STANBURY
TRAFFIC PLANNING
TRAFFIC, PARKING & TRANSPORT CONSULTANTS

PARKING & TRAFFIC IMPACT ASSESSMENT

PROPOSED AFFORDABLE HOUSING DEVELOPMENT
23-25 CHARLES STREET
LIVERPOOL

PREPARED FOR HUME COMMUNITY HOUSING

OUR REF: 20-215-4

DECEMBER 2020

302/166 glebe point road
glebe nsw 2037
morgan@stanburytraffic.com.au
www.stanburytraffic.com.au
ph : 0410 561 848
abn : 23 613 111 916

TABLE OF CONTENTS

APPENDICES

1. **Architectural Plans**
2. **Swept Path Plans**
3. **Traffic Survey Data**
4. **SIDRA Output (Existing Conditions)**

1. INTRODUCTION

1.1 Scope of Assessment

Stanbury Traffic Planning has been commissioned by Hume Community Housing to prepare a Parking & Traffic Impact Assessment with respect to a proposal to demolish two existing detached dwellings and the construction of a residential apartment development comprising 23 dwellings.

The aim of this assessment is to investigate and report upon the potential parking and traffic consequences of the proposal and to recommend appropriate ameliorative measures where required. This report provides the following scope of assessment:

- Section 1 provides a summary of the site location, details, existing and surrounding land-uses;
- Section 2 describes the proposed development;
- Section 3 assesses the adequacy of the proposed site access arrangements, parking provision, internal circulation and servicing arrangements with reference to relevant Council, Transport for NSW (TfNSW, formally Roads & Maritime Services), Australian Standard and State Environmental Planning Policy specifications;
- Section 4 assesses the existing traffic, parking and transport conditions surrounding and servicing the subject development site including a description of the surrounding road network, traffic demands, operational performance and available public transport infrastructure; and
- Section 5 estimates the traffic generating ability of the proposed development and assesses the ability or otherwise of the surrounding road network to be capable of accommodating the altered demand in a safe and efficient manner.

The report has been prepared pursuant to State Environmental Planning Policy (Infrastructure) 2007. The application is not of sufficient scale to be referred to TfNSW under this Instrument.

1.2 Reference Documents

Reference is made to the following documents throughout this report:

- *State Environmental Planning Policy (Affordable Rental Housing) 2009* (hereafter referred to as the 'Affordable Housing SEPP');
- Liverpool City Council's *Liverpool Development Control Plan 2008 (LDCP* 2008);
- Transport for NSW's *Guide to Traffic Generating Developments*;

- Australian Standard for *Parking Facilities Part 1: Off-Street Car Parking* (AS2890.1:2004).

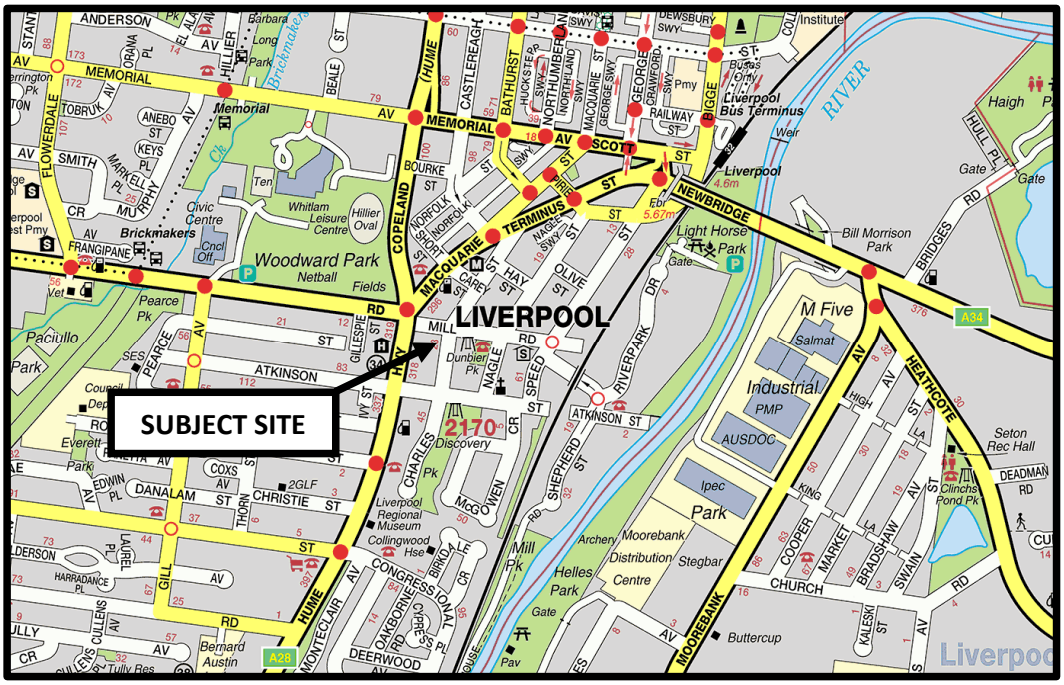
Architectural plans have been prepared by Idraft Architects and should be read in conjunction with this report, reduced copies of a selection of which are included as **Appendix 1** for reference.

1.3 Site Details

1.3.1 Site Location

The subject site is located on the south-western corner of the intersection of Mill Road and Charles Street, Liverpool. The site located is illustrated below and overleaf within a local and aerial context by **Figure 1** and **Figure 2,** respectively.

FIGURE 1
SITE LOCATION WITHIN A LOCAL CONTEXT



Source: UBD's Australian City Streets – Version 8

FIGURE 2
SITE LOCATION WITHIN AN AERIAL CONTEXT

Source: Six Maps (accessed 26/10/2020)

1.3.2 Site Description

The subject site comprises two allotments providing a real property description of Lots 1 & 2 within DP500066, collectively providing a street address of 23 – 25 Charles Street, Liverpool.

The above allotments provide a predominantly rectangular shaped parcel of land providing approximate frontages of 20m and 35m to Mill Road and Charles Street, respectively. The total site area is approximately 690m^2.

1.3.3 Existing Site Use

No. 23 & 25 Charles Street each currently accommodate a detached residential dwelling and associated outbuildings, with each dwelling being serviced by combined ingress / egress driveways connecting with Charles Street.

1.3.4 Surrounding Uses

North of the subject site, on the opposite side of Mill Road, land is accommodated by a residential apartment building fronting and serviced by separate driveways in Mill Road and Charles Street.

Immediately south and to the east of the site (on the opposite side of Charles Street), land is occupied by detached residential dwellings, also fronting and serviced by Charles Street.

A vacant block of land adjourns the site to the west.

2. SUSTAINABLE TRANSPORT ACCESSIBILITY

2.1 Public Transport

The subject site is located in close proximity to various forms of public transport including rail and various bus routes. Connectivity between the site and this public transport infrastructure is facilitated by safe and efficient pedestrian access and mobility facilities.

The following provides a summary of the immediately surrounding sustainable transport accessibility.

2.1.1 Buses

There are a large number of bus services within the subject vicinity, with the closest stops being located approximately 350m walking distance from the site.

Table 1 below provides a summary of the bus routes provided within the vicinity of the site and the frequencies of these bus routes. It is noted that at the time of writing this report, bus services and hours may have been affected due to COVID-19.

TABLE 1
BUS SERVICE FREQUENCIES

Route No.	Origin / Destination	Frequency		
		Weekday Peak	Weekday Business	Weekend
851	Liverpool / Carnes Hill Marketplace	30 mins	60 mins	60 mins
852	Liverpool / Carnes Hill Marketplace	30 mins	60 mins	60 mins
853	Liverpool / Carnes Hill via Hoxton Park Road	15 mins	30 mins	60 mins
855	Liverpool / Rutleigh Park Via Austral & Leppington Station	60 mins	2 hours	3 hours
856	Liverpool / Bringelly	60 mins	2 hours	3 hours
857	Liverpool / Narellan	30 mins	60 mins	3 hours
865	Casula / Liverpool via Lurnea Shops	30 mins	30 mins	60 mins
866	Casula / Liverpool	30 mins	30 mins	60 mins
869	Liverpool / Ingleburn	30 mins	30 mins	30 mins
870	Liverpool / Campbelltown	30 mins	60 mins	60 mins
871	Liverpool / Campbelltown via Glenfield	60 mins	60 mins	60 mins
872	Liverpool / Campbelltown via Macquarie Fields	30 mins	30 mins	30 mins

Route 851, 852, 855, 856, 857, 865, 866, 870, 871, and 872 operate along Hume Highway opposite Passefield Road, approximately 350m walking distance to the south-west of the site.

Routes 853 and 869 operate along Hoxton Park Road, with the closest stop being situated approximately 350m walking distance to the west of the site.

2.1.2 Heavy Rail

The site is located approximately 1km walking distance from Liverpool Railway Station. This station provides access to train services which operate along the T3 Liverpool Line. Liverpool Station also serves as an interchange providing access to services along the T2 Leppington / Inner West and T5 Leppington / Richmond lines. Services along these lines provide efficient connectivity to the remainder of the Sydney metropolitan rail network via interchanges at Liverpool, Parramatta and Lidcombe.

2.1.3 Pedestrians

Pedestrians are provided with the following access and mobility infrastructure within the immediate vicinity of the subject site:

- Pedestrian refuges are provided over all approaches of the roundabout controlled intersection of Charles Street and Mill Road;
- Footpaths are provided along both sides of Charles Street and Mill Road;
- Signalised pedestrian crossings are provided over all approaches of the intersection of Macquarie Street, Hoxton Park Road, Hume Highway ad Copeland Street;
- Footpaths are provided along both sides of Hume Highway; and
- Footpaths are provided along both sides of Atkinson Street.

2.1.4 Cyclists

A number of off road cycle paths are provided through Liverpool including on Mill Road and Speed Street with connectivity to Liverpool Station, Warwick Farm and Cabramatta in the north and Casula and beyond in the south.

3. PROPOSED DEVELOPMENT

3.1 Built Form

The subject application seeks approval to demolish the existing site structures and the construction of a residential apartment development comprising 23 dwellings.

The building is to be constructed in accordance with the Affordable Housing SEPP, providing 23 dwellings as follows:

- 12 one bedroom apartments; and
- 11 two bedroom apartments.

The development is to be serviced by a single parking level containing 11 vehicular parking spaces. A total of 15 bicycle parking spaces are proposed to be provided external to the building, adjacent to the southern building wall.

The on-site parking area is proposed to be serviced by a single combined ingress / egress access driveway connecting with Charles Street in the south-eastern corner of the site.

Pedestrian access to the building is proposed to be provided via internal pathways connecting with the western Charles Street footpath to the north of and separate from the vehicular access driveway. An additional pedestrian access pathway is proposed to be provided connecting with Mill Road in the north-western corner of the site.

4. SITE ACCESS & INTERNAL CIRCULATION

4.1 Passenger Vehicular Access

Vehicular access between the on-site parking area and Charles Street is proposed to be provided via a 6.1m wide combined ingress / egress driveway located within the south-eastern corner of the site, connecting with Charles Street approximately 30m south of the intersection of Charles Street and Mill Road. The driveway is proposed to provide direct connectivity to an internal roadway / ramp adjoining the southern site boundary.

