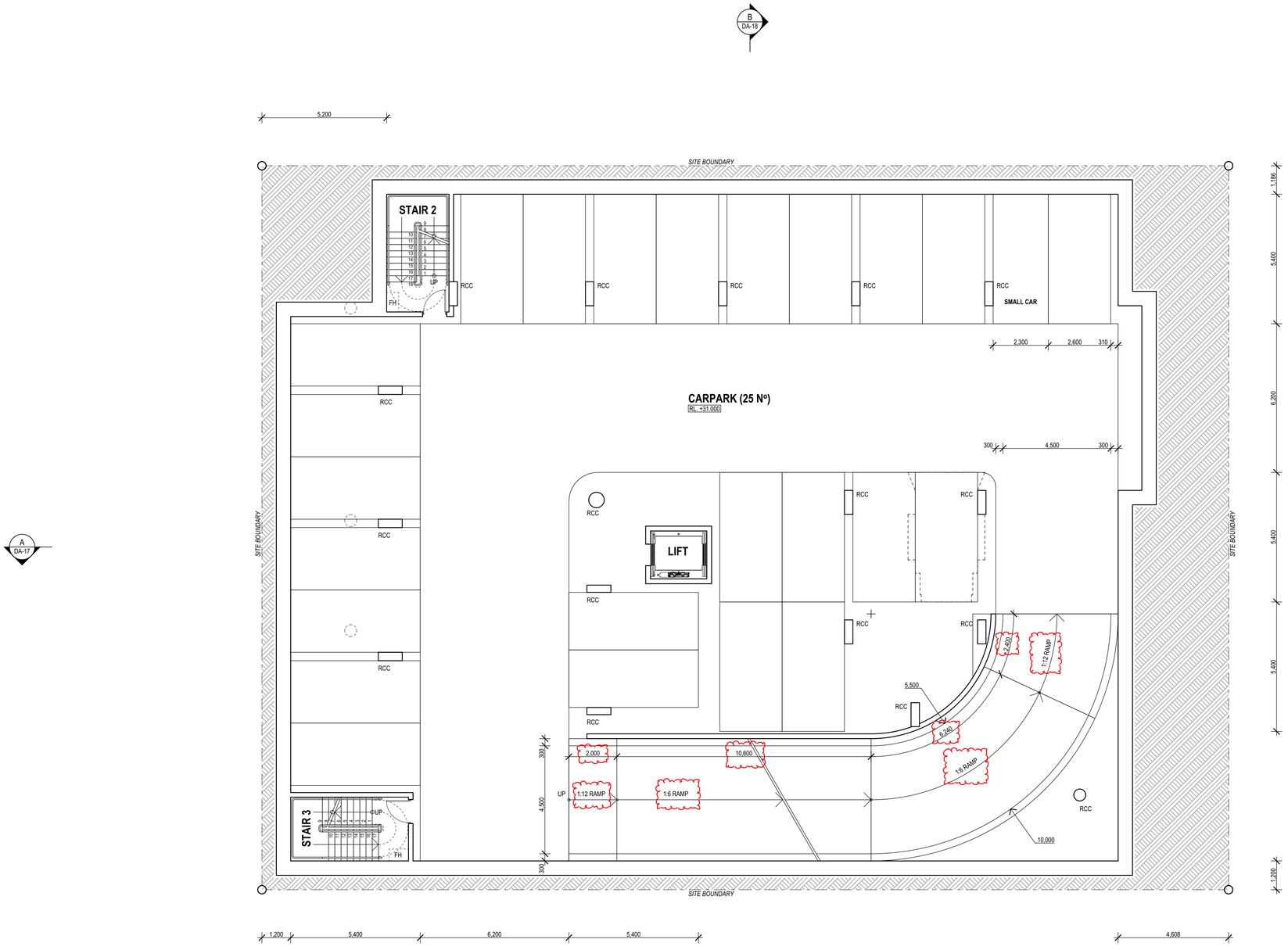
The Grove

DRAWING
FLOOR PLAN - BASEMENT 2

PROJECT NO.	DRAWING NO.	ISSUE
2959-378	DA-02	01

LEGEND

AC	AIR CONDITIONING UNIT
ACC	ACCESSABLE
BAL	BALCONY
BAL-#	BALUSTRADE-TYPE
BRK	BRICK
CUP'D	CUPBOARD
COMMS	COMMUNICATIONS RISER
CT	COOK TOP
DP	DOWN PIPE
DW	DISHWASHER
EG	EAVES GUTTER
ELEC	ELECTRCIAL RISER
ENS	ENSUITE
FFL	FINISHED FLOOR LEVEL
FH	FIRE HYDRANT
HYD	HYRDRAULIC RISER
MRS	METAL ROOF SHEETING
NGL	NATURAL GROUND LINE
OV	OVEN
P	PANTRY
RL	RELATIVE LEVEL
REN	RENDER
RCC	REINFORCED CONCRETE COLUMN
SCR-#	SCREEN-TYPE
WIR	WALK IN ROBE
WH	WINDOW HOOD
REF	REFRIDGETATROR
ROBE	WARDROBE
SHR	SHOWER
WC	WATER CLOSET
PCP	PREFABRICATED CONCRETE PANEL
VB	VANITY BASIN



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ISSUE	DATE	BY	DESCRIPTION	CHKD
01	10.07.2026	JM	DRAFT	LG