AS2890.1:2004 provides driveway design specifications based on the proposed primary land use, the functional order of the access road and the number of spaces the driveway is to serve. Tables 3.1 and 3.2 of AS2890.1:2004 specify that, at minimum, a Category 1 type driveway is required, providing a combined ingress / egress driveway width of between 3m and 5.5m based on the local (non-arterial) functional order of Charles Street, the residential land-use and the passenger vehicle parking provision within the basement parking area of 11 spaces. The proposed combined ingress / egress driveway width of 6.1m therefore exceeds the minimum AS2890.1-2004 specifications and accordingly is considered to be satisfactory.

Swept path plans have been prepared in order to demonstrate the ability of passenger vehicles to enter and exit the site in combination, copies of which are included as **Appendix 2**.

The safety and efficiency of access / egress movements are also proposed to be assisted by the provision of a relatively level (maximum 1:20) grade for exiting traffic on approach to the property boundary. It is further noted that sight distance between exiting vehicles and Charles Street are not proposed to be impeded by any obstructions along the site frontage, suitably according with the requirements of Figure 3.3 of AS2890.1:2004.

Further, the consistent vertical and horizontal alignment of Charles Street facilitates an acceptable level of sight distance prevailing between the proposed access driveway location and the frontage road. Notwithstanding this, it is acknowledged that sight distance between the proposed driveway location Charles Street to the north is somewhat limited the proximity of the frontage driveway to the roundabout controlled intersection of Charles Street and Mill Road. However the nature of the intersection control is such that southbound traffic entering Charles Street from Mill Road will be required to travel at a significantly reduced speed (in comparison to the sign posted speed limit of 50km/h) in order to safely negotiate the intersection. Further, the driveway is proposed to be located at the furthest possible point from the intersection, along the longest frontage of the site. The location of the site access driveway is therefore considered appropriate in the subject instance.

4.2 Parking Provision

4.2.1 Vehicular Parking Provision

The development is proposed to be serviced by a single parking level containing 11 passenger vehicle parking spaces, all of which are to be allocated to residents.

The Affordable Housing SEPP provides state wide relevant parking requirements for in fill affordable housing. Clause 14(2)(a)(ii) of the Affordable Housing SEPP states the following with respect to car parking:

14. Standards that cannot be used to refuse consent

(2) A consent authority must not refuse consent to development to which this Division applies on any of the following grounds:

(a) parking
if:

(i) in the case of a development application made by a social housing provider for development on land in an accessible area – at least 0.4 parking spaces are provided for each dwelling containing 1 bedroom, at least 0.5 parking spaces are provided for each dwelling containing 2 bedrooms and at least 1 parking space is provided for each dwelling containing 3 or more bedrooms.

Clause 4 of the Affordable Housing SEPP defines ***accessible area*** as land that is within:

a) 800 metres walking distance of a public entrance to a railway station or a wharf from which a Sydney Ferries ferry service operates, or

b) 400 metres walking distance of a public entrance to a light rail station or, in the case of a light rail station with no entrance, 400 metres walking distance of a platform of the light rail station, or

c) 400 metres walking distance of a bus stop used by a regular bus service (within the meaning of the Passenger Transport Act 1990) that has at least one bus per hour servicing the bus stop between 06.00 and 21.00 each day from Monday to Friday (both days inclusive) and between 08.00 and 18.00 on each Saturday and Sunday.

As presented in section 2.1, the subject site is located 350m from bus stops located on Hume Highway near Passefield Road and Hoxton Park Road near Gillespie Street. State Transit buses service the bus stop on Hume Highway every 5 – 10 mins on weekdays and every 15 – 20 mins on weekends. Buses service the bus stop on Hoxton Park Road every 30 minutes on weekdays and weekends. The subject site is therefore defined as being within an accessible area and the parking rates from Clause 14(2)(c) therefore apply.

Table 2 overleaf provides the off-street parking requirements based on the requirements of Affordable Housing SEPP.

TABLE 2 OFF-STREET PARKING REQUIREMENTS AFFORDABLE HOUSING SEPP			
Item	**Rate**	**No.**	**Spaces Required**
1 bedroom dwellings	0.4 spaces per dwelling	12	4.8
2 bedroom dwellings	0.5 spaces per dwelling	11	5.5
		Total	10.3 (adopt 11)

Table 2 indicates that the Affordable Housing SEPP requires the development provide a total of 11 passenger vehicle parking spaces.

A consent authority accordingly cannot refuse consent to the proposed development on the grounds of car parking, as 11 on-site spaces are provided for the development.

Whilst the Affordable Housing SEPP does not provide specific requirements for visitor parking, it is acknowledged that the development may generate some demand for visitors.

Kerbside parking is provided within both Charles Street and Mill Road in the vicinity of the site, generally in an unrestricted manner (despite 'No Stopping' restrictions applying within Charles Street on immediate approach to Mill Road). Observations have indicated that whilst demand for on-street parking within the immediate vicinity of the subject site is notable, supply exists to accommodate a minor level of additional demand. It is therefore considered most unlikely that any minor visitor parking demand associated with the development, should it be generated, will result in any unreasonable impacts on surrounding residential amenity.

4.2.2 Bicycle Parking

The subject development is to provide class 3 bicycle storage racks capable of accommodating up to 15 bicycles within the pedestrian access pathway, adjacent to the southern building wall.

The Affordable Housing SEPP does not prescribe bicycle parking rates for in-fill affordable housing. Liverpool City Council's DCP 2008 provides bicycle parking rates for residential flat buildings as follows:

Resident
1 per 2 units, or 1 for every 4 bedrooms (whichever is greater)

Visitors
1 per 10 units
The subject development a total of 23 units, comprised of 12 one bedroom units and 11 two bedroom units. The subject development is therefore proposed to comprise a total of 34 bedrooms. DCP 2008 therefore requires a bicycle parking provision as follows:

Resident (Class 1 or 2) Bicycle Spaces
The greater of:
0.5 x 23 = 11.5 *or* *0.25 x 34 = 8.5*

Visitor (Class 3) Bicycle Spaces
0.1 x 23 = 2.3

Based on 23 dwellings, Liverpool City Council's *DCP 2008* recommends a bicycle parking provision of 11.5 (adopt 12) resident and 2.3 (adopt two) visitor parking spaces, or a total of 14 spaces.

It is noted that the Affordable Housing SEPP forms the prevailing planning instrument in the subject instance, which does not specifically require any bicycle parking to be provided. Notwithstanding this, a total of 15 bicycle parking spaces, comprised five class 3 bicycle racks are proposed and are considered satisfactory in the subject instance.

4.3 Internal Circulation and Manoeuvrability

Connectivity between the site access driveway and the car parking area is proposed via a roadway running parallel to the southern site boundary. This roadway is to provide a width of 5.5m for approximately 7m inside the property, prior to linking with a secure roller door connecting with the parking area.

This parking area is largely proposed to comprise a single row of 90-degree angled parking spaces provided within an east-west alignment, being serviced by an adjoining circulation aisle forming an extension of the abovementioned internal access roadway. Two additional parking bays are also proposed to be provided in a north-south alignment, being directly accessed via the northern termination of the internal circulation aisle.

The passenger vehicle parking area have been designed to accord with the minimum requirements of AS2890.1:2004, providing the following base dimensions:

- Parking space width = 2.4m;
- Additional vehicular space width where parking spaces adjoins an obstruction = 0.3m;
- Parking space length = 5.4m;
- Aisle width servicing parking spaces = 6.13m; and
- Headroom = 2.2m.

It is understood that the suitability or otherwise of the accessible parking space parking design is addressed by others under separate cover.

In order to further demonstrate the internal passenger vehicle manoeuvrability within throughout the parking area, this Practice has prepared a number of swept

path plans which are included as **Appendix 2**. The turning paths provided on the plans have been generated using Autoturn software and derived from B99 and B85 vehicle specifications provided within AS2890.1:2004.

Section B4.4 of AS2890.1:2004 states the following with regard to the use of templates to assess vehicle manoeuvring:

> *'Constant radius swept turning paths, based on the design vehicle's minimum turning circle are not suitable for determining the aisle width needed for manoeuvring into and out of parking spaces. Drivers can manoeuvre vehicles within smaller spaces than swept turning paths would suggest.'*

It would therefore appear that whilst the turning paths provided within AS2890.1:2004 can be utilised to provide a 'general indication' of the suitability or otherwise of internal parking and manoeuvring areas, vehicles can generally manoeuvre more efficiently than the paths indicate. Notwithstanding this, the swept path plans illustrate that passenger vehicles can manoeuvre throughout and enter and exit the most difficult passenger vehicle parking spaces within the parking area.

It is noted that the parking area forms a dead-end aisle, a formalised turning bay is not considered to be required as all internal parking spaces are proposed to be specifically allocated to residents.

It is further acknowledged that the vehicles are required to reverse the full length (approximately 20m) of the internal parking aisle to access the northern-most three parking spaces. Whilst such an arrangement is generally not considered to be desirable within large publicly accessible developments, it is considered acceptable in the subject instances given the small and private nature of the development. Notwithstanding this, if considered necessary, Council could impose a condition of consent which required the installation of a mechanical turntable within the northern end of the parking aisle.

4.4 Site Servicing

4.4.1 Refuse Collection

The subject site is anticipated to generate the requirement for regular waste collection vehicle servicing. Garbage bins are proposed to be contained within a storage area situated within the parking area, immediately to the north of the site access driveway. These bins are proposed to be wheeled to the Charles Street footpath for collection in a similar manner to adjoining residential developments.

4.4.2 Removalist Activities

It is likely that the development will generate the requirement for irregular removalist vehicle activity, to be undertaken with vehicles up to and including Medium Rigid Vehicles (MRVs). The irregular nature of such servicing (say, once every few months) and the considerable design impacts of providing infrastructure for the accommodation of such activity on-site is such that it is proposed that such activity be undertaken on-street.

It has previously been presented that kerb-side parking is provided within both Charles Street and Mill Road immediately adjacent to the site in an unrestricted manner. Observations have indicated that whilst demand for on-street parking within the immediate vicinity of the subject site is notable, supply exists to accommodate irregular removalist vehicle demand.

5. EXISTING TRAFFIC CONDITIONS

5.1 Surrounding Road Network

The following provides a summary of the surrounding road network function and controls:

- **Charles Street** performs a local access function, under the care and control of Liverpool City Council. Charles Street provides a north south alignment, forming a T-junction with Terminus Street at its northern extremity, operating under Give Way signage control. Right turn movements are prohibited to eastbound traffic from Terminus Street into Charles Street.

  Charles Street forms a cross intersection with Mill Road adjacent to the subject site, operating under single lane circulating roundabout control.

  In the vicinity of the site, Charles Street provides a 10m wide pavement with one through lane of traffic and parallel parking along both kerb alignments. Traffic flow within Charles Street is governed by a marked speed limit of 50km/h.

  North of the site, Charles Street intersects with a series of east-west aligned local access roads in Carey Street and Hay Street, both under major minor priority control, with Charles Street forming the priority route. South of the site, Charles Street forms a cross intersection with Atkinson Street, also under major minor priority control, prior to terminating in a cul-de-sac arrangement in the south.

- **Mill Road** performs a local access function, providing an east-west connection between Speed Street in the east and Hume Highway southbound carriageway in the west, under the care and control of Liverpool City Council.

  Mill Road provides an 11m wide pavement in the vicinity of the site, providing one through lane of traffic in each direction in conjunction with parallel parking along both kerb alignments. Traffic flow within Mill Road is governed by a sign posted speed limit of 50km/h.

  At its western extremity, Mill Road intersects with the southbound carriageway of Hume Highway under Give Way signage control. In the vicinity of the site, Mill Road intersects with Charles Street under single lane circulating roundabout control, thence intersecting with Nagle Street under major minor priority control with Mill Road forming the priority route. Further to the east, Mill Road intersects with Speed Street under single lane circulating roundabout control prior to terminating in a cul-de-sac arrangement.

- **Hume Highway** performs a major arterial road function under the care and control of Transport for NSW. In Sydney, Hume Highway extends south-west from Haberfield in the inner west to Prestons via Enfield, Greenacre, Villawood, Liverpool and Casula.

In the vicinity of the site, Hume Highway forms a divided carriageway, primarily providing three lanes of traffic in each direction. Immediately north of its intersection with Mill Road, Hume Highway intersects with Hoxton Park Road and Macquarie Street, under traffic signal control, with all movements permitted. Pavement widening is provided within the Highway to facilitate two exclusive right turn lanes for northbound traffic turning into Macquarie Street. Approximately 1km south of the site, Hume Highway intersects with the M5 motorway. Traffic flow within Hume Highway is governed by a sign posted speed limit of 60 km/h.

5.2 Existing Traffic Volumes

This Practice has commissioned peak hour traffic surveys to be completed of the intersection of Charles Street and Mill Road, situated immediately north of the site, in order to accurately ascertain existing traffic demands within the immediate precinct.

Surveys were undertaken between 7:00am – 9:00am and 4:00pm – 6:00pm on Wednesday the 4th of November 2020.

Figure 3 below provides a summary of the surveyed peak hour intervals of traffic flows at the subject intersections including a morning peak hour which has been identified as 8:00am — 9:00 am (AM Peak) and an afternoon peak hour of 5:00pm – 6:00pm (PM Peak), whilst full details are contained within **Appendix 3**.

FIGURE 3
EXISTING WEEKDAY COMMUTER PEAK HOUR TRAFFIC VOLUMES
INTERSECTION OF CHARLES STREET AND MILL ROAD

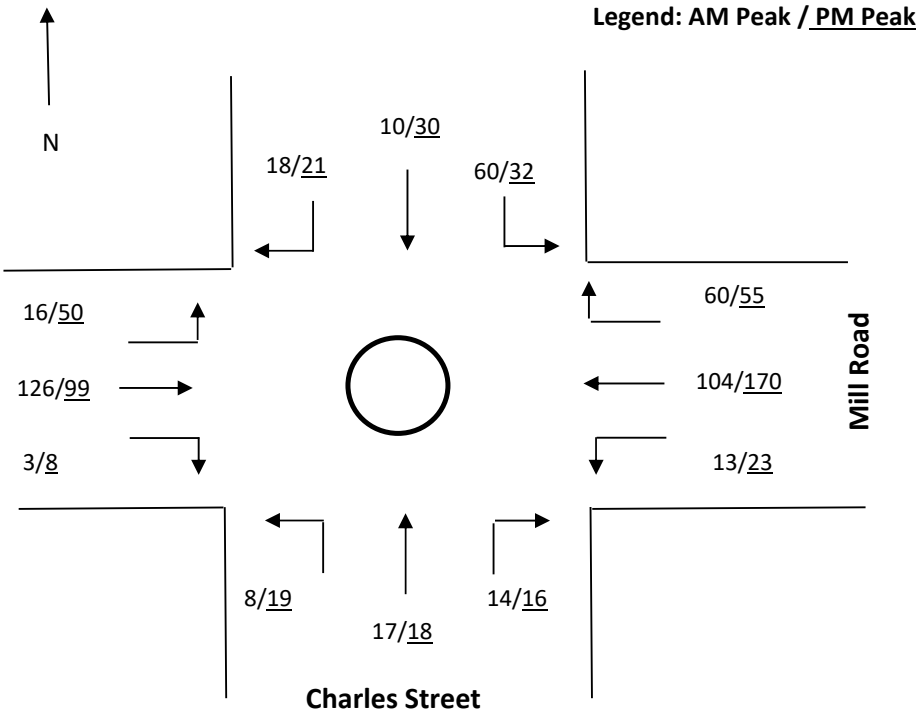


Figure 3 indicates the following:

- Charles Street, adjacent to the site, accommodates directional traffic demands between approximately 25 and 60 vehicles during weekday peak hours; and

- Mill Road, adjacent to the site, accommodates peak hourly directional traffic demands between approximately 130 and 210 vehicles.

5.3 Existing Road Network Operation

5.3.1 Intersection Performance

The surveyed intersection of Charles Street and Mill Road has been analysed utilising the SIDRA computer intersection analysis program in order to objectively assess the operation of the nearby public road network.

SIDRA is a computerised traffic arrangement program which, when volume and geometrical configurations of an intersection are imputed, provides an objective assessment of the operation efficiency under varying types of control (i.e. signs, signal and roundabouts). Key indicators of SIDRA include level of service where results are placed on a continuum from A to F, with A providing the greatest intersection efficiency and therefore being the most desirable by TfNSW.

SIDRA uses detailed analytical traffic models coupled with an iterative approximation method to provide estimates of the abovementioned key indicators of capacity and performance statistics. Other key indicators provided by SIDRA are average vehicle delay, the number of stops per hour and the degree of saturation. Degree of saturation is the ratio of the arrival rate of vehicles to the capacity of the approach. Degree of saturation is a useful and professionally accepted measure of intersection performance.

SIDRA provides analysis of the operating conditions that can be compared to the performance criteria set out in **Table 3** below (being the TfNSW method of calculation of Level of Service).

TABLE 3
LEVEL OF SERVICE CRITERIA FOR ROUNDABOUT CONTROLLED INTERSECTIONS

Level of Service	Average Delay per Vehicle (secs/veh)	Expected Delay
A	Less than 14	Little or no delay
B	15 to 28	Minimal delay and spare capacity
C	29 to 42	Satisfactory delays with spare capacity
D	43 to 56	Satisfactory but near capacity
E	57 to 70	At capacity, incidents will cause excessive delays
F	> 70	Extreme delay, unsatisfactory

The existing conditions have been modelled utilising the peak hour traffic volumes presented within **Figure 3**.

Table 4 below provides a summary of the SIDRA output data whilst more detailed summaries are included as **Appendix 4**.

TABLE 4 SIDRA OUTPUT – EXISTING WEEKDAY PEAK HOUR PERFORMANCE INTERSECTION OF CHARLES STREET & MILL ROAD, LIVERPOOL		
	AM	**PM**
Delay	6.0	6.0
Degree of Saturation	0.13	0.20
Level of Service	A	A

Table 4 indicates that the intersection of Charles Street and Mill operates with a level of service 'A' during weekday commuter peaks, providing motorists with little or no delay.

5.3.2 Charles Street Performance

Reference is made to the TfNSW's *Guide to Traffic Generating Developments* in order to undertake an assessment of the operational performance of the abutting road network. The publication indicates that a single lane of traffic accommodating peak hour traffic demands of less than 200 vehicles per hour, such as that surveyed within Charles Street, provides a level of service of 'A'. Such a level service indicates a condition of free flow where drivers are virtually unaffected by the presence of others in the traffic stream and have the freedom to select their desired speed and to manoeuvre within the traffic stream.

Whilst Mill Road has been surveyed to accommodate directional traffic demands of, at times, slightly greater than 200 vehicles during peak times, a worst case scenario level of service 'B' is assessed in accordance with TfNSW's *Guide*. Such a level service still indicates stable flow where drivers have reasonable freedom to select their desired speed and to manoeuvre within the traffic stream.

It is acknowledged that Hume Highway, Hoxton Park Road and Macquarie Street accommodate considerably greater traffic demands, commensurate with their arterial functions in the road network. The traffic signal controls governing the precinct access junctions however facilitate safe connectivity to and from the subject local precinct.

5. PROJECTED TRAFFIC CONDITIONS

5.1 Traffic Generation

Traffic generation rates for various land-uses have been established through extensive surveys undertaken throughout NSW and published within TfNSW's *Guide to Traffic Generating Developments* and *Guide to Traffic Generating Developments Updated Traffic Surveys Technical Direction TDT 2013/04a*. The following sub-sections provide a summary of the traffic generating potential of the existing and proposed site uses with respect to those rates established by Transport for NSW.

5.1.1 Existing Site Uses

Section 1.3.3 of this report presented that the subject site currently contains two detached residential dwellings. TfNSW's specifies that attached and detached dwellings provide a peak hour traffic generation rate of 0.99 vehicle movements per dwelling. The existing development is therefore considered to be capable of generating up to two peak hour vehicle trips to or from the site.

5.1.2 Proposed Development

TfNSW specifies that high density residential apartment buildings containing more than 20 dwellings provide a weekday commuter peak hour traffic generation rate of 0.29 trips per dwelling. Reduced traffic generation rates are provided for such developments within the *Guide to Traffic Generating Developments Updated Traffic Surveys Technical Direction TDT 2013/04a*, however the above rates are considered more appropriate, given the development location and parking provision.

The subject development is therefore considered to be capable of generating approximately seven peak hour vehicle trips to or from the site.

5.2 Traffic Impacts

The proposed residential apartment building has been projected to generate in the order of seven vehicle movements to and from the subject site during peak hours, or up to five additional vehicle movements over and above that currently generated by the existing site development.

These vehicle movements are primarily likely to comprise egress movements during the morning peak period and ingress movements during the evening peak period, associated with normal journey to and from work patterns of residential development.

The abovementioned peak hour traffic generation equates to approximately one additional vehicle movement every 12 minutes during commuter peaks, over and above that capable of being generated by the existing site use. Such a level of additional traffic is not projected to, in itself, result in any unreasonable impacts on the existing operational performance of the surrounding local road network.

The previous assessment contained within this report has revealed that traffic demands within the surrounding local road network are reasonably low and accordingly motorists are provided with a satisfactory level of service with spare capacity.

In consideration of the above, the impact of the development is most likely to be a result of the safety and efficiency with which motorists are capable of entering and exiting the development. Traffic demands within Charles Street are low during peak periods, thereby provide adequate gaps in directional traffic to facilitate efficient site access and egress movements. Further, the acceptable sight distance provisions between the frontage road and the proposed driveway location is such that it is envisaged that motorists will be capable of entering and exiting the site in a safe manner.

5.3 Transport Impacts

The subject site is located within easy walking distance of bus services along Hoxton Park Road and Hume Highway. Further, the site is located within approximately 15 minutes walking distance of Liverpool Railway Station. It is accordingly expected that a proportion of the future occupants of the development will utilise the surrounding public transport infrastructure to access destinations throughout the greater western Sydney metropolitan area. The capacity of the existing public transport system is however not envisaged to be measurably affected by any additional demand associated with the proposed building, given its limited scale.