UNCONTROLLED

The Grove

DRAWING
FLOOR PLAN - BASEMENT 1

PROJECT NO.	DRAWING NO.	ISSUE
2959-378	DA-03	01

LEGEND

AC	AIR CONDITIONING UNIT
ACC	ACCESSABLE
BAL	BALCONY
BAL-#	BALUSTRADE-TYPE
BRK	BRICK
CUP'D	CUPBOARD
COMMS	COMMUNICATIONS RISER
CT	COOK TOP
DP	DOWN PIPE
DW	DISHWASHER
EG	EAVES GUTTER
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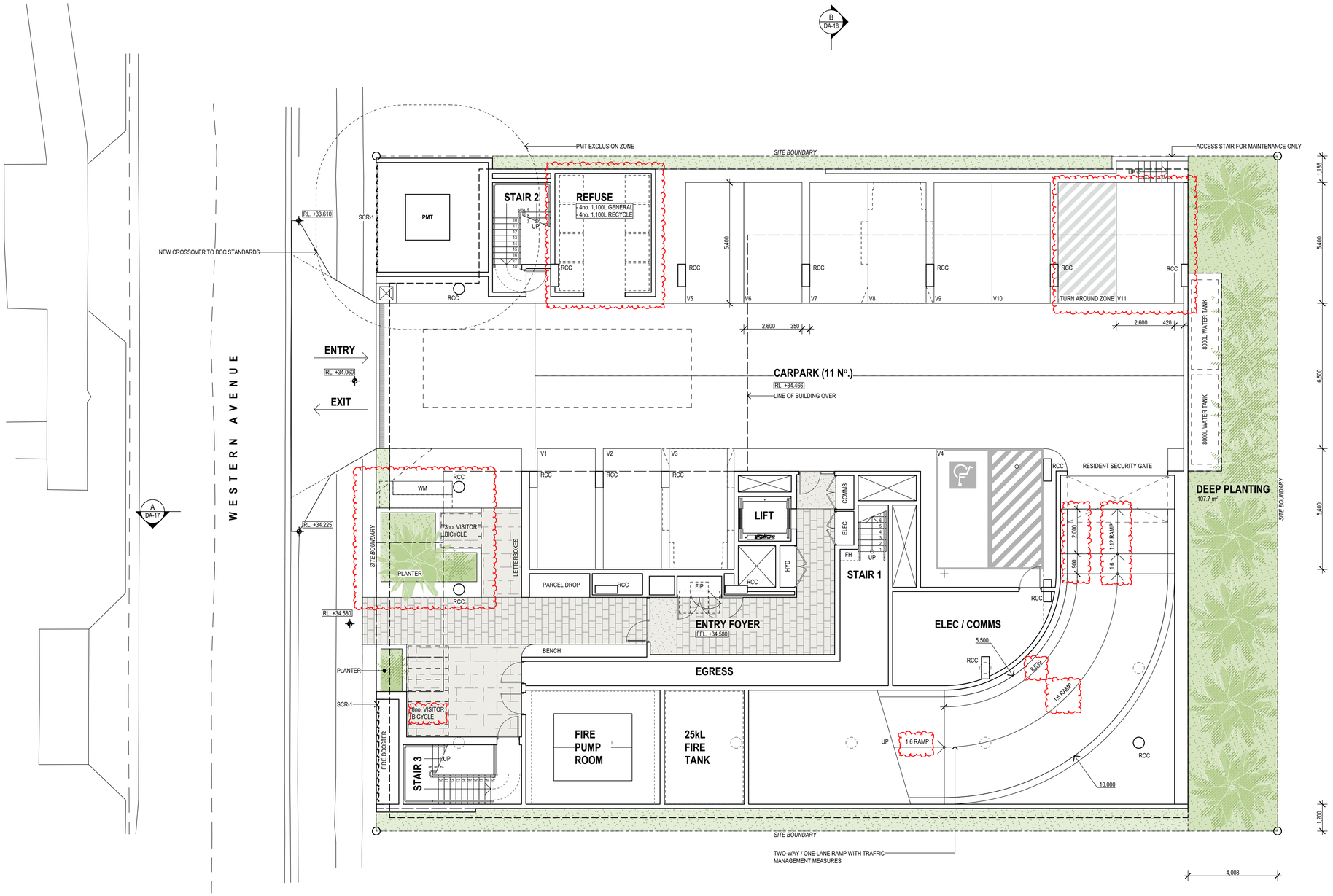

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SCALE 1:100@A3

ISSUE	DATE	BY	DESCRIPTION	CHKD
01	10.07.2026	JM	DRAFT	LG

UNCONTROLLED

The Grove

DRAWING
FLOOR PLAN - GROUND

PROJECT NO.	DRAWING NO.	ISSUE
2959-378	DA-04	01

LEGEND

AC	AIR CONDITIONING UNIT
ACC	ACCESSABLE
BAL	BALCONY
BAL-#	BALUSTRADE-TYPE
BRK	BRICK
CUP'D	CUPBOARD
COMMS	COMMUNICATIONS RISER
CT	COOK TOP
DP	DOWN PIPE
DW	DISHWASHER
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ELEC	ELECTRCIAL RISER
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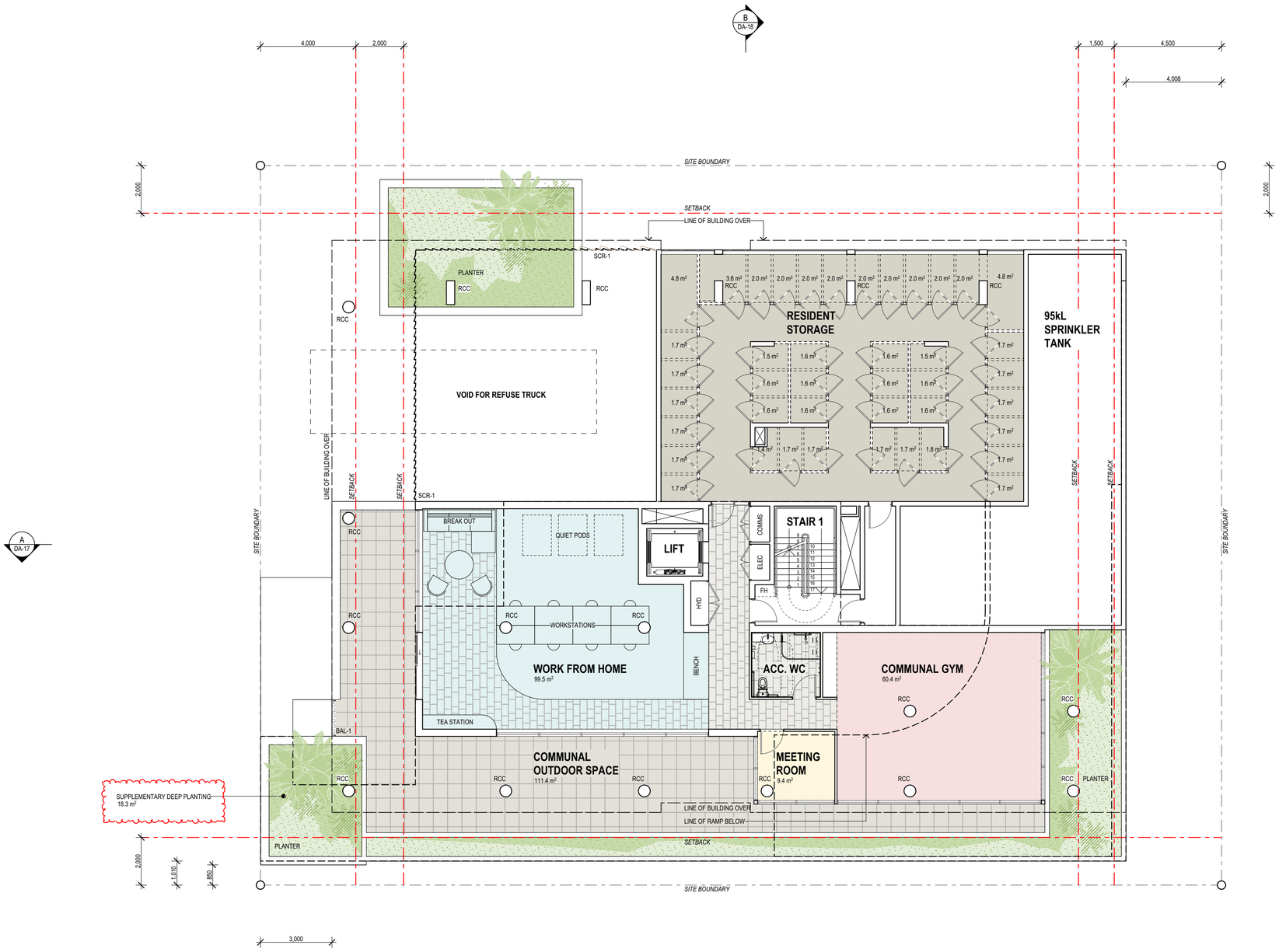