6. CONCLUSION

This report assesses the potential traffic and parking implications associated with an adjoining affordable housing apartment building located at 23 – 25 Charles Street, Liverpool. Based on this assessment, the following conclusions are now made:

- The proposed site access arrangements are projected to result in motorists being capable of entering and exiting the subject site in a safe and efficient manner;

- The proposed off-street vehicular parking provision satisfies the requirements specified by the Affordable Housing SEPP;

- The internal passenger vehicle circulation arrangements are capable of providing for safe and efficient internal manoeuvring;

- The surrounding road network operates with a good level of service during peak periods;

- The development is projected to generate seven peak hour vehicle trips, representing up to five additional trips over and above that capable of being generated by the existing site development; and

- It is considered that the minor level of additional traffic associated with the subject development will not have any unreasonable impacts on the overall safety and efficiency of the surrounding road network.

It is considered, based on the contents of this report and the conclusions contained herein, there are no traffic or parking related issues that should prevent approval of the subject application.

APPENDIX 1

23-25 CHARLES STREET,LIVERPOOL
PROPOSED RESIDENTIAL FLAT BULIDING

CALCULATIONS

SITE DETAILS
23-25 Charles Street,
Liverpool
Lot 1 & 2 - DP 500066

Site Area 802m²

COMPLIANCE

CATEGORY	REQUIREMENT	PROPOSAL
Zoning	R4 Residential High Density	
FSR - **INCL. AHSEPP**	1.5:1+0.5:1 = 2:1 GFA 1604m²	1631m2
Max Height	24m	8 Storeys
Communal Open Space	25% min, 200m²	220m2, (27%)
Landscaping	30% min, 240m²	355m2, (44%)
Deep Soil	15% min, 120.3m²	310m2, (39%)
Parking		
	1 / 1BR Unit (0.4 per unit)	
	2 / 2BR Unit (0.5 per unit)	
	Visitor n/a under AHSEPP	
	= 11 Spaces REQ	11 Resident Spaces provided
	Bicycles Spaces REQ 14	15 Bicycles Spaces provided
Solar Access	70% of units, 16.8 Units	100%, 24 Units
Natural Ventilation	60% of units, 14.4 Units	100%, 24 Units

GROSS FLOOR AREA	
LEVEL	AREA (m2)
LEVEL G	31
LEVEL 1	289
LEVEL 2	289
LEVEL 3	289
LEVEL 6	176
LEVEL 4	176
LEVEL 5	176
LEVEL 7	170

TOTAL GFA
AREA (m2)
1,597

UNIT BREAKDOWN	
UNIT TYPE	QUANTITY
1 Bed	12
2 Bed	11

TOTAL UNITS
QUANTITY
23

UNIT RATING	
RATING	QUANTITY
PLATINUM	11
SILVER	12

ADG - COS	
NAME	AREA (m2)
Communal Open Space	220

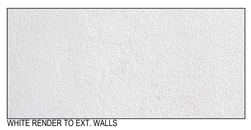
ADG - LANDSCAPE	
NAME	AREA (m2)
Landscaping	355

ADG - DEEP SOIL	
NAME	AREA (m2)
Deep Soil	310

MATERIALS & FINISHES SCHEDULE


CEMINTEL CLADDING TO EXT. WALL & FEATURE BLADE WALL


FACEBRICK - PGH - SANDSTOCKS BALMAIN TO EXT. WALLS


WHITE RENDER TO EXT. WALLS


COLORBOND WOODLAND GREY - METAL DECK ROOF & COLUMNS


COLORBOND NIGHT SKY - WINDOW & DOOR FRAMES

CONTENTS	
PAGE NO.	DRAWING DESCRIPTION
0000	Perspective
0001	Perspective
0002	Calculations
0003	Basix Commitments
0004	Building Separation Context - Up to 4 Storeys
0005	Building Separation Context - Up to 8 Storeys
0006	Site Analysis
0007	Demolition Plan
0008	Sedimentation Control Plan
0009	Site Zones
0010	Site Plan
1001	Subfloor Plan
1002	Ground Floor Plan
1003	Level 1 Plan
1004	Level 2 Plan
1005	Level 3 Plan
1006	Level 4 Plan
1007	Level 5 Plan
1008	Level 6 Plan
1009	Level 7 Plan
1010	Level 8 Plan
1011	Roof Plan
2001	North Elevation
2002	South Elevation
2003	East Elevation
2004	West Elevation
2005	Mill Rd. Streetscape
3001	Section A-A & B-B
3002	Section B & Driveway Section
4001	Window & Door Schedule
4002	Adaptation Details Typical L1 - L3
4003	Adaptation Details Typical L4 - L6
4004	Adaptation Details Typical L7
4005	Solar Diargrams
4006	Cross Ventilation Diagrams
4007	Shadow Diagram
4008	Consolidated Plans - Mill Road
4009	Fence Details

UNIT SCHEDULE				
UNIT	UNIT TYPE	AREA (m2)	LEVEL	RATING
Unit 01	2 Bed	71	L1	PLATINUM
Unit 02	1 Bed	50	L1	SILVER
Unit 03	2 Bed	71	L1	PLATINUM
Unit 04	2 Bed	71	L1	PLATINUM
Unit 05	2 Bed	71	L2	PLATINUM
Unit 06	1 Bed	50	L2	SILVER
Unit 07	2 Bed	71	L2	PLATINUM
Unit 08	2 Bed	71	L2	PLATINUM
Unit 09	2 Bed	71	L3	PLATINUM
Unit 10	1 Bed	50	L3	SILVER
Unit 11	2 Bed	71	L3	PLATINUM
Unit 12	2 Bed	71	L3	PLATINUM
Unit 13	1 Bed	54	L4	SILVER
Unit 14	1 Bed	51	L4	SILVER
Unit 15	1 Bed	50	L4	SILVER
Unit 16	1 Bed	54	L5	SILVER
Unit 17	1 Bed	51	L5	SILVER
Unit 18	1 Bed	50	L5	SILVER
Unit 19	1 Bed	54	L6	SILVER
Unit 20	1 Bed	51	L6	SILVER
Unit 21	1 Bed	50	L6	SILVER
Unit 22	2 Bed	76	L7	PLATINUM
Unit 23	2 Bed	78	L7	PLATINUM

AFFORDABLE HOUSING UNITS

POS SCHEDULE	
UNIT	AREA (m2)
Unit 01	14
Unit 02	8
Unit 03	17
Unit 04	15
Unit 05	14
Unit 06	8
Unit 07	17
Unit 08	15
Unit 09	14
Unit 10	8
Unit 11	17
Unit 12	15
Unit 13	8
Unit 14	8
Unit 15	10
Unit 16	8
Unit 17	9
Unit 18	11
Unit 19	8
Unit 20	9
Unit 21	11
Unit 22	10
Unit 23	22

All work to be carried out in accordance with BCA, All Council conditions.

Energy Smart Design: AAA rated water conservation devices include rainwater tanks shower heads, water top flow regulators, dual flush toilets & cisterns A compliant hot water systems with minimum green house score of 3.5 stars are to be used in the development. All occupants are encouraged to use AAA rated dish washing machines with front loading where possible.

NOTES

ISSUE	DRAWING DESCRIPTION	DATE
REV 2	REVISED CONCEPT BASED ON DRP AND PRE DA COMMENTS	21/07/20

IDRAFT ARCHITECTS
Nominated Architect
Adriaan Winton NSW Architects Registration Board 5347
02 9548 8648 | www.idraft.com.au | PO Box 427, Merrylands NSW 2160

project:
Demolition & construction of a eight (8) storey Residential development containing 23 units under ARHSEPP

client:
Hume Community Housing

council
Liverpool City Council

drawing title:
Calculations

designed + drawn:
M.Trinh & P.Revollar

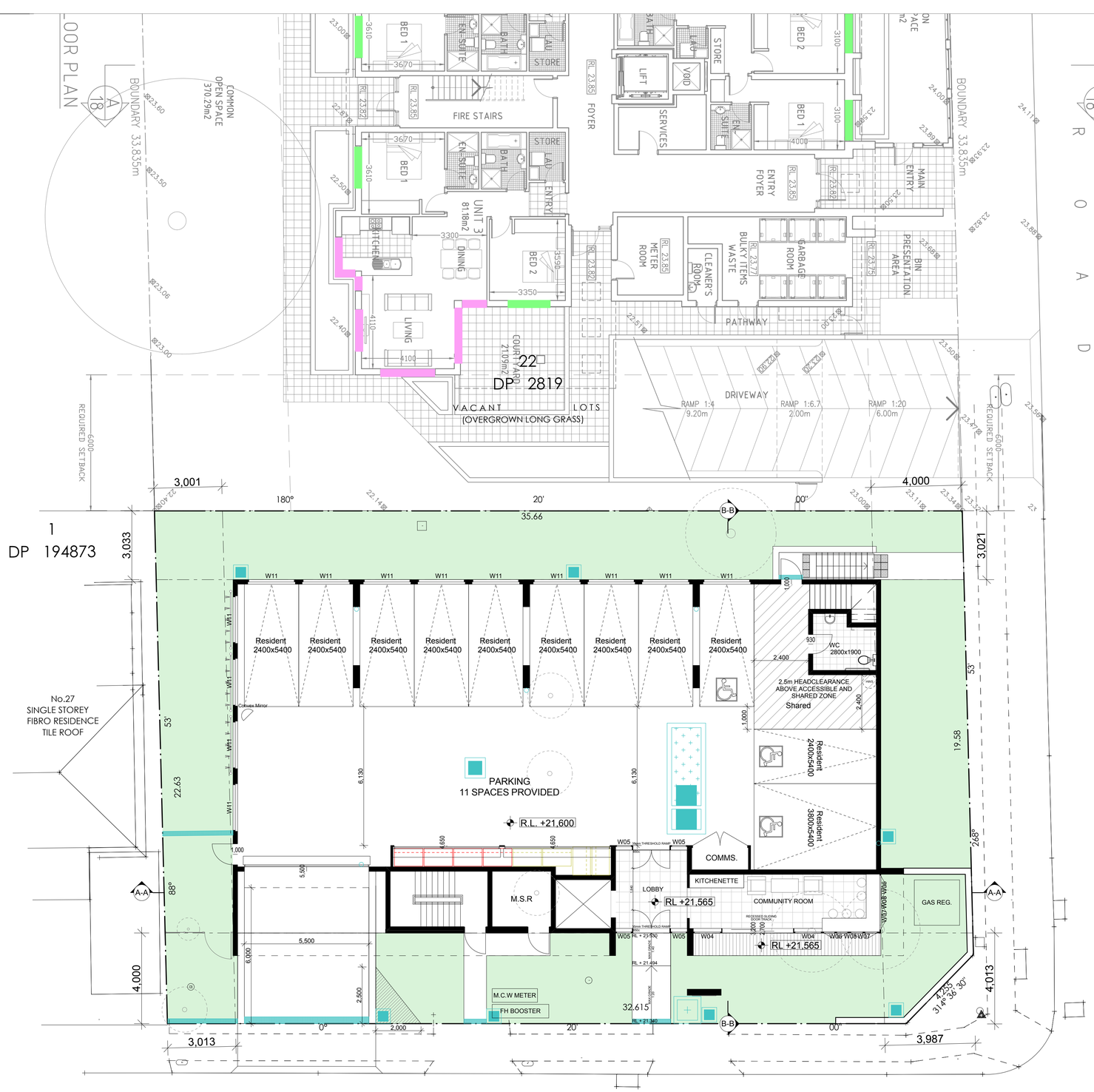
issue/Stage:
DA - ISSUE A

paper/scale:
A2/

date:
2/12/2020

job #: **28705** dwg #: **0002**

23-25 Charles Street, Liverpool



Ground floor

scale 1:100

0 1 2 3 4 5

LEVEL G
Area: 31 m2

Potential for Fully Accessible | SILVER LHG - Silver level | PLATINUM LHG - Platinum level

NORTH POINT

All work to be carried out in accordance with BCA, All Council conditions.

Copyright:The concepts & information contained in these drawings are the copyright of Idraft Group Pty Ltd. Use or duplication in part or in full without written permission of Idraft Group Pty Ltd constitutes an infringement of copyright. Do not scale off architectural drawings. These notes must be read in conjunction with colours selection for additional details on appliances, PC items & shower sizes shown on plan are inside hob dimensions shower screens to be fitted on inside of hob bulkheads may be required to accommodate drainage lines & steel beams position to be determined on site. Use figured dimensions ONLY, do not scale. Finished ground levels shown on plans are subject to site conditions, all calculated dimensions are subject to site measure during construction & no allowance has been made for shrinkage or milling position of electrical meter to be determined on site in accordance to the turret position front garden top on meter.

Energy Smart Design: AAA rated water conservation devices include rainwater tanks shower heads, water ion flow regulators, dual flush toilets & cisterns a compliant hot water systems with minimum green house score of 3.5 stars are to be used in the development. All occupants are encouraged to use AAA rated dish washing machines with front loading where possible.

NOTES

REV	DATE	DRAWING DESCRIPTION
2	21/07/20	REVISED CONCEPT BASED ON DRP AND PRE DA COMMENTS

IDRAFT ARCHITECTS

Nominated Architect
Adriaan Winters NSW Architects Registration Board 5347
02 9648 8648 | www.idraft.com.au | PO Box 427, Merrylands NSW 2160

project:
Demolition & construction of a eight (8) storey Residential development containing 23 units under ARHSEPP

client:
Hume Community Housing

council
Liverpool City Council

drawing title:
Ground Floor Plan

designed + drawn:
M.Trinh & P.Revollar

Issue/Stage:
DA - ISSUE A

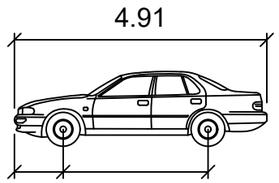
paper/scale:
A2/1:0.94, 1:100

date:
2/12/2020

job #: **28705**
dwg #: **1002**

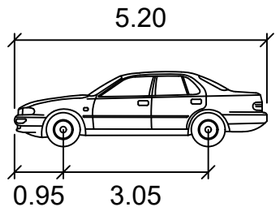
23-25 Charles Street, Liverpool

APPENDIX 2



B85

		meters
Width	:	1.87
Track	:	1.77
Lock to Lock Time	:	6.0
Steering Angle	:	34.1



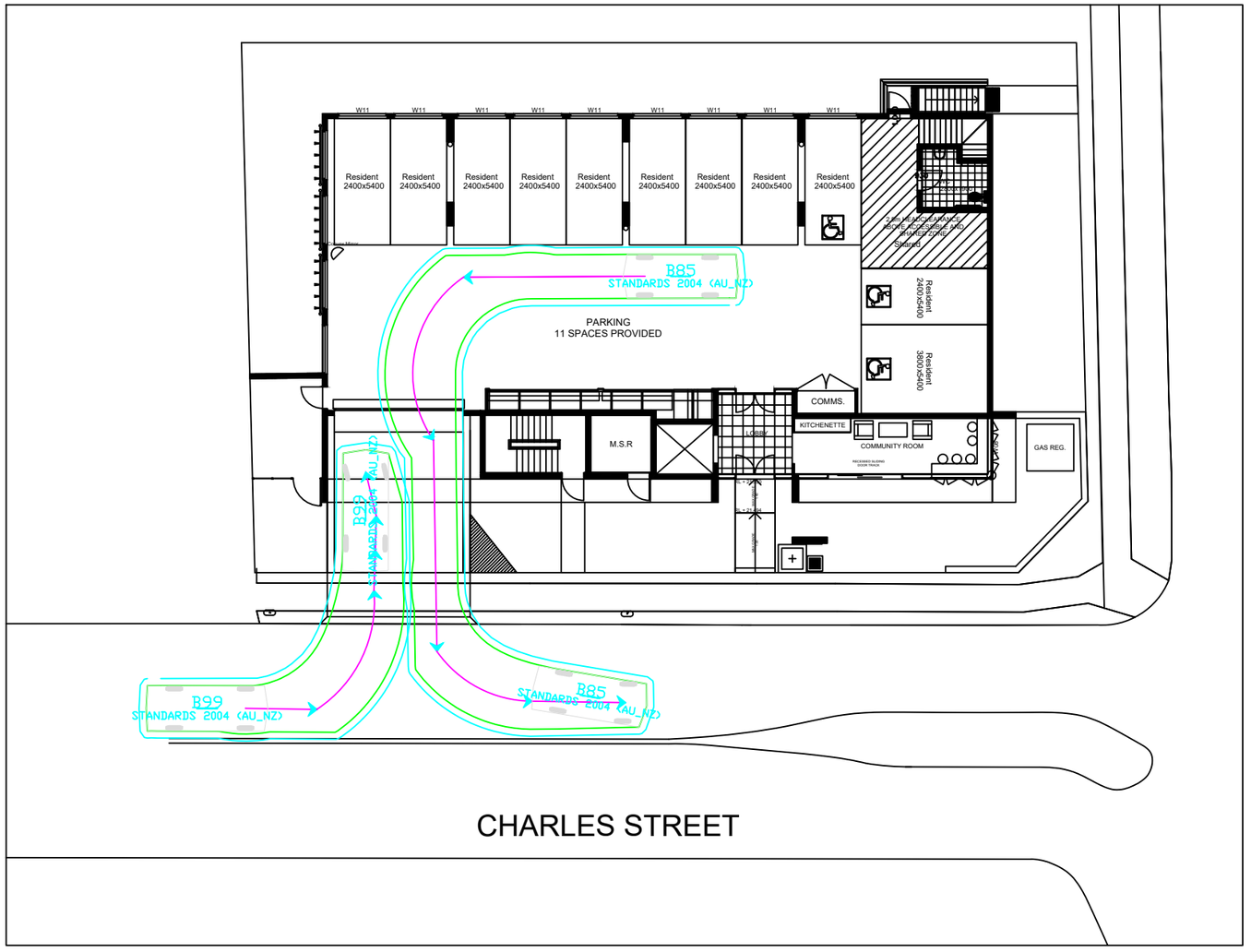
B99

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

LEGEND

VEHICLE BODY PATH (INCLUDING OVERHANG)

MANOEUVRING CLEARANCE (300mm)



STANBURY TRAFFIC PLANNING
TRAFFIC, PARKING & TRANSPORT CONSULTANTS

STANBURY TRAFFIC PLANNING
ADDRESS: 302/166 GLEBE POINT RD, GLEBE
PH: (02) 8971 8314
MOB: 0410 561 848
EMAIL: info@stanburytraffic.com.au
WEBSITE: www.stanburytraffic.com.au

NOTES:

1. THIS PLAN IS BASED ON ARCHITECTURAL PLANS PREPARED BY IDRAFT ARCHITECTS..
2. THE SWEPT PATHS PROVIDED ON THIS PLAN HAVE BEEN GENERATED UTILISING AUTOTURN PRO VERSION 11 IN CONJUNCTION WITH B99 & B85 PASSENGER VEHICLE MANOEUVRING SPECIFICATIONS IN ACCORDANCE WITH THE AUSTRALIAN STANDARD FOR PARKING FACILITIES PART 1: OFF-STREET CAR PARKING (AS2890.1:2004).

STANBURY TRAFFIC PLANNING

PASSENGER VEHICLE SWEPT PATHS

SITE INGRESS / EGRESS MOVEMENTS

PROPOSED AFFORDABLE HOUSING DEVELOPMENT

23 - 25 CHARLES STREET, LIVERPOOL

SCALE: 1:250 AT A3

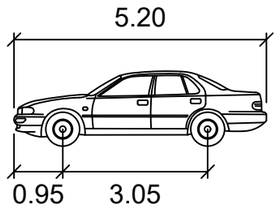
FILE: 20-215

SUPERSEDES SHEET/ISSUE -

ISSUE A

DATE: 3/12/2020

SHEET 1



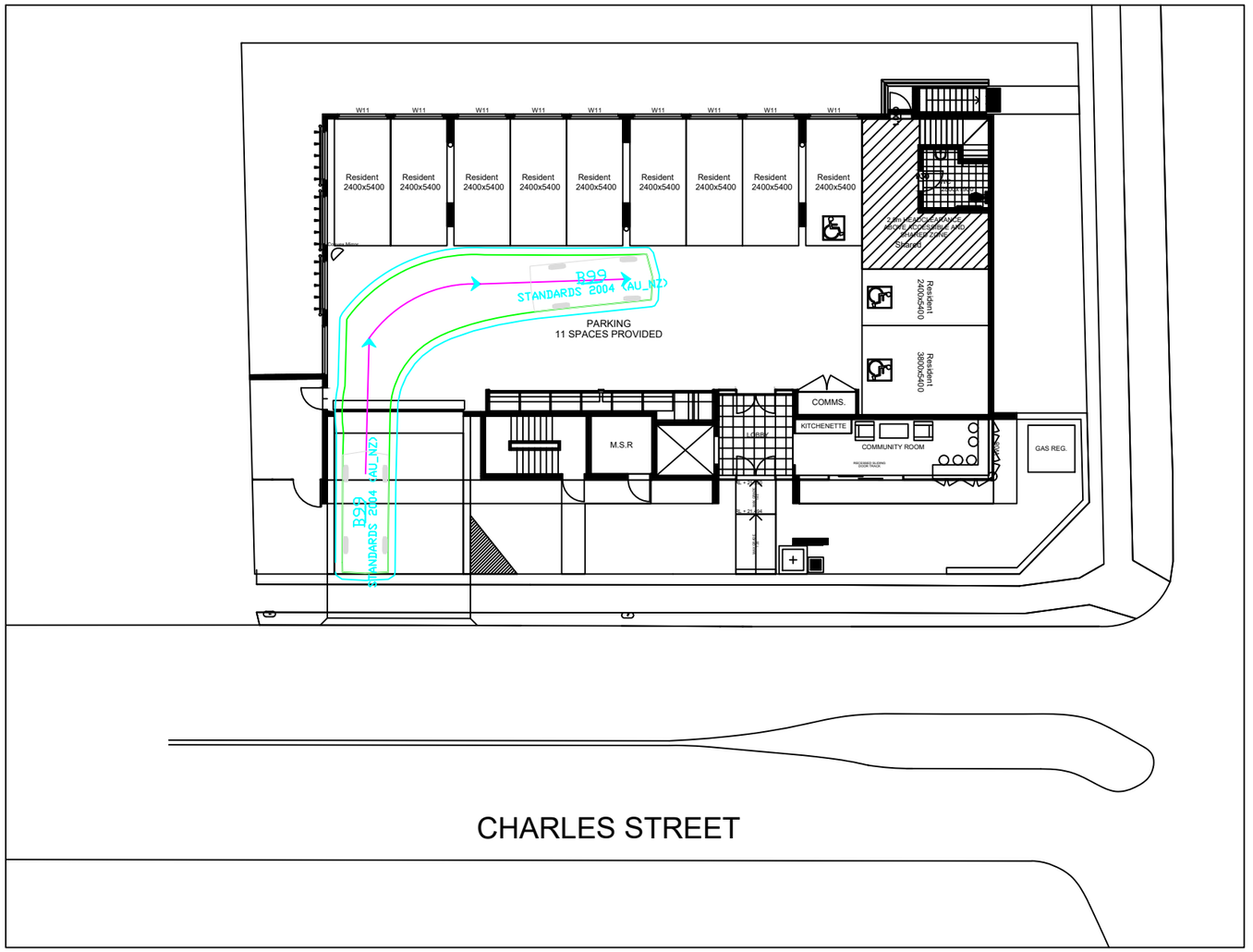
B99

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

LEGEND

VEHICLE BODY PATH (INCLUDING OVERHANG)