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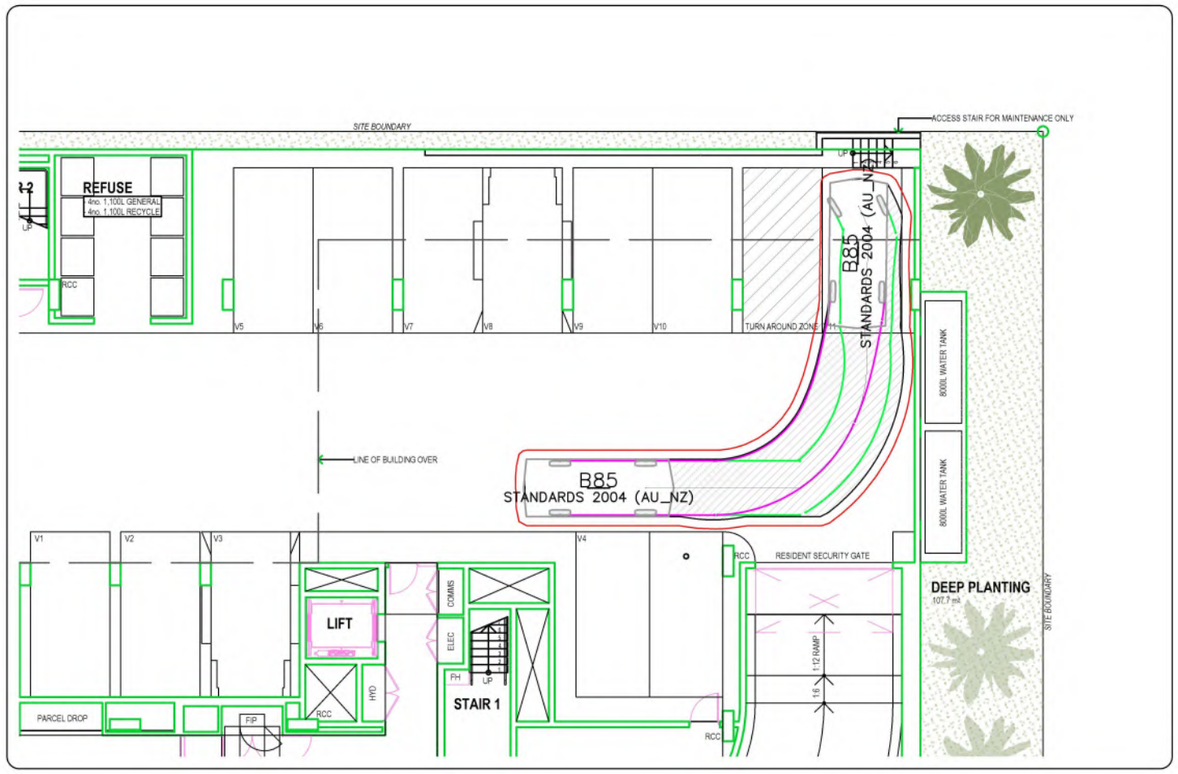
ISSUE	DATE	BY	DESCRIPTION	CHKD
01	10.07.2026	JM	DRAFT PLAN	LG