MANOEUVRING CLEARANCE (300mm)



STANBURY TRAFFIC PLANNING
TRAFFIC, PARKING & TRANSPORT CONSULTANTS

STANBURY TRAFFIC PLANNING
ADDRESS: 302/166 GLEBE POINT RD, GLEBE
PH: (02) 8971 8314
MOB: 0410 561 848
EMAIL: info@stanburytraffic.com.au
WEBSITE: www.stanburytraffic.com.au

NOTES:

1. THIS PLAN IS BASED ON ARCHITECTURAL PLANS PREPARED BY IDRAFT ARCHITECTS..
2. THE SWEPT PATHS PROVIDED ON THIS PLAN HAVE BEEN GENERATED UTILISING AUTOTURN PRO VERSION 11 IN CONJUNCTION WITH B99 PASSENGER VEHICLE MANOEUVRING SPECIFICATIONS IN ACCORDANCE WITH THE AUSTRALIAN STANDARD FOR PARKING FACILITIES PART 1:OFF-STREET CAR PARKING (AS2890.1:2004).

STANBURY TRAFFIC PLANNING

PASSENGER VEHICLE SWEPT PATHS

SITE INGRESS MOVEMENTS

PROPOSED AFFORDABLE HOUSING DEVELOPMENT

23 - 25 CHARLES STREET, LIVERPOOL

SCALE: 1:250 AT A3

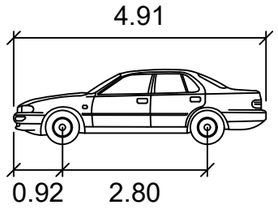
FILE: 20-215

SUPERSEDES SHEET/ISSUE -

DATE: 3/12/2020

ISSUE A

SHEET 2

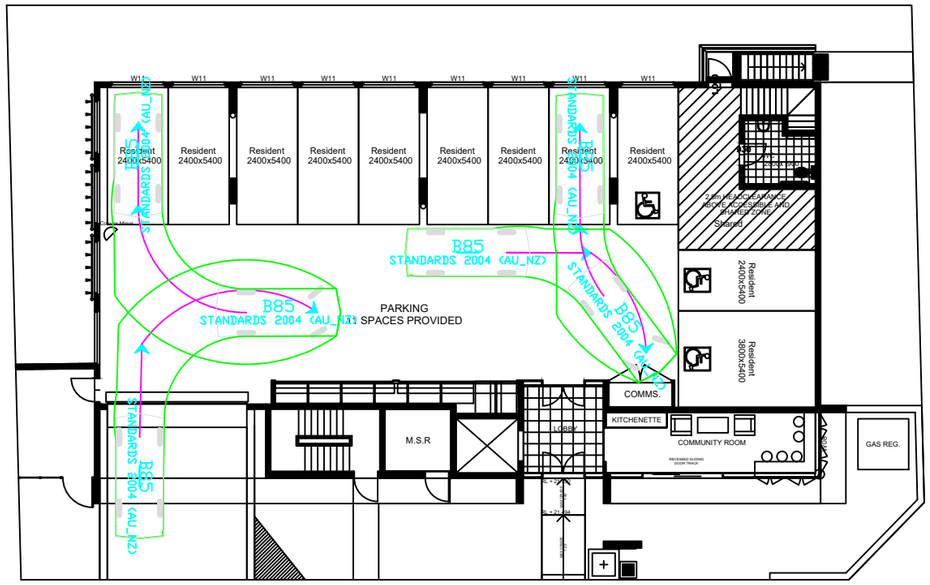


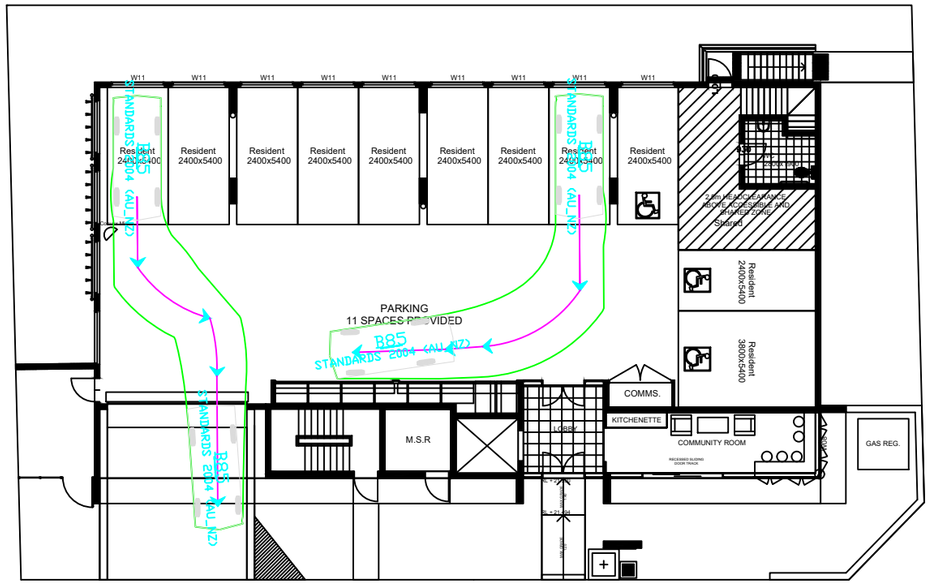
B85

	meters
Width	: 1.87
Track	: 1.77
Lock to Lock Time	: 6.0
Steering Angle	: 34.1

LEGEND

VEHICLE BODY PATH (INCLUDING OVERHANG)





STANBURY TRAFFIC PLANNING
TRAFFIC, PARKING & TRANSPORT CONSULTANTS

STANBURY TRAFFIC PLANNING
ADDRESS: 302/166 GLEBE POINT RD, GLEBE
PH: (02) 8971 8314
MOB: 0410 561 848
EMAIL: info@stanburytraffic.com.au
WEBSITE: www.stanburytraffic.com.au

NOTES:

1. THIS PLAN IS BASED ON ARCHITECTURAL PLANS PREPARED BY IDRAFT ARCHITECTS..
2. THE SWEPT PATHS PROVIDED ON THIS PLAN HAVE BEEN GENERATED UTILISING AUTOTURN PRO VERSION 11 IN CONJUNCTION WITH B85 PASSENGER VEHICLE MANOEUVRING SPECIFICATIONS IN ACCORDANCE WITH THE AUSTRALIAN STANDARD FOR PARKING FACILITIES PART 1:OFF-STREET CAR PARKING (AS2890.1:2004).

STANBURY TRAFFIC PLANNING

PASSENGER VEHICLE SWEPT PATHS

INTERNAL PARKING SPACE INGRESS / EGRESS MOVEMENTS

PROPOSED AFFORDABLE HOUSING DEVELOPMENT

23 - 25 CHARLES STREET, LIVERPOOL

SCALE: 1:250 AT A3

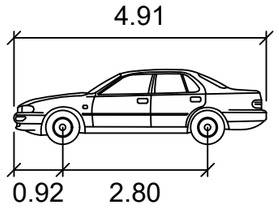
FILE: 20-215

SUPERSEDES SHEET/ISSUE -

DATE: 3/12/2020

ISSUE A

SHEET 3

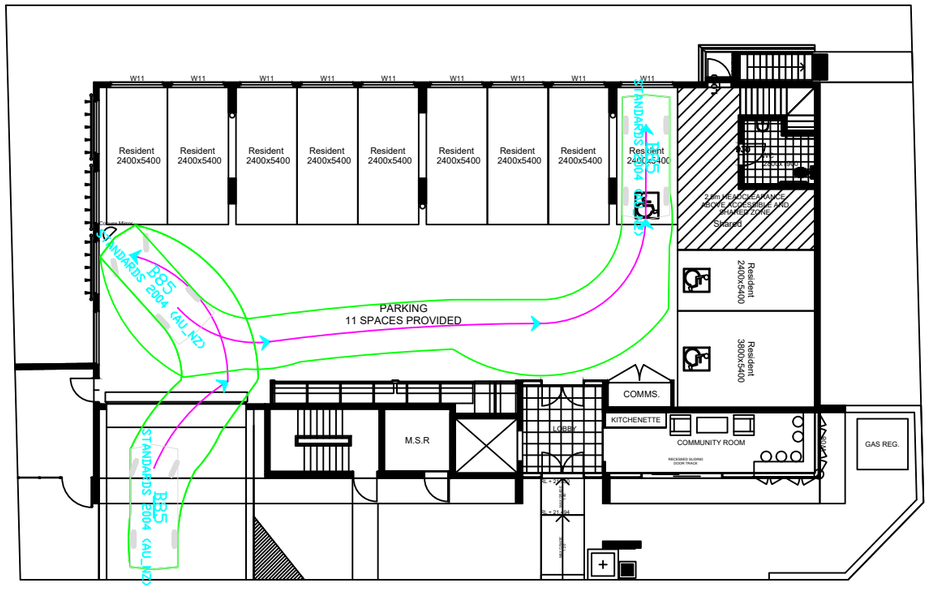


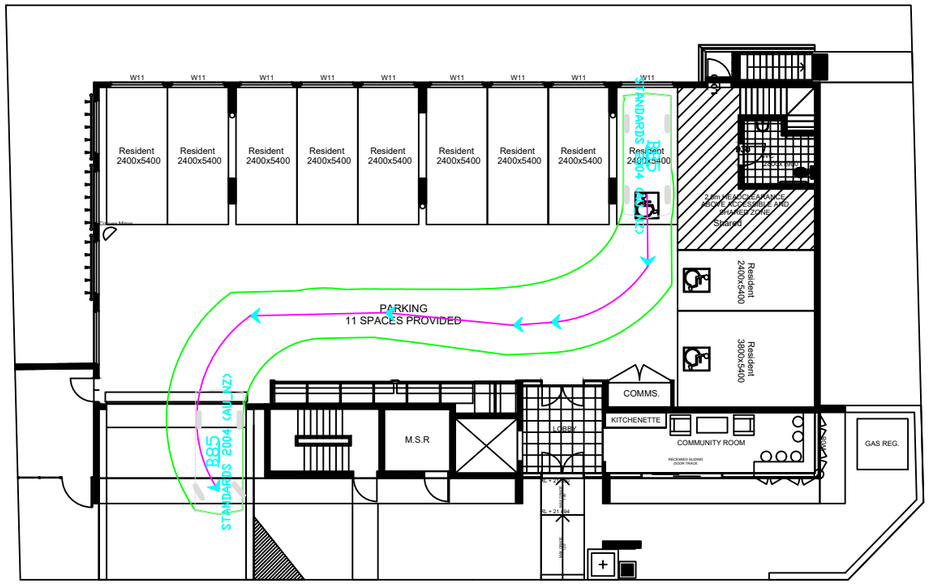
B85

		meters
Width	:	1.87
Track	:	1.77
Lock to Lock Time	:	6.0
Steering Angle	:	34.1

LEGEND

VEHICLE BODY PATH
(INCLUDING OVERHANG)