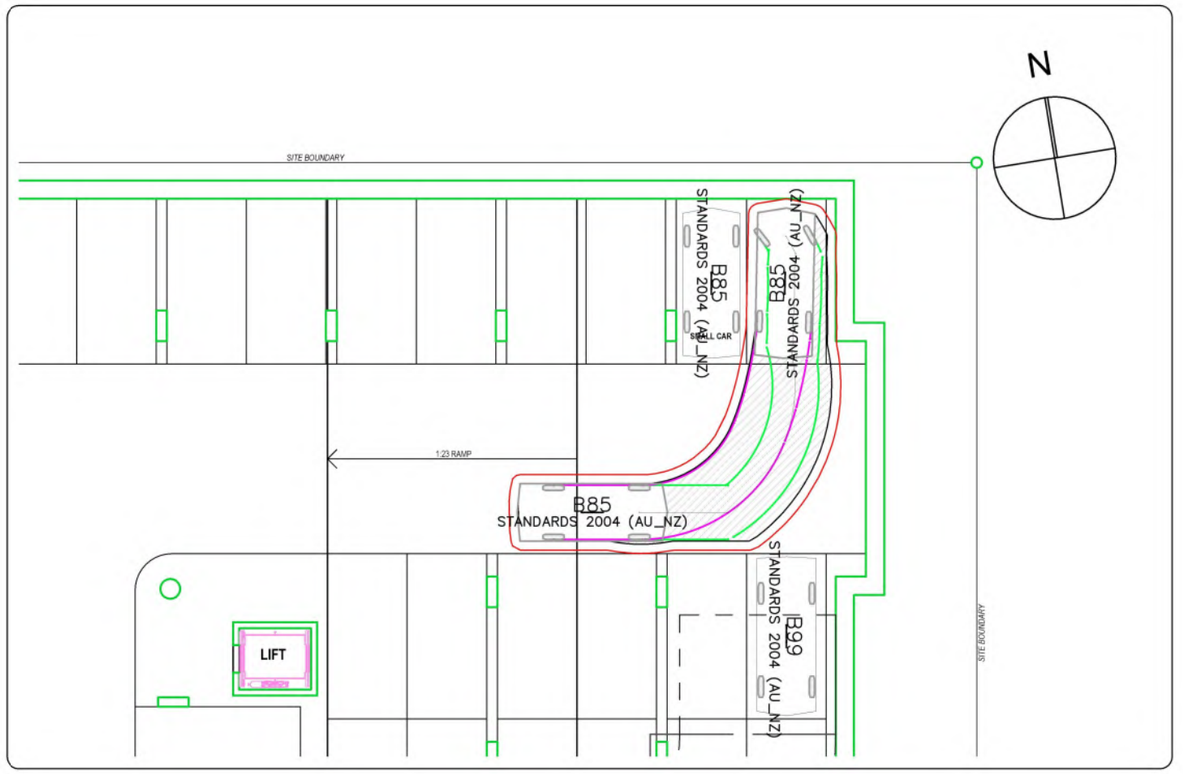
UNCONTROLLED

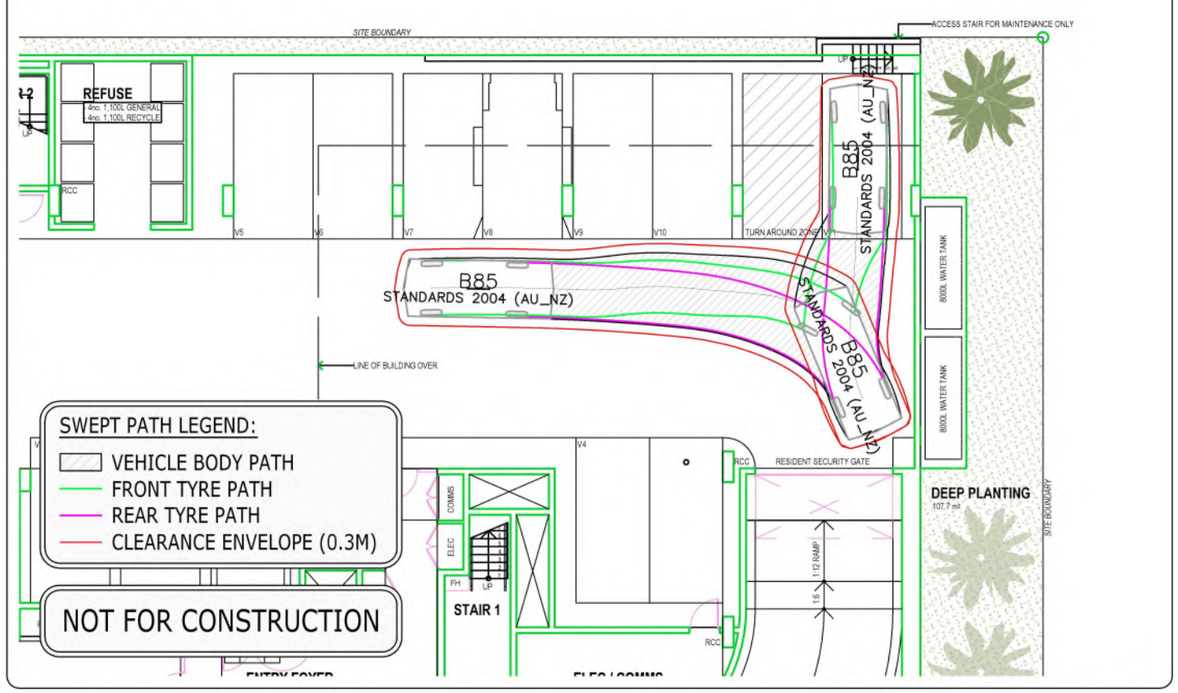
The Grove

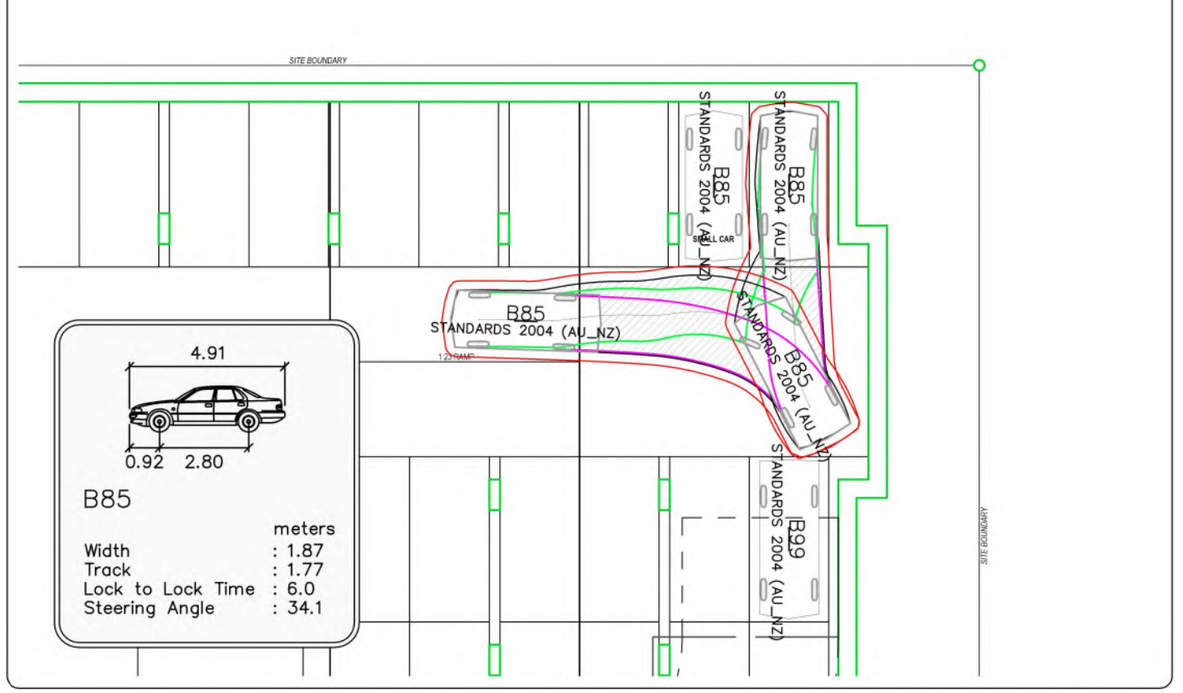
DRAWING
FLOOR PLAN - LEVEL 1

PROJECT NO.	DRAWING NO.	ISSUE
2959-378	DA-05	01









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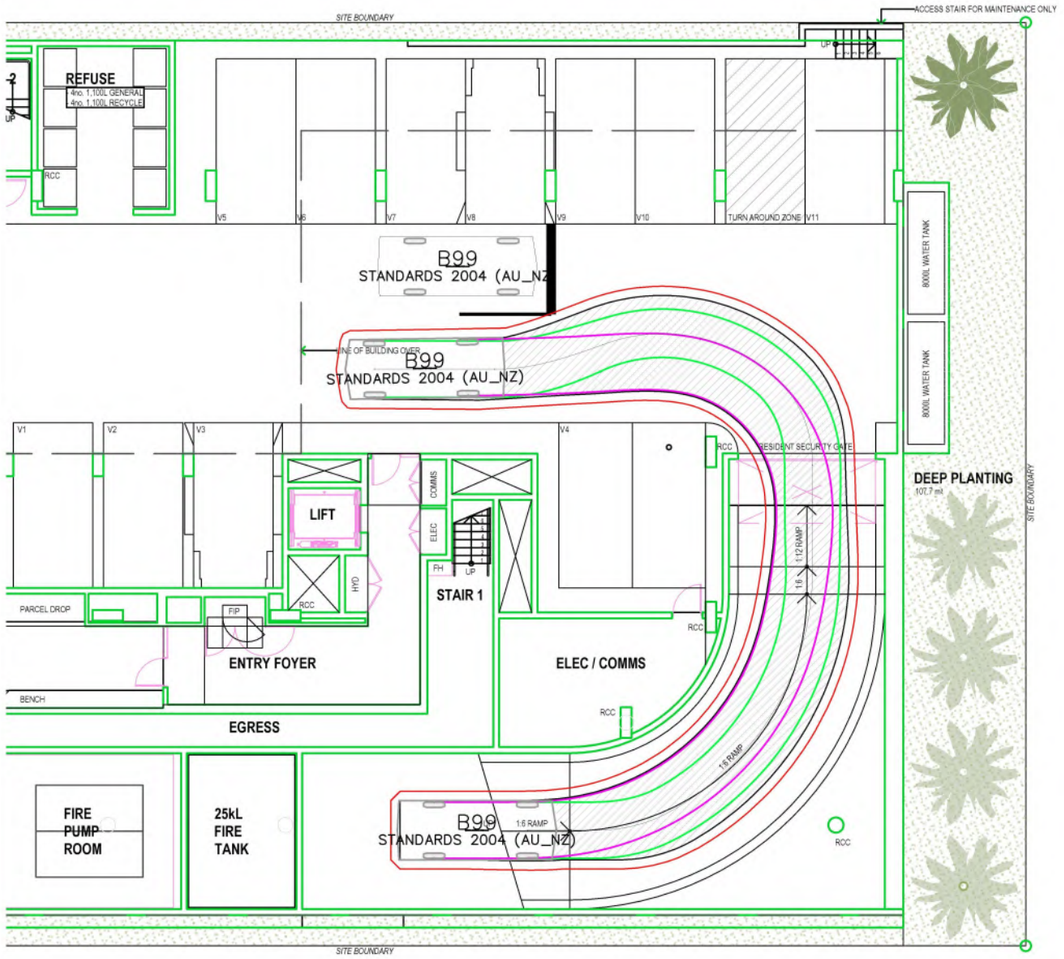
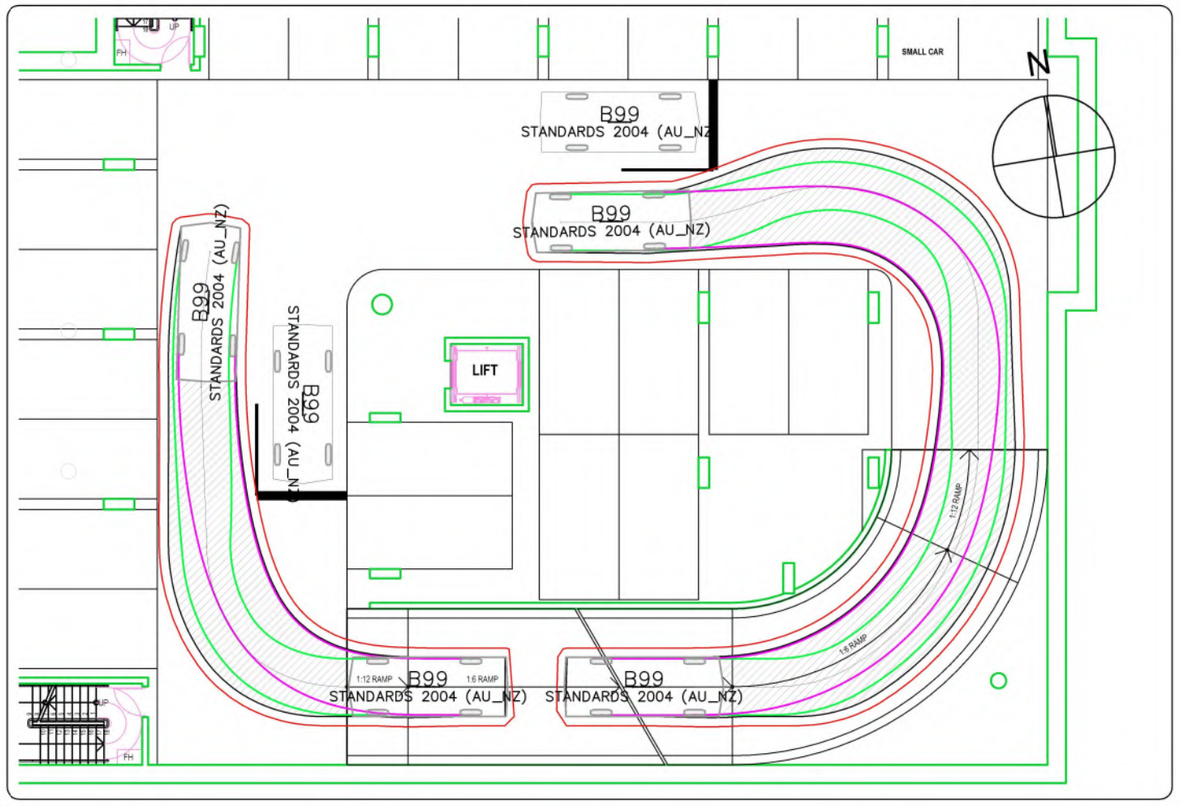
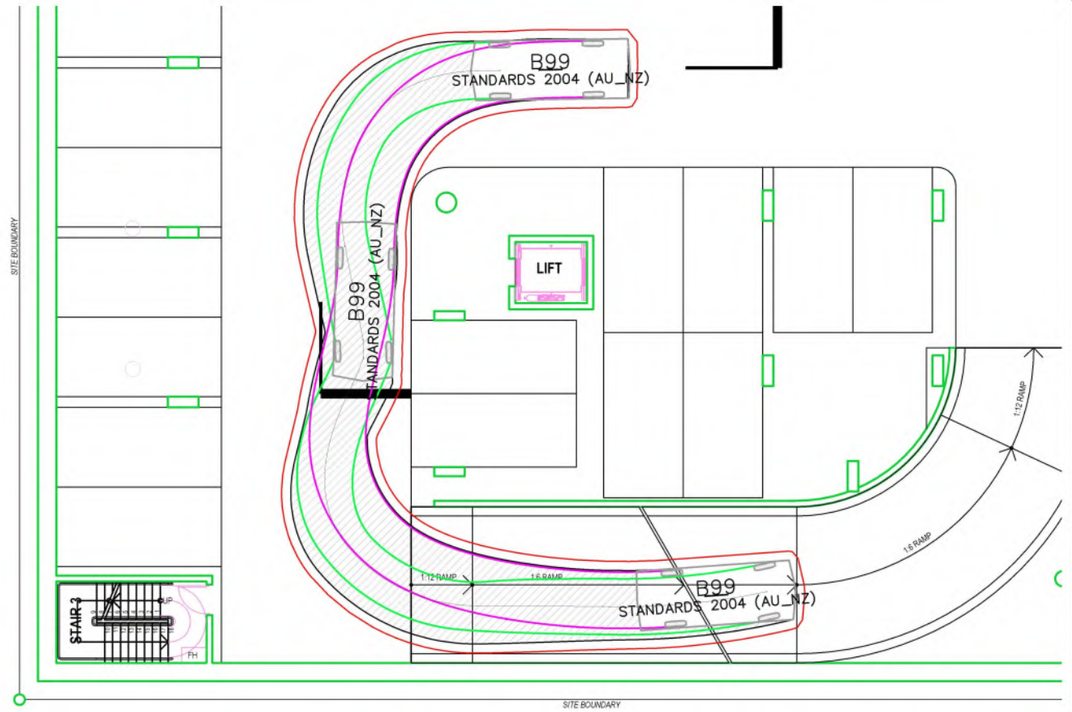
REV	DESCRIPTION	DRN	DATE
A	INITIAL ISSUE	MY	20/07/26

DRAWING TITLE:	DRAWING NO:	REV:	SCALE:	APPROVED BY:
MANOEUVRING AT ENDS OF AISLES	26-396-001	A	1:200 @ A3	JPG (RPEQ 22233)
PROJECT TITLE: 21-23 WESTERN AVENUE, CHERMSIDE	CLIENT: LSH WEST TRUST PARTNERSHIP			

P:\2025-26\26-396 21-23 Western Avenue, Chermside\Calcs\SK001D



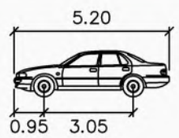




SWEPT PATH LEGEND:

- VEHICLE BODY PATH
- FRONT TYRE PATH
- REAR TYRE PATH
- CLEARANCE ENVELOPE (0.3M)

NOT FOR CONSTRUCTION



B99

	meters
Width	: 1.94
Track	: 1.84
Lock to Lock Time	: 6.0
Steering Angle	: 33.9

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A	INITIAL ISSUE	MY	20/07/26

DRAWING TITLE:	DRAWING NO:	REV:	SCALE:	APPROVED BY:
VEHICLE MANOEUVRING ALONG RAMP	26-396-002	A	1:200 @ A3	JPG (RPEQ 22233)

PROJECT TITLE:	CLIENT:
21-23 WESTERN AVENUE, CHERMSIDE	LSH WEST TRUST PARTNERSHIPS

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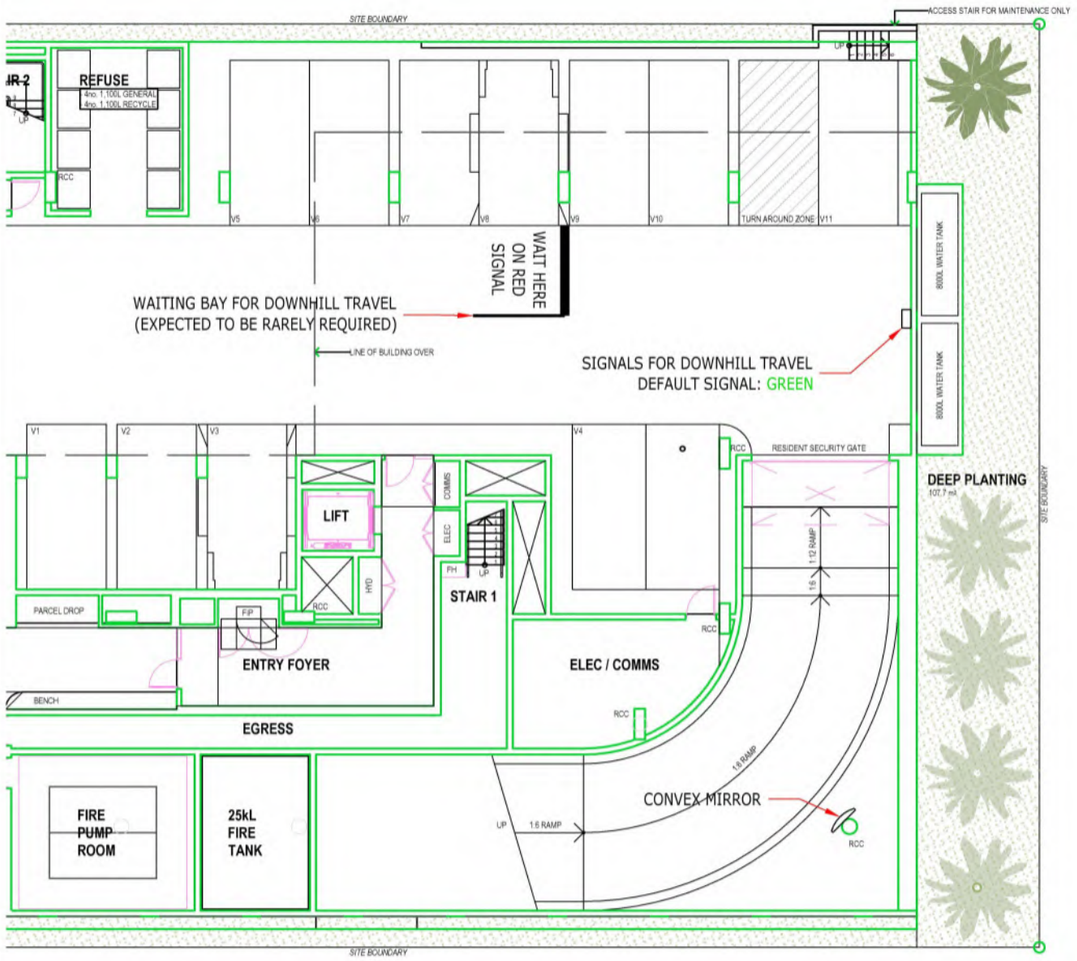

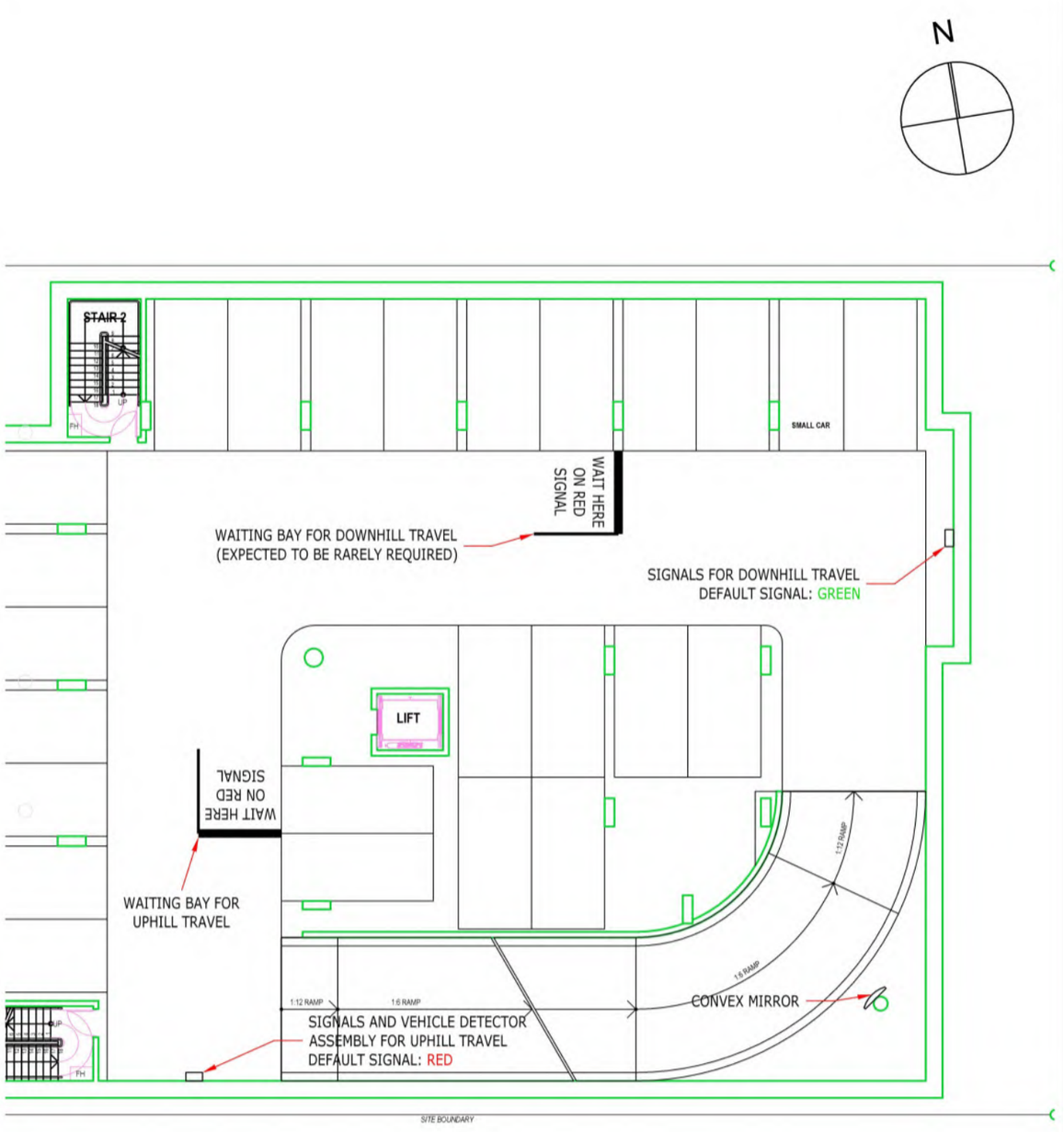

NOT FOR CONSTRUCTION

NOTE: UPPER BASEMENT LEVEL SHOWN. SAME TREATMENTS RECOMMENDED IN LOWER BASEMENT LEVEL (WHERE APPLICABLE).

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REV	DESCRIPTION	DRN	DATE
A	INITIAL ISSUE	MY	20/07/26

DRAWING TITLE:	DRAWING NO:	REV:	SCALE:	APPROVED BY:
RECOMMENDED RAMP TRAFFIC MANAGEMENT MEASURES	26-396-003	A	1:200 @ A3	JPG (RPEQ 22233)
PROJECT TITLE: 21-23 WESTERN AVENUE, CHERMSIDE	CLIENT: LSH WEST TRUST PARTNERSHIPS			