STANBURY TRAFFIC PLANNING
TRAFFIC, PARKING & TRANSPORT CONSULTANTS

STANBURY TRAFFIC PLANNING
ADDRESS: 302/166 GLEBE POINT RD, GLEBE
PH: (02) 8971 8314
MOB: 0410 561 848
EMAIL: info@stanburytraffic.com.au
WEBSITE: www.stanburytraffic.com.au

NOTES:

1. THIS PLAN IS BASED ON ARCHITECTURAL PLANS PREPARED BY IDRAFT ARCHITECTS..
2. THE SWEPT PATHS PROVIDED ON THIS PLAN HAVE BEEN GENERATED UTILISING AUTOTURN PRO VERSION 11 IN CONJUNCTION WITH B85 PASSENGER VEHICLE MANOEUVRING SPECIFICATIONS IN ACCORDANCE WITH THE AUSTRALIAN STANDARD FOR PARKING FACILITIES PART 1:OFF-STREET CAR PARKING (AS2890.1:2004).

STANBURY TRAFFIC PLANNING

PASSENGER VEHICLE SWEPT PATHS

INTERNAL PARKING SPACE INGRESS / EGRESS MOVEMENTS

PROPOSED AFFORDABLE HOUSING DEVELOPMENT

23 - 25 CHARLES STREET, LIVERPOOL

SCALE: 1:250 AT A3

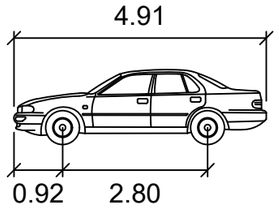
FILE: 20-215

SUPERSEDES SHEET/ISSUE -

DATE: 3/12/2020

ISSUE A

SHEET 4

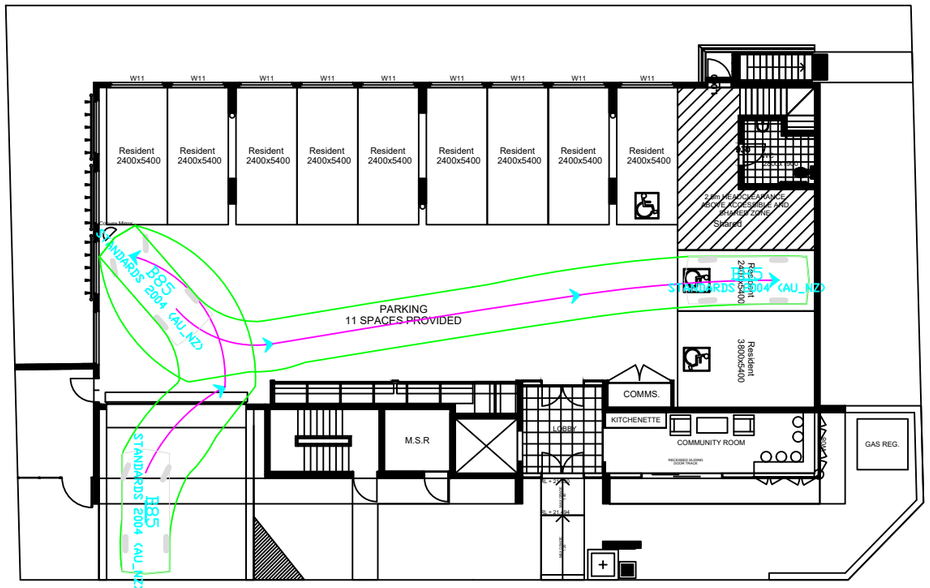


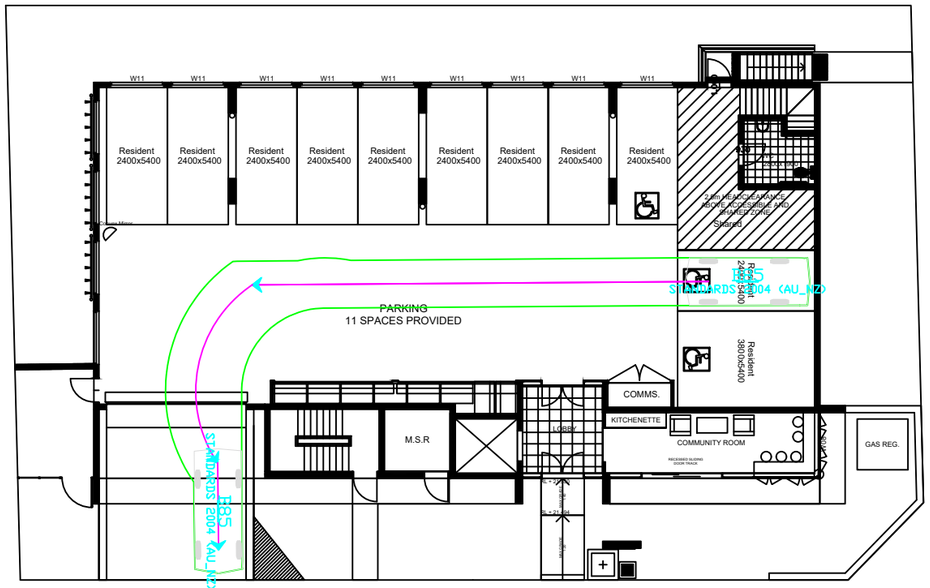
B85

	meters
Width	: 1.87
Track	: 1.77
Lock to Lock Time	: 6.0
Steering Angle	: 34.1

LEGEND

VEHICLE BODY PATH
(INCLUDING OVERHANG)





STANBURY TRAFFIC PLANNING
TRAFFIC, PARKING & TRANSPORT CONSULTANTS

STANBURY TRAFFIC PLANNING
ADDRESS: 302/166 GLEBE POINT RD, GLEBE
PH: (02) 8971 8314
MOB: 0410 561 848
EMAIL: info@stanburytraffic.com.au
WEBSITE: www.stanburytraffic.com.au

NOTES:

1. THIS PLAN IS BASED ON ARCHITECTURAL PLANS PREPARED BY IDRAFT ARCHITECTS..
2. THE SWEPT PATHS PROVIDED ON THIS PLAN HAVE BEEN GENERATED UTILISING AUTOTURN PRO VERSION 11 IN CONJUNCTION WITH B85 PASSENGER VEHICLE MANOEUVRING SPECIFICATIONS IN ACCORDANCE WITH THE AUSTRALIAN STANDARD FOR PARKING FACILITIES PART 1:OFF-STREET CAR PARKING (AS2890.1:2004).

STANBURY TRAFFIC PLANNING

PASSENGER VEHICLE SWEPT PATHS

INTERNAL PARKING SPACE INGRESS / EGRESS MOVEMENTS

PROPOSED AFFORDABLE HOUSING DEVELOPMENT

23 - 25 CHARLES STREET, LIVERPOOL

SCALE: 1:250 AT A3

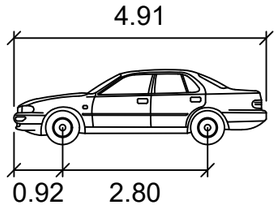
FILE: 20-215

SUPERSEDES SHEET/ISSUE -

DATE: 3/12/2020

ISSUE A

SHEET 5

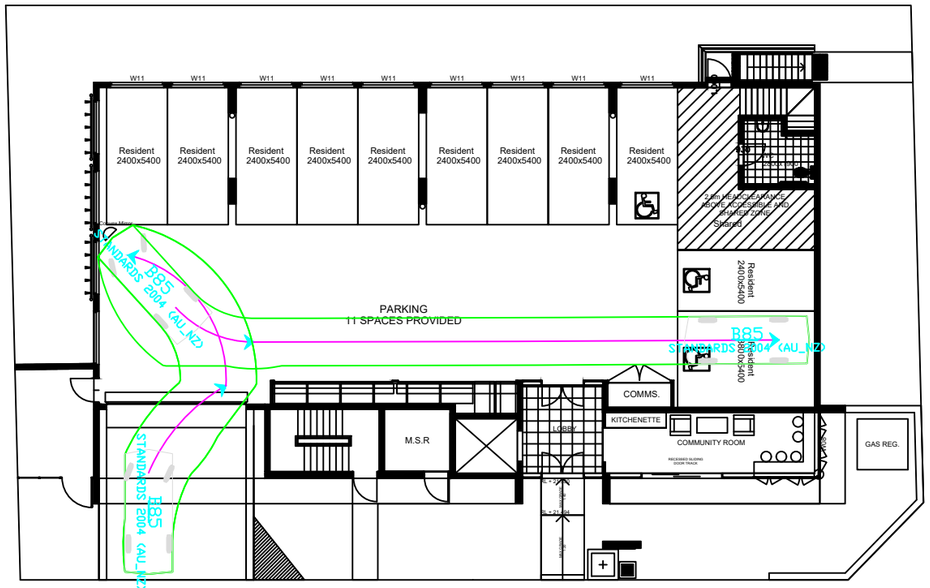


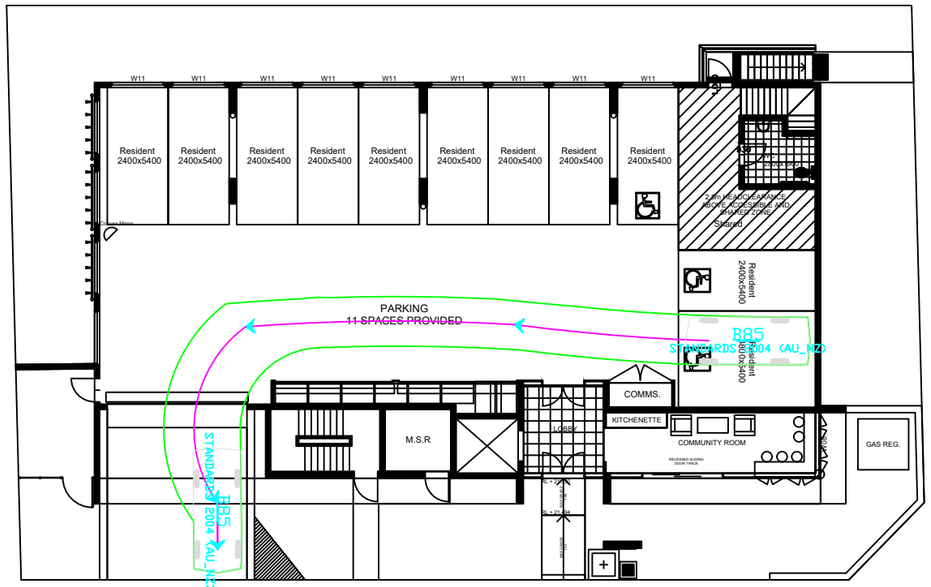
B85

	meters
Width	: 1.87
Track	: 1.77
Lock to Lock Time	: 6.0
Steering Angle	: 34.1

LEGEND

VEHICLE BODY PATH
(INCLUDING OVERHANG)