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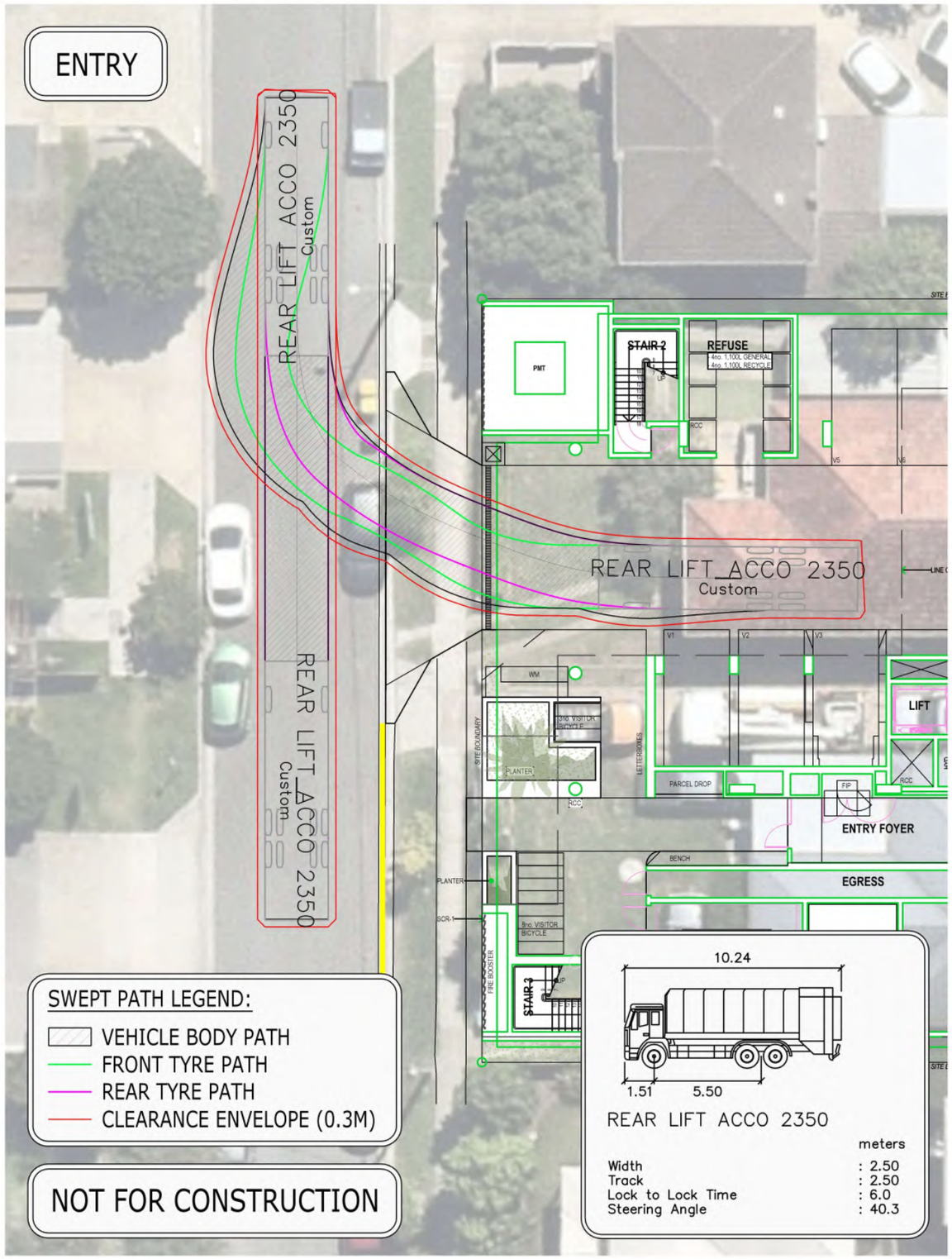
ENTRY



SWEPT PATH LEGEND:

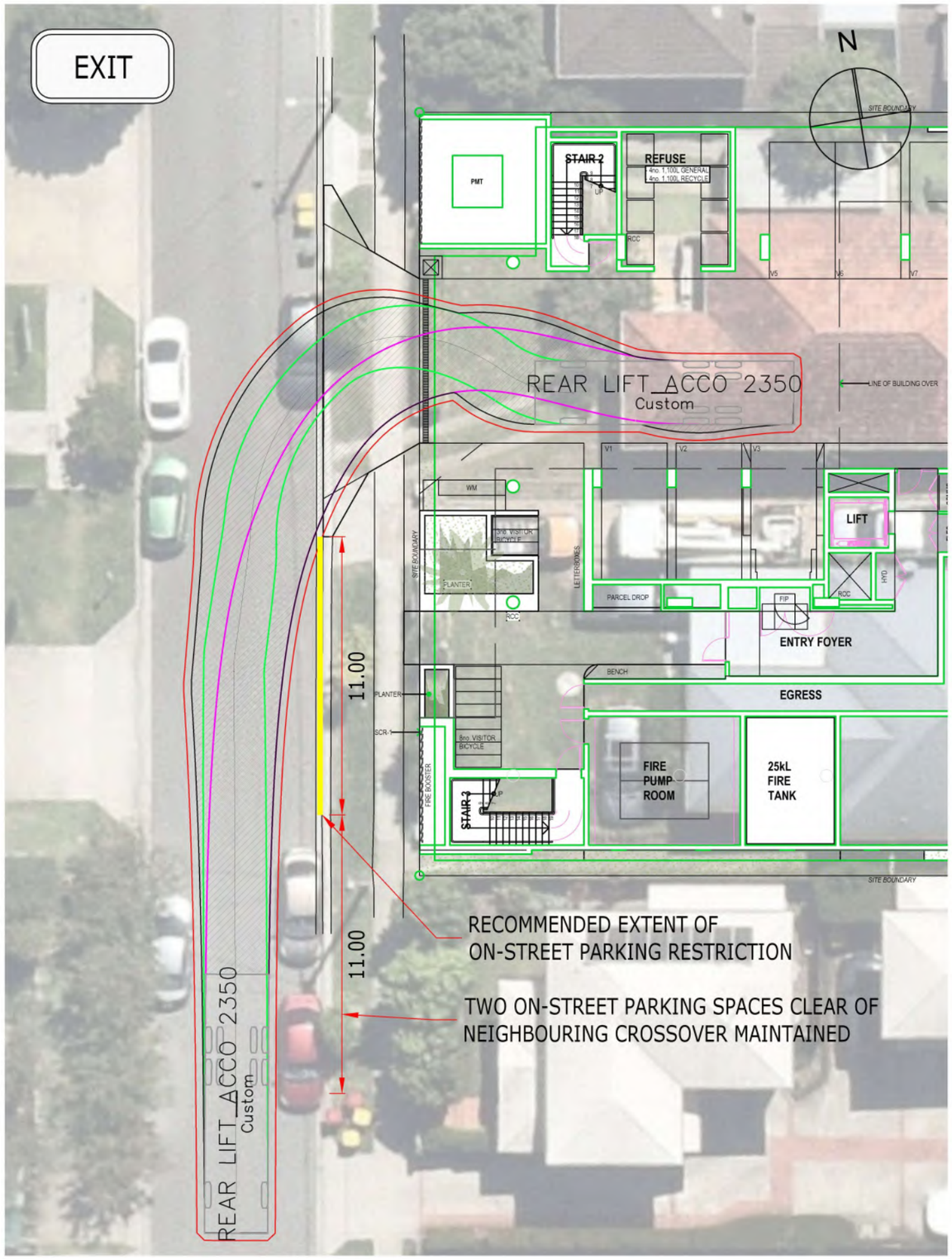
- VEHICLE BODY PATH
- FRONT TYRE PATH
- REAR TYRE PATH
- CLEARANCE ENVELOPE (0.3M)

NOT FOR CONSTRUCTION

REAR LIFT ACCO 2350

	meters
Width	: 2.50
Track	: 2.50
Lock to Lock Time	: 6.0
Steering Angle	: 40.3

EXIT



RECOMMENDED EXTENT OF ON-STREET PARKING RESTRICTION

TWO ON-STREET PARKING SPACES CLEAR OF NEIGHBOURING CROSSOVER MAINTAINED

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REV	DESCRIPTION	DRN	DATE
A	INITIAL ISSUE	MY	??/??/??