STANBURY TRAFFIC PLANNING
TRAFFIC, PARKING & TRANSPORT CONSULTANTS

STANBURY TRAFFIC PLANNING
ADDRESS: 302/166 GLEBE POINT RD, GLEBE
PH: (02) 8971 8314
MOB: 0410 561 848
EMAIL: info@stanburytraffic.com.au
WEBSITE: www.stanburytraffic.com.au

NOTES:

1. THIS PLAN IS BASED ON ARCHITECTURAL PLANS PREPARED BY IDRAFT ARCHITECTS..
2. THE SWEPT PATHS PROVIDED ON THIS PLAN HAVE BEEN GENERATED UTILISING AUTOTURN PRO VERSION 11 IN CONJUNCTION WITH B85 PASSENGER VEHICLE MANOEUVRING SPECIFICATIONS IN ACCORDANCE WITH THE AUSTRALIAN STANDARD FOR PARKING FACILITIES PART 1: OFF-STREET CAR PARKING (AS2890.1: 2004).

STANBURY TRAFFIC PLANNING

PASSENGER VEHICLE SWEPT PATHS

INTERNAL PARKING SPACE INGRESS / EGRESS MOVEMENTS

PROPOSED AFFORDABLE HOUSING DEVELOPMENT

23 - 25 CHARLES STREET, LIVERPOOL

SCALE: 1:250 AT A3

FILE: 20-215

SUPERSEDES SHEET/ISSUE -

DATE: 3/12/2020

ISSUE A

SHEET 6

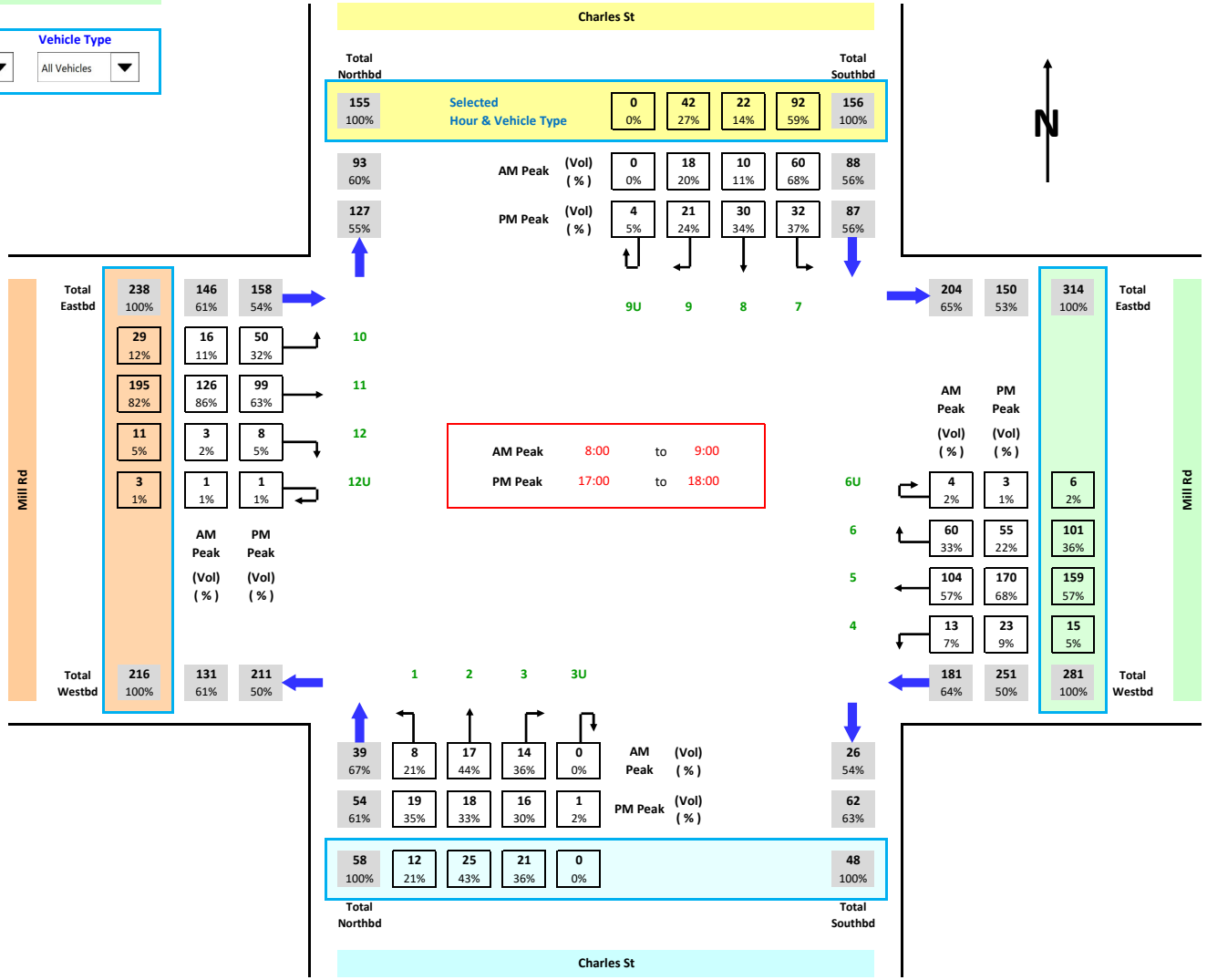
APPENDIX 3

Job No. : N6045
Client : Stanbury Traffic Planning
Suburb : STP Nov 2020
Location : 3. Mill Rd / Charles St

Day/Date : Wed, 4 Nov 2020
Weather : Fine
Description : Classified Intersection Count
: Intersection Diagram

MATRIX Traffic and Transport Data

Hour Starting AM Totals | **Vehicle Type** All Vehicles



APPENDIX 4

MOVEMENT SUMMARY

Site: [Intersection of Charles Street & Mill Road, Liverpool]

Existing AM Peak
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Charles Street South												
1	L2	8	5.0	0.037	6.0	LOS A	0.2	1.3	0.35	0.57	0.35	51.9
2	T1	17	5.0	0.037	5.9	LOS A	0.2	1.3	0.35	0.57	0.35	52.7
3	R2	14	5.0	0.037	8.8	LOS A	0.2	1.3	0.35	0.57	0.35	52.3
Approach		39	5.0	0.037	6.9	LOS A	0.2	1.3	0.35	0.57	0.35	52.4
East: Mill Road East												
4	L2	13	5.0	0.132	5.1	LOS A	0.7	5.2	0.14	0.54	0.14	52.5
5	T1	104	5.0	0.132	5.0	LOS A	0.7	5.2	0.14	0.54	0.14	53.4
6	R2	60	5.0	0.132	7.9	LOS A	0.7	5.2	0.14	0.54	0.14	52.9
Approach		177	5.0	0.132	6.0	LOS A	0.7	5.2	0.14	0.54	0.14	53.2
North: Charles Street North												
7	L2	60	5.0	0.081	5.8	LOS A	0.4	3.0	0.32	0.57	0.32	52.3
8	T1	10	5.0	0.081	5.7	LOS A	0.4	3.0	0.32	0.57	0.32	53.1
9	R2	18	5.0	0.081	8.6	LOS A	0.4	3.0	0.32	0.57	0.32	52.7
Approach		88	5.0	0.081	6.4	LOS A	0.4	3.0	0.32	0.57	0.32	52.4
West: Mill Road West												
10	L2	16	5.0	0.125	5.5	LOS A	0.6	4.6	0.26	0.50	0.26	52.7
11	T1	126	5.0	0.125	5.4	LOS A	0.6	4.6	0.26	0.50	0.26	53.6
12	R2	3	5.0	0.125	8.3	LOS A	0.6	4.6	0.26	0.50	0.26	53.1
Approach		145	5.0	0.125	5.5	LOS A	0.6	4.6	0.26	0.50	0.26	53.5
All Vehicles		449	5.0	0.132	6.0	LOS A	0.7	5.2	0.23	0.54	0.23	53.1

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.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: [Intersection of Charles Street & Mill Road, Liverpool]

Existing PM Peak
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Charles Street South												
1	L2	19	5.0	0.054	6.3	LOS A	0.3	1.9	0.41	0.60	0.41	51.8
2	T1	18	5.0	0.054	6.2	LOS A	0.3	1.9	0.41	0.60	0.41	52.6
3	R2	16	5.0	0.054	9.2	LOS A	0.3	1.9	0.41	0.60	0.41	52.2
Approach		53	5.0	0.054	7.2	LOS A	0.3	1.9	0.41	0.60	0.41	52.2
East: Mill Road East												
4	L2	23	5.0	0.195	5.3	LOS A	1.1	8.0	0.22	0.53	0.22	52.5
5	T1	170	5.0	0.195	5.2	LOS A	1.1	8.0	0.22	0.53	0.22	53.4
6	R2	55	5.0	0.195	8.1	LOS A	1.1	8.0	0.22	0.53	0.22	52.9
Approach		248	5.0	0.195	5.9	LOS A	1.1	8.0	0.22	0.53	0.22	53.2
North: Charles Street North												
7	L2	32	5.0	0.075	5.7	LOS A	0.4	2.7	0.30	0.56	0.30	52.2
8	T1	30	5.0	0.075	5.6	LOS A	0.4	2.7	0.30	0.56	0.30	53.1
9	R2	21	5.0	0.075	8.5	LOS A	0.4	2.7	0.30	0.56	0.30	52.6
Approach		83	5.0	0.075	6.3	LOS A	0.4	2.7	0.30	0.56	0.30	52.6
West: Mill Road West												
10	L2	50	5.0	0.134	5.5	LOS A	0.7	5.0	0.26	0.52	0.26	52.7
11	T1	99	5.0	0.134	5.4	LOS A	0.7	5.0	0.26	0.52	0.26	53.6
12	R2	8	5.0	0.134	8.3	LOS A	0.7	5.0	0.26	0.52	0.26	53.1
Approach		157	5.0	0.134	5.6	LOS A	0.7	5.0	0.26	0.52	0.26	53.3
All Vehicles		541	5.0	0.195	6.0	LOS A	1.1	8.0	0.26	0.54	0.26	53.0

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.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.