DRAWING TITLE: RCV ACCESS AND EGRESS	DRAWING NO: 26-396-004	REV: A	SCALE: 1:200 @ A3	APPROVED BY: JPG (RPEQ 22233)
PROJECT TITLE: 21-23 WESTERN AVENUE, CHERMSIDE	CLIENT: LSH WEST TRUST PARTNERSHIPS			

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ENTRY

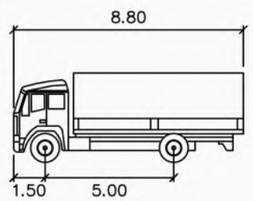
MRV
STANDARDS 2018 (AU)

PMT
STAIR-2
UP
REFUSE
4no. 1,100L GENERAL
4no. 1,100L RECYCLE
RCC
V5
V6
V1
V2
V3
WM
8no. VISITOR BICYCLE
PLANTER
SITE BOUNDARY
LETTERBOXES
LIFT
HYD
PARCEL DROP
FIP
ENTRY FOYER
BENCH
EGRESS
SCR-1
FIRE BOOSTER
STAIR-3
LINE OF

SWEPT PATH LEGEND:

- VEHICLE BODY PATH
- FRONT TYRE PATH
- REAR TYRE PATH
- CLEARANCE ENVELOPE (0.3M)

NOT FOR CONSTRUCTION



MRV

	meters
Width	: 2.50
Track	: 2.50
Lock to Lock Time	: 6.0
Steering Angle	: 34.0

EXIT

N

SITE BOUNDARY

MRV
STANDARDS 2018 (AU)

LINE OF BUILDING OVER

PMT
STAIR-2
UP
REFUSE
4no. 1,100L GENERAL
4no. 1,100L RECYCLE
RCC
V5
V6
V7
V1
V2
V3
WM
8no. VISITOR BICYCLE
PLANTER
SITE BOUNDARY
LETTERBOXES
LIFT
HYD
PARCEL DROP
FIP
ENTRY FOYER
BENCH
EGRESS
SCR-1
FIRE BOOSTER
STAIR-3
FIRE PUMP ROOM
25kL FIRE TANK

11.00
11.00

RECOMMENDED EXTENT OF
ON-STREET PARKING RESTRICTION

TWO ON-STREET PARKING SPACES CLEAR OF
NEIGHBOURING CROSSOVER MAINTAINED

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REV	DESCRIPTION	DRN	DATE
A	INITIAL ISSUE	MY	??/??/??

DRAWING TITLE: MRV ACCESS AND EGRESS	DRAWING NO: 26-396-005	REV: A	SCALE: 1:200 @ A3	APPROVED BY: JPG (RPEQ 22233)
PROJECT TITLE: 21-23 WESTERN AVENUE, CHERMSIDE	CLIENT: LSH WEST TRUST PARTNERSHIPS			

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PRACTICE NOTE

QUEUING CHARACTERISTICS AT SITE ACCESSES

BACKGROUND

On-site queuing areas are required at site access locations to ensure that vehicles do not queue across pedestrian paths or back onto the frontage road.

However, with queuing requirements in planning scheme policies becoming increasingly onerous, the usage of these figures can result in excessive queuing areas which can unnecessarily have an adverse effect construction costs and development yields.

This practice note demonstrates how conventional queuing theory can be used in traffic engineering to determine the anticipated queue length at access locations as a function of local conditions.

QUEUING THEORY

To calculate the amount of queuing space required, we must estimate the probability of a number of vehicles in a queue (n) exceeding a specified number of vehicles (N) at any instant. This is calculated using the following formula:

$$Pr\ (n>N) = \rho^{N+1} \leq \alpha$$

Where:

- ρ is the queue utilisation factor
- α is the probability of a queue of N vehicles being exceeded

Rearranging this formula enables the calculation of the design queue length in terms of the number of vehicles as follows:

$$N = \frac{\log(\alpha)}{\log(\rho)} - 1$$

The **minimum** design queue would be calculated as N vehicles, which may include a fraction of a vehicle (eg 1.2 vehicles). This design queue could be applied subject to engineering judgment.

The **desirable** design queue would be the smallest integer which contains the value, N (ie rounded up to the nearest integer).

Application of a standard vehicle length of 6m per vehicle results in a design queue length in metres.

QUEUE UTILISATION FACTOR

The utilisation factor, ρ, is the ratio of the mean arrival rate (r) and the mean service rate (s), ie:

$$\rho = \frac{r}{s}$$

The mean arrival rate (veh/hr) varies for each situation. It is calculated using the peak hour trip generation for the facility. This is expressed in vehicles per hour.

The mean service rate (veh/hr) is determined by observing the operations of similar facilities.

PTT has calculated the mean service rate for a non-controlled (ie no boom gate) parking facility by surveying the average time taken for cars to enter and leave from visitor parks in a residential development.

This survey was undertaken at a recently approved and constructed mixed use commercial/residential development at Nundah on a Wednesday in July 2014 between 4:30-6:00pm. A minimum of 30 observations were made for both "parking" and "unparking" manoeuvres The results of this analysis are shown in Table 1.

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PRACTICE NOTE

QUEUING CHARACTERISTICS AT SITE ACCESSES

Table 1: MEAN VEHICLE MANOEUVRING TIME (seconds/vehicle)

MANOEUVRE	MEAN TIME	STD DEV	MIN	MAX
Parking	12.2	13.8	1.1	69.5
Unparking	14.7	7.1	2.1	37.2

The application of the mean "unparking" value from Table 1 assumes that each vehicle which enters the access will be waiting for a car to "unpark" from the space nearest to the access. This is an extremely conservative assumption, which will result in an over-estimate of queue lengths.

The mean service time for car parks with entrance controls such as boom gates, ticket dispensing machines, car stackers and mechanical parking installations can usually be provided by the supplier of the product.

PROBABILITY OF EXCEEDANCE

The queuing formula is used to calculate the queue length given a specified probability (α).

Generally, the 95th percentile queue is considered an adequate measure of an acceptable queue at access driveways. This infers that there is a 5% probability that the queue length will be exceeded (ie α=0.05).

Australian Standards, AS2890.1, outlines the requirement to provide a 98th percentile queue for situations where mechanical parking installations such as car stackers are used (ie α=0.02).

EXAMPLE

A development with a mean peak hour trip generation of 100 veh/hr and a 80:20 in:out split results in a vehicle arrival rate of 80 veh/hr.

The service rates from Table 1 can be applied to calculate the queue utilisation factor. However common units are required to find a ratio.

Therefore, the service rate, s, is:

$$\frac{vehicle}{hour} = 3{,}600\left(\frac{seconds}{vehicle}\right)^{-1}$$

$$s = \frac{3{,}600}{14.7} = 244.9 \text{ vehicles per hour}$$

The queue utilisation factor is:

$$\rho = \frac{r}{s} = \frac{80}{244.9} = 0.327$$

The 95th percentile design queue:

$$N = \frac{\log(\alpha)}{\log(\rho)} - 1$$

$$N = \frac{\log(0.05)}{\log(0.327)} - 1$$

$$N = 1.68 \text{ vehicles}$$

Therefore, desirably, the development should be designed to allow for an entrance queue of two vehicles (ie 12m). However, an available queuing distance of 1.68 vehicles (ie 10.1m) would be considered acceptable to cater for the 95th percentile queue, subject to engineering judgment.

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PRACTICE NOTE

QUEUING CHARACTERISTICS AT SITE ACCESSES

CONCLUSION

Conventional traffic engineering queuing theory can be used to determine the anticipated queue length at access locations. This ensures that queuing does not adversely impact on nearby traffic or pedestrian flows whilst ensuring that the queuing area is not excessive.

REFERENCES

Bennett, DW and Rose, G (1988), *Unsignalised Intersection Analysis,* University of Melbourne

Institute of Transport Studies Monash University (2003), *Traffic Engineering and Management,* Volume 2, Caufield East

Standards Australia (2004), *AS2890.1:2004 Parking facilities Part 1: Off-street car parking,* Sydney

DISCLAIMER

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